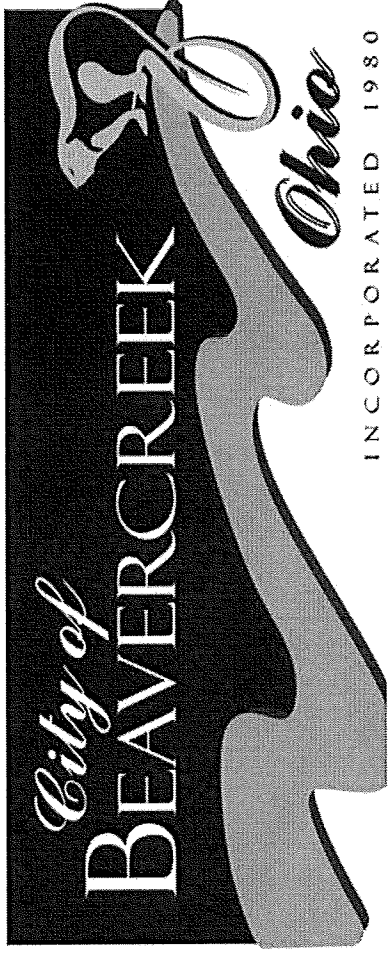




CITY OF BEAVERCREEK

SUBDIVISION CONSTRUCTION STANDARDS

(Submitted for Planning Commission Approval)

DEPARTMENT OF PUBLIC WORKS
DEPARTMENT OF PLANNING & ZONING

April 2018

Subdivision Construction Standards

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SECTION I – GENERAL CONDITIONS

SECTION I - GENERAL CONDITIONS

- A. TITLE.** These construction standards shall be known and may be cited and referred to as the "City of Beavercreek Subdivision Construction Standards Manual", and shall hereinafter be referred to as "Construction Standards Manual".
- B. EFFECTIVE DATE.** This Construction Standards Manual shall be effective on the date of adoption of a resolution by the City of Beavercreek Planning Commission. Henceforth, any other regulations previously adopted which are in direct conflict with this set of adopted construction standards shall be deemed to be repealed and/or declared void and all others shall remain in full force.
- C. VALIDITY.** Should any section or individual provision of this document be decided by the courts to be unconstitutional or invalid, such a decision shall not affect the validity of this Construction Standards Manual as a whole or any part hereof, other than the particular portion so held to be unconstitutional or invalid.
- D. ENFORCEMENT.** This Construction Standards Manual shall be enforced by the City Engineer, or his designated representative.
- E. INTERPRETATION.** The provisions of the Construction Standards Manual shall be the minimum requirements adopted for the promotion of health, safety, and welfare of the constituents of the City of Beavercreek, Ohio. When this Construction Standards Manual imposes greater restrictions than are required by existing laws or rules, then the provisions of the Construction Standards Manual shall take precedence and govern.
- F. JURISDICTION.** This Construction Standards Manual shall be applicable to all subdivisions of land within the City of Beavercreek.
- G. AMENDMENTS.** The Planning Commission may, by Resolution, amend, supplement, or change the Construction Standards Manual upon the receipt of a recommended modification from the City Engineer. Within thirty (30) days after receipt of the recommended modification from the City Engineer, the Planning Commission shall schedule a public hearing. The date of the hearing shall not be more than forty-five (45) days from the receipt of the recommended modification. Notice of such hearing shall be given by the Planning Commission by at least fifteen (15) days before the date of the hearing. The amendment(s) shall be on file in the Department of Public Works for public examination during said fifteen (15) days. As soon as reasonably possible after completion of the public hearing, the Planning Commission shall pass a motion to adopt, amend, return or deny the recommendation of the City Engineer by a vote of a majority of the Planning Commission membership. Such amendment adopted by the Planning Commission shall become effective immediately upon passage.

SECTION II - SUBDIVISION DRAINAGE DESIGN

4. **Roughness Coefficient.** The roughness coefficient (n) used in the Manning Formula shall be:

- n = 0.009 - PVC pipe
- n = 0.013 - concrete pipe
- n = 0.025 - channels in good condition
- n = 0.035 - channels with stones & weeds
- n = 0.060 - channels in poor condition

5. **Minimum Cover.** The minimum cover for any storm sewer under pavement will be one (1) foot measured from the bottom of the roadway base material to the top of the pipe. Outside of the paved roadway, the minimum cover shall be two (2) feet.

6. **Minimum / Maximum Velocities.**

- a. The velocities in storm sewer pipes shall not be less than two (2) feet per second for the design storm nor more than twelve (12) feet per second when flowing full.
- b. Velocities higher than twelve (12) feet per second may be considered in cases where it can be shown to the satisfaction of the City Engineer, that staying within the maximum allowed would cause an unreasonable burden. In such situations special provisions, such as concrete pipe anchors, shall be provided. Other measures may be necessary to inhibit pipe and soil erosion.

7. **Free Outlets.** Where a storm sewer outlets to an open channel or a detention facility, a headwall must be constructed. Rock channel protection, or other suitable erosion protection controls, must be placed at the pipe outlet as shown on Exhibit C.

8. **Manholes.** Manholes shall be located at each horizontal change in direction, vertical change in grades, and shall be no more than 300 feet apart.

9. **Pipe Requirements.** All storm sewer pipe that is within the public right-of-way or public easement shall be reinforced concrete pipe (ODOT CMS 706.02), with granular bedding and backfill (ODOT type B).

Non-reinforced concrete or alternative material pipe may be used outside of road right-of-ways provided the strength of such pipe is sufficient to withstand the loads imposed upon it. The pipe shall be designed in accordance with the Ohio Department of Transportation design manual. In no case shall corrugated metal pipe be permitted.

B. CULVERT DESIGN

- 1. Storm Frequencies.** The peak rate of runoff used for selecting the culvert shall be determined by using the following storm frequencies:
 - a. Design to convey the 25-year storm and to meet the maximum allowable headwater elevations.
 - b. Check the 100-year storm to meet the maximum allowable headwater elevations.
 - c. Driveway pipes are considered culverts, and will be sized for the 10-year storm. Each driveway pipe need not be formally designed except when the headwater approaches the maximum allowable elevation.
- 2. Design Method.** Culverts will be designed by the methods found in "Hydraulic Charts for the Selection of Highway Culverts, FHWA, Highway Engineering Circular No. 5-1965" or later revision and charts in the Ohio Department of Transportation Location and Design Manual - Drainage Design Charts. All culvert design data must be submitted to the City Engineer for approval.
- 3. Type of Culvert Flow.** All culverts will be reviewed for both inlet and outlet control. The higher headwater elevation will govern.
- 4. Headwalls.** All culverts, except driveway pipes, will be constructed with headwalls.
- 5. Allowable Headwater Elevations.**
 - a. The calculated headwater elevation from the 100-year storm shall be two (2) feet below the lowest opening in any existing or proposed building subject to flooding and one (1) foot below the near edge of pavement elevation.
 - b. The headwaters for the 25-year storm shall be no higher than 2.5 feet above the inlet crown and the tailwater elevation shall not submerge the outlet crown.
 - c. The minimum cover for culvert pipes shall be as specified above for storm sewer pipes.

6. Erosion Control. The outlet velocity and pipe size will determine the erosion control needed at the culvert outlet. Rock size, depth, length, and minimum width of rock channel protection shall be determined by Exhibit C.

- a. The height of protection along the side slope shall be the depth of water at the outlet end of the culvert for a 25-year storm plus two (2) feet.
- b. Filter fabric or a granular bed six (6) inches deep must be provided under all rock channel protection.
- c. Specially designed energy dissipaters, or reinforced concrete channel lining, may be required with the approval of the City Engineer.

C. BRIDGE DESIGN

1. Design. All structures will be designed according to the American Association of State Highway and Transportation Officials (AASHTO) HS20-44 loading. All structures shall be the width of the pavement plus four (4) feet additional on each side. They shall be adequately protected with guard rails in accordance with the State of Ohio Standard Design Specifications. If sidewalks are required, additional railing or fences for pedestrian safety may be required by the City Engineer.

2. Waterway Adequacy. A minimum freeboard of two (2) feet shall be maintained from the bridge deck to the waterway surface at the 100-year storm.

D. CATCH BASIN DESIGN

1. Inlet Size & Spacing. It will be the responsibility of the designer to place inlets in the street and inlets or catch basins in other locations using accepted empirical techniques. The use of Nomographs for Flow in Triangular Channels, and the Ohio Department of Transportation Location and Design Manual - Drainage Design Charts - is encouraged. Data and computations for pavement inlet spacing will be submitted in a format acceptable to the City Engineer.

- a. Allowable Spread of Water. The horizontal spread of water on pavement must not exceed 8 feet based on a 2-year storm.
- b. The spread is measured from the face of curb towards the street centerline. The depth of the water must not exceed the top of curb.
- c. Inlet Interception. Each inlet on a continuous grade in the storm sewer system in pavement must intercept no less than 80% of the

gutter flow reaching it. At intersections and low points, 100% of the flow must be intercepted. No water will be permitted to flow across crosswalks or through street intersections.

- d. Inlets on a continuous grade shall be either ODOT Type 3-A catch basins or shall be a City of Beavercreek Type 1 catch basin. Inlets in street sags or other low points shall be either ODOT Type 3 catch basins or shall be a City of Beavercreek Type 2 catch basin.
- e. The depth of ponded water cannot exceed the crown of the curb opening of the inlet for a 25-year storm.
- f. The maximum spacing of catch basins in roadways is 300 feet.

E. OPEN CHANNELS

- 1. **Proposed and Natural Watercourses.** All proposed and existing watercourses that are contained within the limits of a proposed development, where the anticipated storm drainage from the 100-year storm can be conveyed in a 72 inch concrete pipe or less, shall be carried in a closed conduit.
- 2. **Lot Drainage.** In residential areas, lot by lot drainage to the street by use of swales between adjacent buildings may be used, provided that the swale conveys the runoff from no more than one-half acre. Drainage areas greater than one-half acre shall be intercepted by the development's storm sewer system.

3. Open Channels.

- a. All channels in a development will be reviewed for depth, width, and velocity for a 100-year storm using acceptable hydraulic techniques. Proposed developments contiguous to existing channels must be located such that the maximum water surface elevations due to the 100-year storm, including the backwater from culverts and other restrictions, shall be two (2) feet below the lowest opening in any existing or proposed building subject to flooding by the channel.
- b. The horizontal limits of the water surface after development, as determined by the 100-year storm, must be no closer than 25 feet to any proposed building.
- c. At the City's discretion, natural channels contiguous to or running through an area being considered for development, but not disturbed by the development, shall be studied to determine the need for upgrading, rehabilitation, or maintenance. If such work is required,

the developer shall provide all necessary design information and a plan showing in detail the work to be done. This work may consist of tree, debris, and obstruction removal, bottom and slope erosion control, slope stabilization with rock or other protection, and the regrading of the side slopes to achieve a more suitable grade. The City may require, for pipe sizes less than 72 inches in diameter, that the flow within the existing channel be enclosed in a conduit. Each area will be considered on its own merits to standards set forth by the City.

- d. When required by the City Engineer, Public drainage easements shall be conveyed to the City for any existing or proposed channels within the limits of a proposed subdivision.
- e. Open channels shall be designed to convey the anticipated flow from the 100-year storm within its banks.
- f. Channel protection shall be required if the velocities of the flow in a channel exceed six (6) feet per second for sodded channels. If the exit velocity from a storm sewer exceeds the allowable velocities, an energy dissipating device (e.g. stilling basin, dumped rock) may be necessary.
- g. A typical section of all proposed open channels shall be shown in the plans and shall contain at least the following information.
 - I. Side slopes (The steepest permissible side slope is 3:1)
 - II. Flat bottom width or rounding radius
 - III. Depth of water at the design storm
 - IV. Type and width of channel lining.
 - V. Width of drainage easement

F. STORM WATER DETENTION

All storm water detention plans for proposed developments shall conform to the requirements of Chapter 154, Storm Water Management Ordinance, of the City of Beavercreek Codified Ordinances.

The basic premise is that land uses and developments which increase the runoff rate and volume shall be required to control the discharge rate of runoff prior to its release to its off-site outlet.

Any increase in the rate of discharge of site surface drainage water caused by site development shall be controlled so that the post-development peak rate of runoff does not exceed that of the one-year pre-development storm, for all 24-hour storms between a one-year frequency and the critical storm frequency as determined below. The method by which an applicant shall determine changes in rates and volumes of runoff is presented in the U.S. Department of Agriculture, Engineering Division of the Soil Conservation Service, Urban Hydrology for Small Watersheds, Technical Release No. 55, **June 1986 or most current edition**.

To find the critical storm frequency for which additional control will be needed, the applicant shall:

- a. Determine the percent increase in runoff volume for a one-year frequency, 24-hour storm occurring on the development area.
- b. Determine the critical storm frequency for which additional control is needed by using the percent increase in runoff volume, derived in Table 1.
- c. Control the post-development storms of a frequency between one-year and the critical storm, so as to be equal to, or less than, the pre-development peak runoff rate for a 24-hour one-year frequency storm.
- d. Control the post-development peak runoff of all storms less frequent than the critical storm to not exceed pre-development conditions.

**DETERMINING STORM FREQUENCY
FOR WHICH CONTROL IS NEEDED**

Percent increase in runoff volume from a 1-year freq. 24-hour storm		The Critical Storm for Peak Rate Control
Equal or Greater Than (Percent)	Less Than (Percent)	(years)
--	10	1
10	20	2
20	50	5
50	100	10
100	250	25
250	500	50
500	--	100

1. WATER QUALITY

Water quality is a portion of storm water that must be addressed for projects per the requirements of Chapter 154, Storm Water Management Ordinance, of the City of Beavercreek Codified Ordinances and Ohio Environmental Protection Agency (OEPA) requirements for post-construction Best Management Practices (BMPs). For purposes of the quantifying water quality, calculations use the Water Quality Volume (WQ_v). This is the amount of storm water runoff from any given storm that should be captured and treated in order to remove a majority of storm water pollutants on an average annual basis. The WQ_v for any given development can be calculated from the following equation:

$$WQ_v = (P * A * C_q) / 12$$

Where:	WQ _v	=	Water Quality Volume (Acre-feet)
	P	=	Precipitation (0.75 inches)
	A	=	Contributing Drainage Area (acre)
	C _q	=	0.858i ³ -0.78i ² +0.774i+0.04
	i	=	impervious area divided by the total area (use 0.9 within existing roadway right-of-way for calculation purposes)
	C _q	=	0.9 when all drainage area is impervious

The WQ_v is then used in the sizing of the water quality structure(s) that will be used on the project.

2. DRAINAGE PLANS

The following data shall be provided, at a minimum, to allow for the City Engineer to determine if the developer's plan conforms to Chapter 154 of the City of Beavercreek Codified Ordinances and the provisions contained in this document.

[At all critical points within the subdivision]:

- a. Tributary drainage areas delineated on a topographic map of the highest accuracy available. USGS data shall be utilized as a last resort.
- b. Pre and post-development drainage area maps.
- c. Times of concentrations with the flow paths used to determine these values delineated on the drainage area maps.

- d. Overland flow paths for when the capacity of the development's storm sewer is exceeded.
- e. Allowable peak discharge calculations.
- f. Critical storm determination.
- g. Curve Numbers used in calculations with supporting documentation showing how the Curve Numbers were derived. Pre-development and post-development curve numbers shall be determined and submitted to the City Engineer for approval.
- h. Inflow and outflow hydrographs for all detention/retention structures and any direct release.
- i. Water quality calculations, graphs, etc. to show compliance with City of Beavercreek and OEPA requirements.
- j. All software used for storm water modeling shall be based upon the SCS methodology (e.g. TR-55).

3. HYDRAULIC CALCULATIONS

- a. Sizes and types of drainage improvements, including special structures, typical sections, right-of-way width and detention/retention outlet structure elevations and details, and storm water quality structures.
- b. Supporting calculations for upstream and downstream channel capacities as they affect overflow, erosion, or backwater within the subdivision. Such calculations shall be substantiated by such additional information as is required to determine profile and cross-section of the upstream and downstream channel reaches under consideration.

- c. Sufficient contours and grading details to indicate proposed street grades and elevations throughout the subdivision. The steepest permissible slope in a development is 3:1.

4. CONSTRUCTION PLANS

The final construction plans for drainage within the subdivision shall conform to the above provisions and to any special conditions as required by the City Engineer in approving the drainage plan. Such construction plans for drainage shall be approved by the City Engineer prior to construction of any drainage facilities within the subdivision. A grading plan

shall be submitted along with the construction plans to identify the lot grading and in-tract drainage planned for the subdivision.

The designer should investigate the capacity of the downstream drainage facilities to determine if they will be adequate to handle the design flow from this particular subdivision. If the downstream facilities are inadequate, it may be necessary to provide additional detention or to improve existing downstream drainage structures.

5. DETENTION/RETENTION BASINS

- a. Detention basins serve to capture and temporarily store the surface water runoffs which result from urban development. This temporary storage allows for the release of the storm runoff at discharge rates which are acceptable to the receiving waterway.
- b. On-site provision for detention storage would follow these approaches:
 - I. The release rate and volume of detention storage would be based upon Chapter 154, Storm Water Management Ordinance, of the City of Beavercreek Codified Ordinances, as shown in Exhibit G.
 - II. Recreational uses should be maximized where possible and feasible.

6. RECOMMENDATIONS FOR DRY DETENTION BASINS

- a. Where water quality during dry weather periods in small basins would be a potential problem due to lack of adequate dry weather flow, direct pollution from surface water runoff, or high nutrients in the flow; the basin should be designed to remain dry except when in flood use.
- b. Dry detention basins should be designed to minimize the wetness of the bottom so that water does not remain standing in the bottom; thereby harboring insects and limiting the potential use of the basin. This shall be accomplished by means of a concrete low flow channel between inlet and outlet structures. Minimum slope shall be no less than 0.5 percent.
- c. The detention basin should be designed to have a multi-purpose function. Recreational facilities, aesthetic qualities, etc., as well as flood water storage should be considered in planning the basin.
- d. Side slopes shall be 3 to 1 or flatter.

- e. There shall be a minimum of a 3-foot berm at 2 percent between right-of-way and top of basin slopes.

7. RECOMMENDATIONS FOR BASINS CONTAINING PERMANENT WATER

- a. In order to provide better management for water quality, retention basins containing permanent lakes should have a water area of at least one-half acre. The lake area should be an average depth of at least approximately seven (7) feet to inhibit weed and insect growth, and should have no extensive shallow areas. A system to augment storm flows into the lake with water from other sources should be provided to enhance the water quality, if necessary. These systems would include the use of public water supplies or wells on site.
- b. In excavated lakes, the underwater side slopes in the lakes should be stable.
- c. A safety ledge 4 to 6 feet in width is recommended and should be installed in all lakes approximately 30 to 36 inches below the permanent water level to provide a footing if people fall into the water. In addition, there shall be a minimum of a 5-foot berm at 2 percent slope beginning at least 1 foot above normal pond elevation. The slope between two ledges should be stable and of a material which will prevent erosion due to wave action (see sketch attached). Walkways consisting of a non-erosive material should be provided in areas where extensive population use tramples growth. One area in particular would be along the shoreline of a heavily fished lake.
 - I. Side slopes above the berm shall be 3 to 1 or flatter.
- d. Side slopes of the pool shall be 2 to 1 or flatter.
- e. To obtain maximum recreational benefits from developed water areas and provide for insect control, ponds should be stocked with fish. For best results, stocking should follow recommendations for warm water sport fishing by the Ohio Department of Conservation, Division of Fisheries, or similar organizations.
- f. Periodic maintenance will be required in lakes to control weed and larval growth. The basin should also be designed to provide for the easy removal of sediment which will accumulate in the lake during periods of basin operation. A means of maintaining the designed water level of the lake during prolonged periods of dry weather is also recommended.

8. RECOMMENDATIONS COMMON TO EITHER DRY DETENTION BASINS OR RETENTION BASINS WITH PERMANENT WATER

- a. All basins shall have an emergency overflow.
- b. The 100-year post development storm will be routed through the pond and will remain within the confines of the pond.
- c. All excavated spoils should be spread so as to provide for aesthetic and recreational features such as sledding hills, sports fields, etc. Slopes of 6 horizontal to 1 vertical are recommended except where recreation uses call for steeper slopes. Even these features should have a slope no greater than 3 horizontal to 1 vertical for safety, minimal erosion, stability, and ease of maintenance.
- d. Danger signs should be mounted at appropriate locations to warn of deep water, possible flood conditions during storm periods, and other dangers that exist.
- e. Grass or other suitable vegetative cover should be maintained throughout the entire reservoir area. Grass should be cut regularly no less than five times a year.
- f. Debris and trash removal and other necessary maintenance should be performed after each storm to assure continued operation in conformance to the design.

9. INSPECTION OF BASINS

- a. "As-built" drawings shall be required for all basins to assure compliance with all applicable requirements.

10. MISCELLANEOUS WATER QUALITY STRUCTURES

- a. The method selected to address the water quality volume requirements of the development is subject to the approval of the City Engineer.

- b. Acceptable water quality volume treatments include:

- I. Incorporation into proposed detention/retention facilities

- II. Manufactured systems

- III. Vegetated biofilters

- IV. Micropools

- V. Bioretention cells

- VI. Others as approved by the City Engineer

- c. Calculations for quantities of structure(s) needed shall conform with Chapter 154, Storm Water Management Ordinance, of the City of Beavercreek Codified Ordinances, and Ohio Environmental Protection Agency (OEPA) requirements for post-construction Best Management Practices (BMPs).

- d. Maintenance and signage shall be as appropriate as specified in F.8.

- e. Plantings for Water Quality Structures shall consist of suitable native plants to the maximum extent possible.

- f. A long term maintenance plan shall be required for the water quality measures selected by the designer to ensure the long term operation of these measures.

- g. The party responsible for the long term maintenance of any water quality structures shall be identified by the designer.

- h. Redevelopment projects where structural BMPs were not previously required:

- I. Redevelopment projects are construction projects on land where impervious surfaces had previously been developed and where the new land use will not increase the runoff coefficient.
- II. If the runoff coefficient will increase with the redevelopment, then the project is considered a **NEW DEVELOPMENT**, not a redevelopment project and shall proceed as a new development.
- III. Post-construction BMPs are required on projects that qualify as redevelopment. Structural BMPs are still required on large construction sites. However, due to the site constraints typically incurred in redevelopment situations, three options for meeting post-construction requirements are provided:
 - i. Treatment must be provided for 20% of the WQv;
 - ii. The impervious area of the proposed redevelopment project will be 20% less than the impervious area on the existing site prior to the construction activity; or
 - iii. A combination of i. and ii.

IV. Projects where a portion of the project area has been developed in the past and a portion has not. Is this a redevelopment project?

- i. This situation usually occurs within a single, larger common plan of development or sale. Refer to F.10.h to determine if the project is considered redevelopment.
- ii. This situation sometimes occurs when adjacent land is purchased and added to an existing larger common plan of development or sale. In this case, these types of projects are partially redevelopment projects and partially new development projects. To determine the WQ_v that must be treated, a weighted average of the WQ_v should be calculated using acreage as a basis. This is calculated per the following equation:

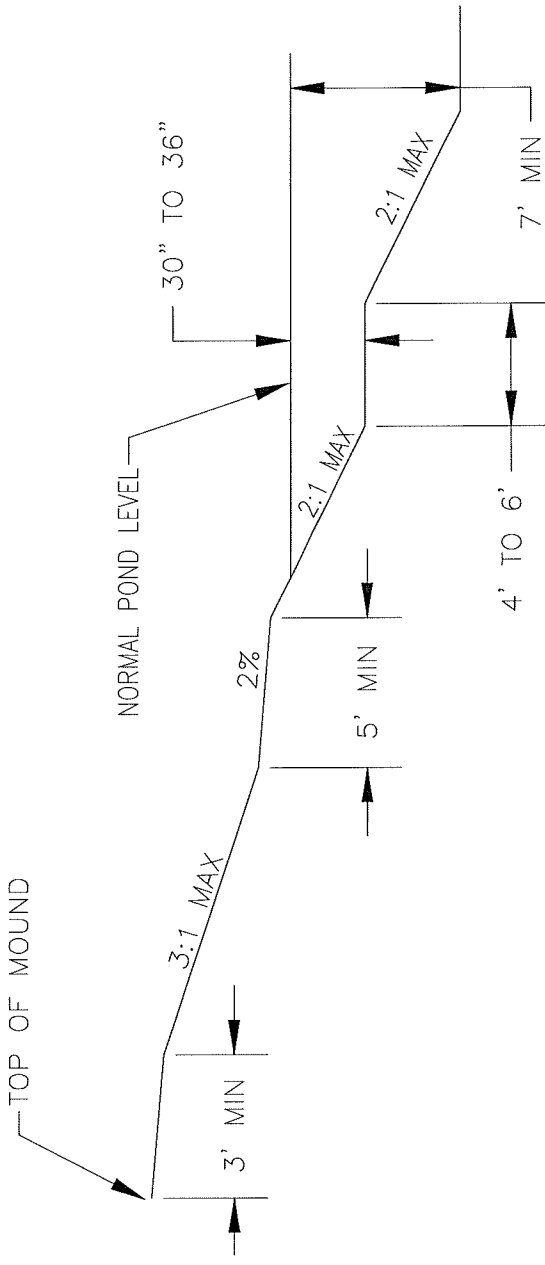
$$\text{Required } WQ_v = \text{Redevelopment} + \text{New Development}$$

$$= \frac{\text{Redevelopment acreage}}{\text{Total acreage}} \times 0.20WQ_v + \frac{\text{New Development acreage}}{\text{Total Acreage}} \times WQ_v$$

- i. Easement shall be granted over detention/retention structures as determined by the City Engineer.

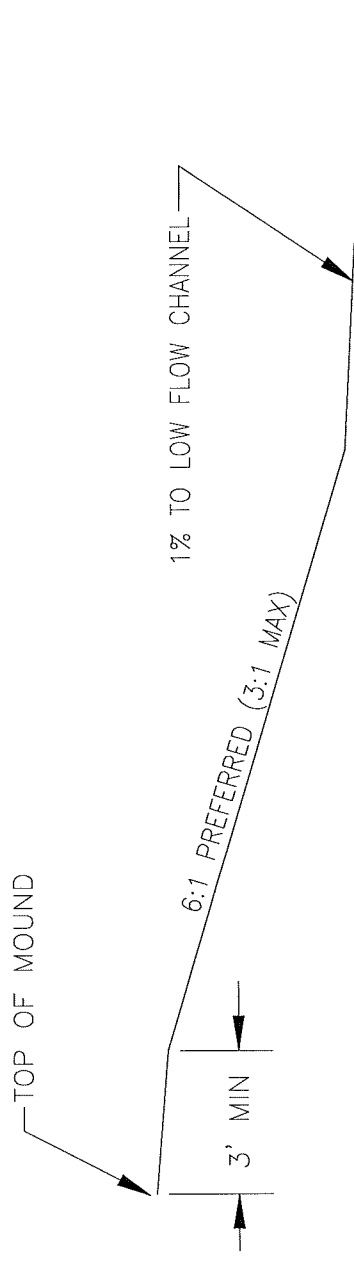
SLOPE DESIGN FOR STORM WATER STORAGE FACILITIES

RETENTION BASIN OR POND



NOTE: RIP RAP IS REQUIRED TO BE PLACED AROUND THE POND 2' ABOVE AND 2' BELOW THE NORMAL POND LEVEL.

DETENTION BASIN OR DRY BASIN



NOTE: PAVED LOW FLOW CHANNEL REQUIRED WITH 1/2% SLOPE MIN

* AS-BUILT DRAWINGS REQUIRED ON ALL RETENTION AND DETENTION PONDS

SECTION III - SUBDIVISION ROADWAY FEATURES

SECTION III - SUBDIVISION ROADWAY FEATURES

A. GENERAL

1. **Material Specifications.** The construction and material specifications to be used for all developments shall be as shown in the 'State of Ohio, Department of Transportation, Construction and Materials Specifications' current edition, together with such State supplements and modifications thereto amended as follows:

All references to the Director, the Director of Highways, the First Assistant Director and Chief Engineer, the Deputy Director of Design and Construction, the Deputy Director of Operations, the Engineer of Construction, the Engineer of Maintenance, the Engineer of Bridges, or the Engineer of Tests shall be considered to read the City Engineer. References, if any, to the State of Ohio, the Department, the Department of Highways, or the Highway Department shall be considered to read the City of Beavercreek, Ohio.

When aggregate or granular material is specified for base, bedding, or backfill material in any item, only material composed of gravel or crushed stone shall be used. Crushed concrete, slag, or similar material shall not be used.

2. **Design Standards.** The standards shown in the AASHTO publication 'A Policy on Geometric Design of Highways and Streets (Green Book)', current edition (2004 or later) shall govern the design of all roadway construction and improvements within the City of Beavercreek, unless otherwise superseded by these regulations.
3. **Bikeway Standards.** The standards shown in the AASHTO publication 'Guide for the Development of Bicycle Facilities', 3rd edition (1999) or current edition shall govern the design of all bikeway construction and improvements within the City of Beavercreek, unless otherwise superseded by these regulations. All catch basin grates shall be bicycle safe. This publication is also available for download as a PDF file at http://www.sccrtc.org/bikes/AASHTO_1999_BikeBook.pdf.
4. **Traffic Control.** All traffic control devices placed within the right-of-way and maintenance of traffic operations shall comply with the standards shown in the 'Ohio Manual of Uniform Traffic Control Devices for Streets and Highways', current edition. This manual is available for download or purchasing from ODOT at the following website: http://www.dot.state.oh.us/Divisions/Engineering/Roadway/DesignStandards/traffic/OhioMUTCD/Pages/OMUTCD2012_current_default.aspx.

B. ROADWAY DESIGN

1. **Thoroughfare Roadway Design Standards.** The dedication of right-of-way and design standards for work along existing public roadways and roadways identified in the City of Beavercreek Official Thoroughfare Plan shall be as directed by the City Engineer.
2. **Design Standards for Cul-De-Sac Streets.** The design and improvement standards contained herein are minimums for cul-de-sac streets in residential subdivisions. All such streets shall be designed and constructed in accordance with standards as specified in Exhibit 'H'. Cul-de-sacs shall be required wherever a street is intended to be permanently dead-ended.
3. **Design Standards for Local Type Streets.** The design and improvement standards contained herein are minimums for all local type streets in residential subdivisions. All such streets shall be designed and constructed in accordance with the standards specified in Exhibit 'I'.
4. **Design Standards for Collector Streets.** The design and improvement standards contained herein are minimums for all collector streets. All such streets shall be designed and constructed in accordance with the standards specified in Exhibit 'J'.
5. **Horizontal Alignment.** When there is an angle of deflection of more than 5°30' for Local streets, or 2°45' for collector streets, between two (2) centerline tangent sections of a street, a curve of adequate radius shall connect them. (See Exhibits H, I and J for minimum radii for horizontal curves.) Between reversed curves, a minimum tangent of one hundred (100) feet, shall be introduced.

6. **Vertical Alignment.** All changes in grade shall be connected by a vertical curve. The minimum K values (the rate of vertical curvature) for the various types of streets shall be as shown below:

<u>Street Classification</u>	<u>Crest Vertical Curves</u>	<u>Sag Vertical Curves</u>
Local	$K_{min} = 12$	$K_{min} = 26$
Cul-de-Sac	$K_{min} = 12$	$K_{min} = 26$
Collector	$K_{min} = 29$	$K_{min} = 49$

The length of the Vertical Curve may be calculated from: $L = K \times A$

Where:

L = Length of Vertical Curve

A = Algebraic Difference in Grades (%)

K = Rate of Vertical Curvature

Note: Longer Vertical Curves shall be used when necessary for additional sight distance, as determined by the City Engineer.

No street grade shall be less than 0.50% and on stop streets the grade shall not exceed 2.0% positive and 3% negative within one hundred (100) feet of an intersection unless otherwise approved by the City Engineer. Positive is considered to be going up from the intersection and negative is going down from the intersection.

7. **Intersection Design.** All intersections within subdivisions shall be designed and constructed in accordance with the standards specified in Exhibit 'K'. Additionally, adequate intersection sight distance shall be provided as shown below:

<u>Street Classification</u>	<u>Minimum ISD</u>
Local	375 feet
Cul-de-Sac	375 feet
Collector	500 feet

In those cases where the minimum intersection sight distance values cannot be reasonably obtained, as determined by the City Engineer, the minimum sight distance values available to the driver of the waiting vehicle should not be less than the stopping sight distance for the design speed of the through roadway.

8. **Commercial Subdivision Roadways.** Streets serving commercial developments and accessory parking facilities shall be planned to connect with arterial streets so as to not generate traffic on local streets. The intersection of driveways from parking areas with commercial streets shall be located so as to cause the least possible interference with traffic movement on the commercial street and shall be located not less than two hundred (200) feet from the intersection of an arterial or collector street. Additionally, curb cuts on commercial streets shall be spaced not less than two hundred (200) feet from each other. The design and construction standards for commercial streets shall be approved by the City Engineer.

9. **Industrial Subdivision Roadways.** Streets for industrial subdivisions shall be planned to serve industrial areas exclusively and shall connect with arterial streets so that no industrial traffic will be directed onto any residential street. The intersections of service streets from parking areas with arterial or collector streets shall not be less than two hundred (200) feet from the intersection with any other street. The location of curb cuts and the design standards for industrial subdivision roadways shall be approved by the City Engineer.

10. **Private Streets.** Private Street designs that deviate from the standards shown in this document shall be considered on a case by case basis.

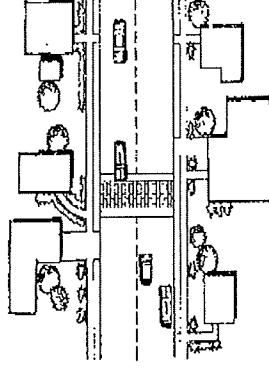
C.

TRAFFIC CALMING. The preferred methods to address inappropriate speeds in new subdivisions consist of circuitous routes, offset intersections, the proper distribution of traffic volumes and fewer long straight sections of roadway. When these measures cannot be incorporated into new subdivisions, or when the City Engineer deems additional traffic calming measures to be appropriate, additional traffic calming measures shall be incorporated into the subdivision. The traffic calming methods shown below, and the traffic calming standard construction drawings, should be considered as being guidelines only. The design professional is responsible for ensuring the safe operation of each traffic calming installation.

1. **Speed Table.** Speed tables are long raised speed humps with a flat section in the middle and ramps on the ends; sometimes constructed with brick or other textured materials on the flat section.

Applications:

- local and collector type streets
- typically long enough for the entire wheel base of a passenger car to rest on top.
- can include a crosswalk



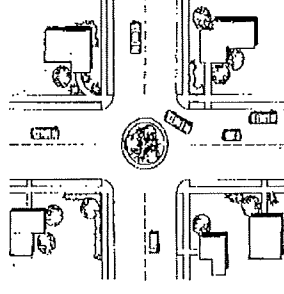
Design Issues

- careful design is needed for drainage
- prohibited on street grades greater than eight (8) percent

2. **Traffic Circle.** Traffic circles are raised islands, placed at intersections, around which traffic circulates. The raised island requires drivers to slow to a speed that allows them to comfortably maneuver around the island.

Applications

- the intersections of local or collector streets
- one lane each direction entering the intersection
- not typically used at intersections with a high volume of trucks and buses turning left.



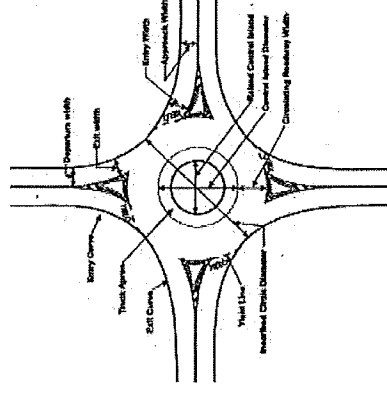
Design Issues

- Landscaping in the raised island needs to be designed to allow adequate sight distance.
- intersection lighting

- Some key design features are the offset distance (distance between projection of street curb and center islands), lane width, and circle diameter.

3.

Roundabouts. Similar in nature to traffic circles. Roundabouts consist of a raised circular area, around which traffic circulates. Islands are placed at the approaches to the intersection to prevent left turns and to direct traffic. Vehicles entering the roundabout must yield the right-of-way to vehicles in the roundabout.



Applications

- the intersections of local and collector streets
- vehicles entering the roundabout must yield to vehicles in the roundabout
- not typically used at intersections with a high volume of trucks and buses turning left

Design Issues

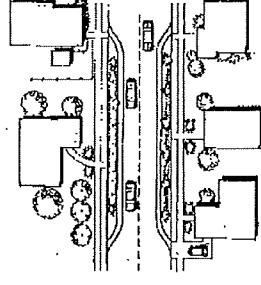
- landscaping in the raised island needs to be designed to allow adequate sight distance.
- intersection lighting
- some key design features are the offset distance (distance between projection of street curb and center islands), lane width, island placement, and circle diameter.

4.

Choker. A choker consists of curb extensions at midblock or intersection corners that narrow a street. Typically the street is narrowed to two (2) narrow lanes.

Applications

- the intersection of local and collector type streets
- may be used in conjunction with other traffic calming measures
- Mid-block on long straight streets



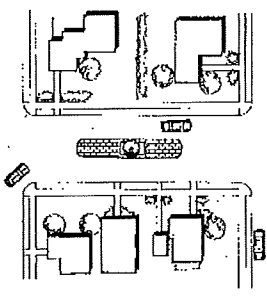
Design Issues

- Driveway access, and drainage considerations
- Selective use of landscaping to allow for adequate sight distance.
- typically narrows the roadway to twenty (20) feet in width for two-way traffic
- vertical delineators, bollards, or object markers are often used to make visible to snow plow operators

5. **Center Island Narrowing.** This traffic calming measure consists of a raised island located along the centerline of a street that narrows the travel lanes. These are sometimes called midblock medians, median slow points, or median chokers.

Applications

- may be used on any type of street
- can help to pedestrianize streets by providing a mid-point refuge island
- may be landscaped to provide visual amenity and neighborhood identity
- may be incorporated as a 'boulevard' roadway design



Design Issues

- driveway access and a reduction in on-street parking
- landscaping may limit visibility of pedestrian crossings

- D. **TRAFFIC SIGNAL INSTALLATIONS.** The following requirements pertain to the personnel and materials supplied when a traffic signal is to be constructed in conjunction with a proposed subdivision development.

1. **PERSONNEL:** The developer shall employ for signal work journeyman electricians who have completed a program registered with the Department of Industrial Relations and given 8000 hours of On-the-job training in the electrical trade. This training shall have included 800 hours of class room training.

At least one (1) journeyman electrician shall always be working on or supervising any phase of work associated with this contract.

In addition to the above requirements, **ALL CONTROLLER WORK** shall be performed by technicians with at least an International Municipal Signal Association (IMSA) Level III Certification and all construction work is to be supervised and/or performed by electricians/technicians with at least Level I IMSA Certification. Controller work shall be defined as all final connections of wires to the backboard, installation of any and all equipment and/or components within the cabinet and all programming and testing of hardware.

2. **TEST EQUIPMENT.** The contractor shall be able to test all elements of the controllers related to this project in addition to all peripheral equipment and field equipment. The contractor shall own and have available in good working condition specialized controller test equipment, VOMs, transistor testers, low impedance meters, ground fault meters, oscilloscopes, NEMA

traffic Controller testers, power line analyzers, communication line test equipment and recording conflict monitor testers to perform repair and the installation testing.

3. **EXPERIENCE.** The contractor performing this work shall be experienced and actively engaged in traffic signal maintenance and installation work. A list of agencies and/or clients who use the contractor's services shall be provided. If required, the contractor shall be requested to demonstrate the ability, produce equipment and employee qualifications needed to provide the services required by this specification.

4. **FACILITIES:** The contractor shall provide facility for bench testing controllers within 50 miles of the project so as to provide convenient accessibility for inspection by the Engineer and/or his agents. All materials and testing equipment required shall be available at this facility in addition to providing and maintaining telephone service.

5. **VEHICULAR SIGNAL HEADS.** Section 732.01 of the ODOT CMS shall be modified as follows:

- a. The vehicle signal heads shall be furnished with tunnel visor type hoods, fastened securely to the body and open at the bottom.
- b. All signal heads and overhead signs to be mounted on mast arms using "V-PED" mounting hardware.
- c. The color of the vehicular signal fixtures shall be black.
- d. Light-emitting diode (LED) lamps are to be furnished with all signal heads.

6. **CONTROLLERS:** The Contractor shall furnish and install controller(s) complete with cabinet(s) as required by the City Engineer.

The cabinet shall be an unpainted natural aluminum, commercially smooth and free of defects that would impair serviceability or detract from general appearance. The cabinets shall be of a door type with a #1 key for the police door and a Corbin type tumble lock keyed for a #2 key on the main door.

The cabinet shall be a large single door enclosure as manufactured by Hennessy Products, Inc., or equal. The cabinet dimensions shall be 57-1/2" x 30"x17".

7. **APPROVAL OF FIELD LOCATIONS:** After staking the locations of all signals, pull boxes, signs, loop detectors, poles and controllers and before the installation of same, the Contractor will be responsible to contact the Engineer to verify and approve the locations prior to placement of any facilities. Failure to notify the Engineer of this information may require the

Contractor to realign, reset, or reconstruct portions of the installation at the Contractor's cost to correct improperly located work items.

- E. STREET LIGHTING.** The locations of street lights and the style of fixture to be installed in new subdivisions shall be as determined by the City Engineer and the Director of Planning and Zoning.

F. CONSTRUCTION DRAWINGS. Prior to the release of the developer's performance bond, the developer's engineer shall submit the following information:

1. "As-built" information and any changes made during the course of the construction of all public improvements shall be tracked.
2. Two (2) sets of "as-built" paper prints will be submitted to the Engineering Division for checking.
3. The Developer, or the Developer's Engineer, will be notified of acceptance or corrections by the Engineering Division.
4. One (1) set of corrected "as-built" drawings in TIFF file format will be submitted to the Engineering Division for final checking.
5. The Engineer will be notified of acceptance or corrections by the Engineering Division.

G. STREET CLEANING CASH BOND. Prior to the commencement of any construction activities for any subdivisions within the City of Beavercreek, the Developer shall post a cash bond with Engineering Division to ensure that mud and debris that are tracked onto public streets are cleaned off in a timely manner. Failure to post the required cash bond prior to the commencement of construction activities shall result in the issue of a stop work order, in accordance with the provisions of Section 155.101 of the Beavercreek Subdivision Regulations, until such time as the required cash bond is received by the Engineering Division.

The Developer shall post a cash bond that is not less than \$50.00 per lot for single family developments, and an amount as determined by the City Engineer for commercial and multi-family developments.

The Developer shall have 24 hours after either verbal or written notice by the City Engineer, or his designated representative, to clean and to remove debris from the streets specified by the City Engineer. If the required street cleaning is not performed to the City Engineer's satisfaction within the above mentioned 24 hour period then the City Engineer shall direct city forces to clean the necessary streets, and any and all costs incurred by the City shall be deducted from said bond.

SECTION IV - EXHIBITS

EXHIBIT A -	RUNOFF COEFFICIENTS & DESIGN CRITERIA
EXHIBIT B -	RAINFALL FREQUENCY CURVES
EXHIBIT C -	ROCK CHANNEL PROTECTION
EXHIBIT D -	MIN/MAX COVER OVER SEWERS
EXHIBIT E -	ACCEPTED STANDARD GENERAL NOTES
EXHIBIT F -	OVERLAND FLOW CHART
EXHIBIT G -	CHAPTER 154, CITY OF BEAVERCREEK CODIFIED ORDINANCES
EXHIBIT H -	DESIGN STANDARDS FOR CUL-DE-SACS
EXHIBIT I -	DESIGN STANDARDS FOR LOCAL STREETS
EXHIBIT J -	DESIGN STANDARDS FOR COLLECTOR STREETS
EXHIBIT K -	INTERSECTION DESIGN STANDARDS
EXHIBIT L -	APPROVED TREE LIST
EXHIBIT M -	NOT USED
EXHIBIT N -	STANDARD CONSTRUCTION DRAWINGS

EXHIBIT A

**CITY OF BEAVERCREEK
MISCELLANEOUS DESIGN CRITERIA GUIDELINES**

- 1. Maximum catch basin spacing is 300 feet.**
- 2. As-Built drawings are required for all detention/retention facilities.**
- 3. Minimum allowable runoff coefficient – Rational Formula**

C – .4 Residential
C – .6 Apartment
C – .9 Commercial

- 4. Time of concentration – Overland Flow Chart**

- 5. The 24-hour storm – SCS Method**

The 24-hour total rainfall for Greene County is:

RECURRENCE INTERVAL YEARS	24-HOUR RAINFALL TOTAL INCHES
1	2.4
2	2.8
5	3.5
10	4.0
25	4.6
50	5.0
100	5.4

EXHIBIT B

CITY OF BEAVERCREEK
MISCELLANEOUS DESIGN CRITERIA GUIDELINES

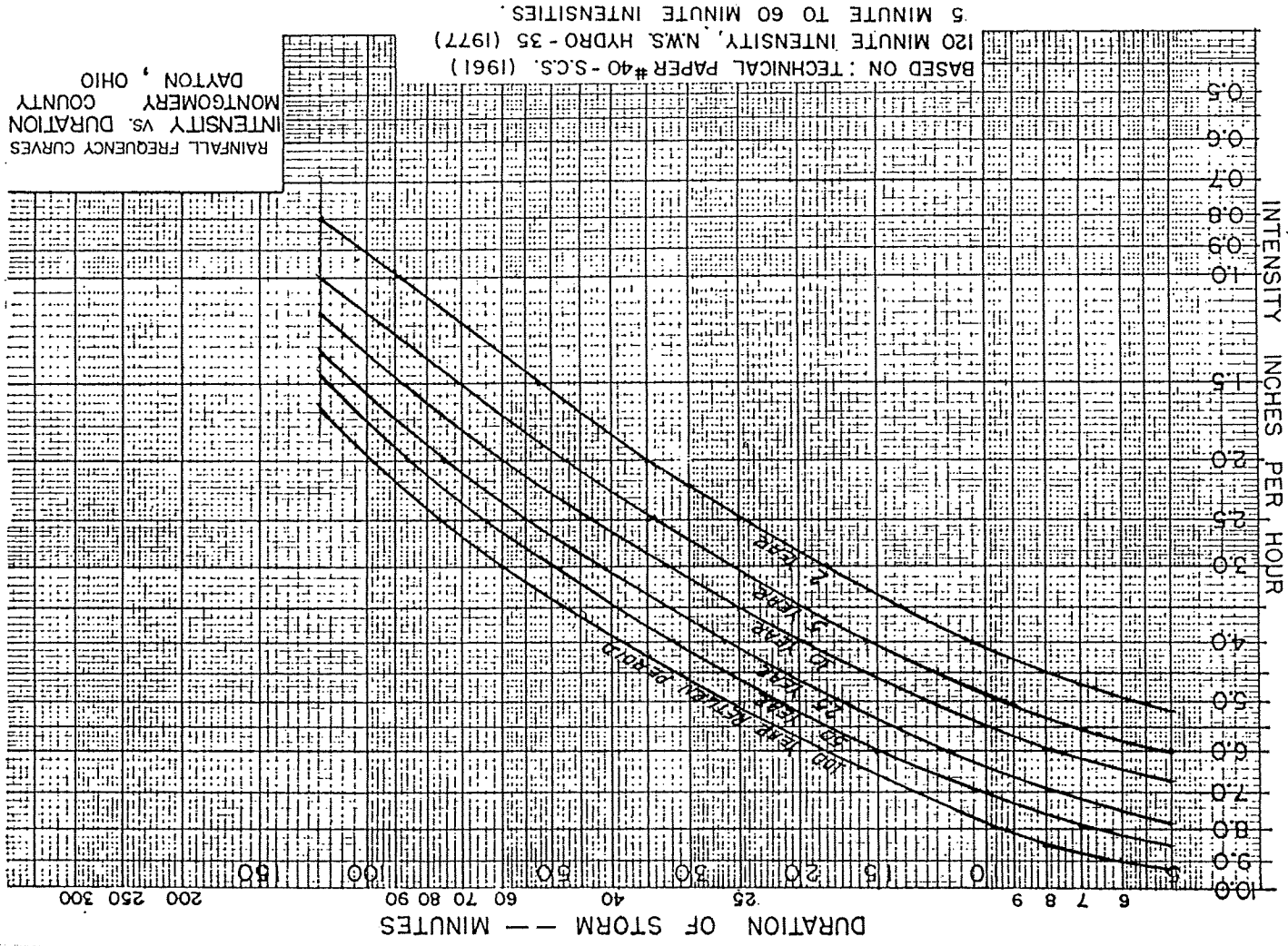
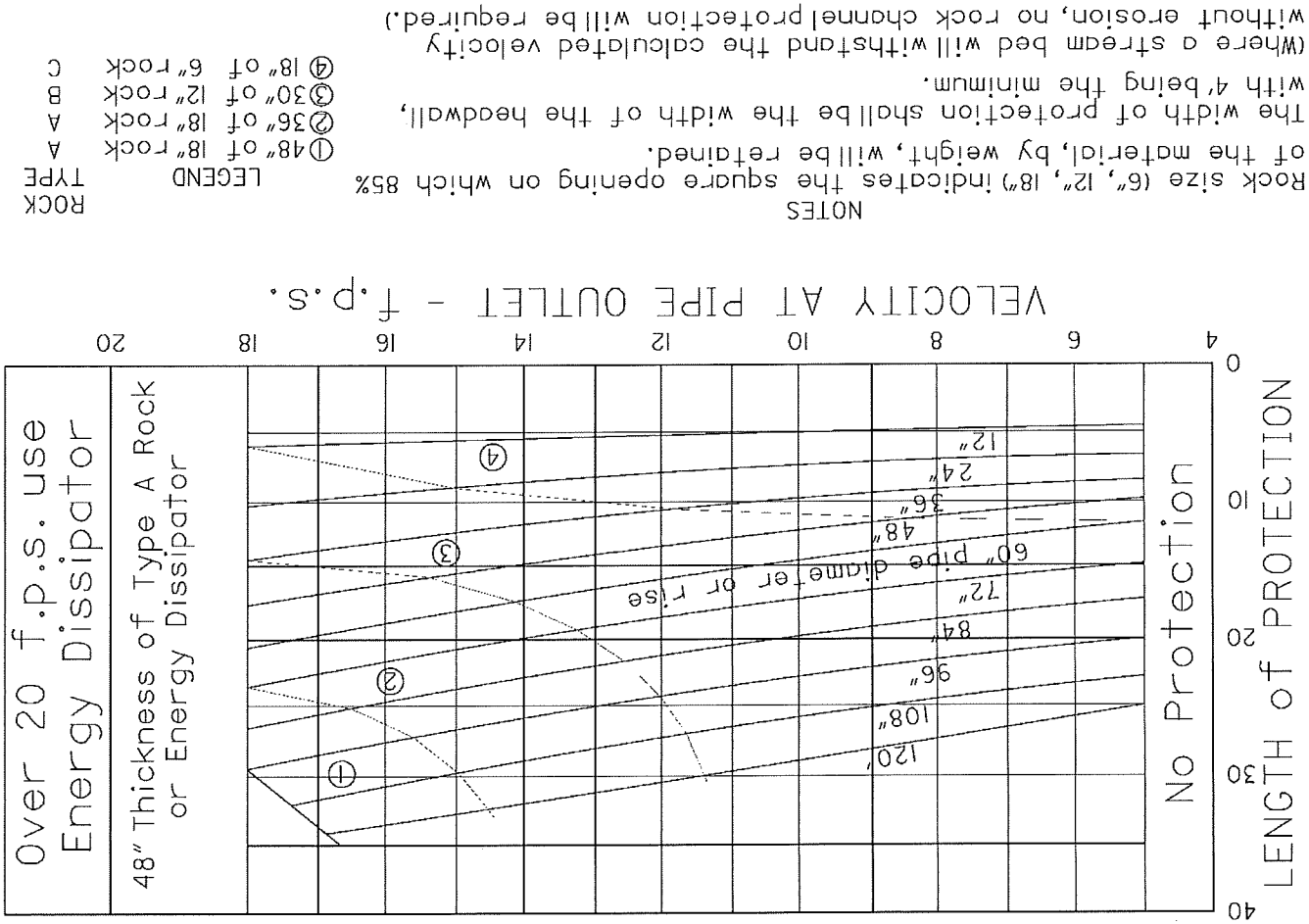


EXHIBIT C

ROCK CHANNEL PROTECTION



TYPE OF ROCK OR RIPRAP	SIZE OF ROCK	
	50% BY WEIGHT	85% BY WEIGHT
TYPE D	> 6 IN.	3 - 12 IN.
TYPE C	> 12 IN.	6 - 18 IN.
TYPE B	> 18 IN.	12 - 24 IN.
TYPE A	> 24 IN.	18 - 30 IN.

EXHIBIT D

MINIMUM AND MAXIMUM COVER OVER SEWERS

STORM SEWERS

ASTM SPEC NO.	C-76 CL. 1	C-76 CL. 2	C-76 CL. 3	C-76 CL. 4	C-76 CL. 5
12"		4-8	3-14	2-30	2-40
15"		3.5-8	3-14	2-30	2-40
18"		3.5-8	3-13	2-30	2-40
21"		3.5-9	2.5-15	2-30	2-40
24"		3-10	2.5-16	2-30	1.5-40
27"		3-10	2.5-17	2-30	1.5-40
30"		3-11	2.5-17	1.5-30	1.5-40
36"		2.5-11	2.0-17	1.5-30	1.0-40
42"		2.5-10	2.0-15	1.0-30	1.0-40
48"		2.5-10	2.0-15	1.0-30	1.0-40
54"		2.0-10	1.5-15	1.0-30	1.0-40
60"	2.5-8	2.0-11	1.5-15	1.0-30	1.0-40
66"	2.5-8	2.0-11	1.0-16	1.0-30	1.0-40
72"	2.0-8	1.5-11	1.0-16	1.0-30	1.0-40
78"	2.0-9	1.5-11	1.0-17	1.0-30	1.0-40
84"	2.0-9	1.5-11	1.0-17	1.0-30	1.0-40
90"	2.0-9	1.5-12	1.0-17	1.0-30	1.0-40
96"	1.5-9	1.0-12	1.0-17	1.0-30	1.0-40
102"	1.5-9	1.0-12	1.0-17	1.0-30	1.0-40

EXHIBIT E

CITY OF BEAVERCREEK STANDARD GENERAL NOTES FOR SUBDIVISIONS

I. STANDARD NOTES FOR ALL ROADWAY AND STORM DRAINAGE

1. All road work shall be performed in accordance with the current edition of the State of Ohio, Department of Transportation "Construction and Material Specifications".
2. All storm drainage construction shall be performed in accordance with the City of Beavercreek Construction Standards.
3. All trench excavation within the existing and proposed street right-of-way shall be backfilled with granular material in accordance with the City of Beavercreek Specifications and compacted before sub-grade approval.
4. All underground utility service laterals are to be installed from main to right-of-way line before streets are surfaced.
5. All catch basins shall be City of Beavercreek Type 1, unless otherwise specified.
6. All catch basin laterals shall be reinforced concrete ASTM Specification Number C-76, Class 4, unless otherwise noted.
7. All manholes shall be Type 'A', unless otherwise noted. Channel bottoms of all manholes.
8. Radius of back of curb at intersections shall be 25 feet, unless otherwise noted.
9. All field tile encountered shall be replaced or connected to the storm sewer system.
10. Curb ramps to be located as indicated on plans and constructed in accordance with the Ohio Department of Transportation Standard Construction Drawing BP-7.1, Type A2.
11. Forty-eight (48) hours before digging is to commence, the contractor shall notify the Ohio Utilities Protection Service (OUPS) at 1-800-362-2764 and all agencies which might have underground utilities involving this project and are non-members of OUPS.
12. All manholes installed in the pavement area shall be installed either centered in a traveled lane or on a longitudinal pavement marking stripe, such as a lane line, channelizing line, or center line.
13. All disturbed areas shall have temporary seeding and mulching. All areas that are planned to be bare for more than 21 days shall be seeded and mulched within seven (7) days.
14. All street surfaces, driveways, culverts, curb and gutters, roadside drainage ditches and other structures that are disturbed or damaged in any manner as a result of construction shall be replaced or repaired in accordance with the specification.

EXHIBIT F

OVERLAND FLOW CHART

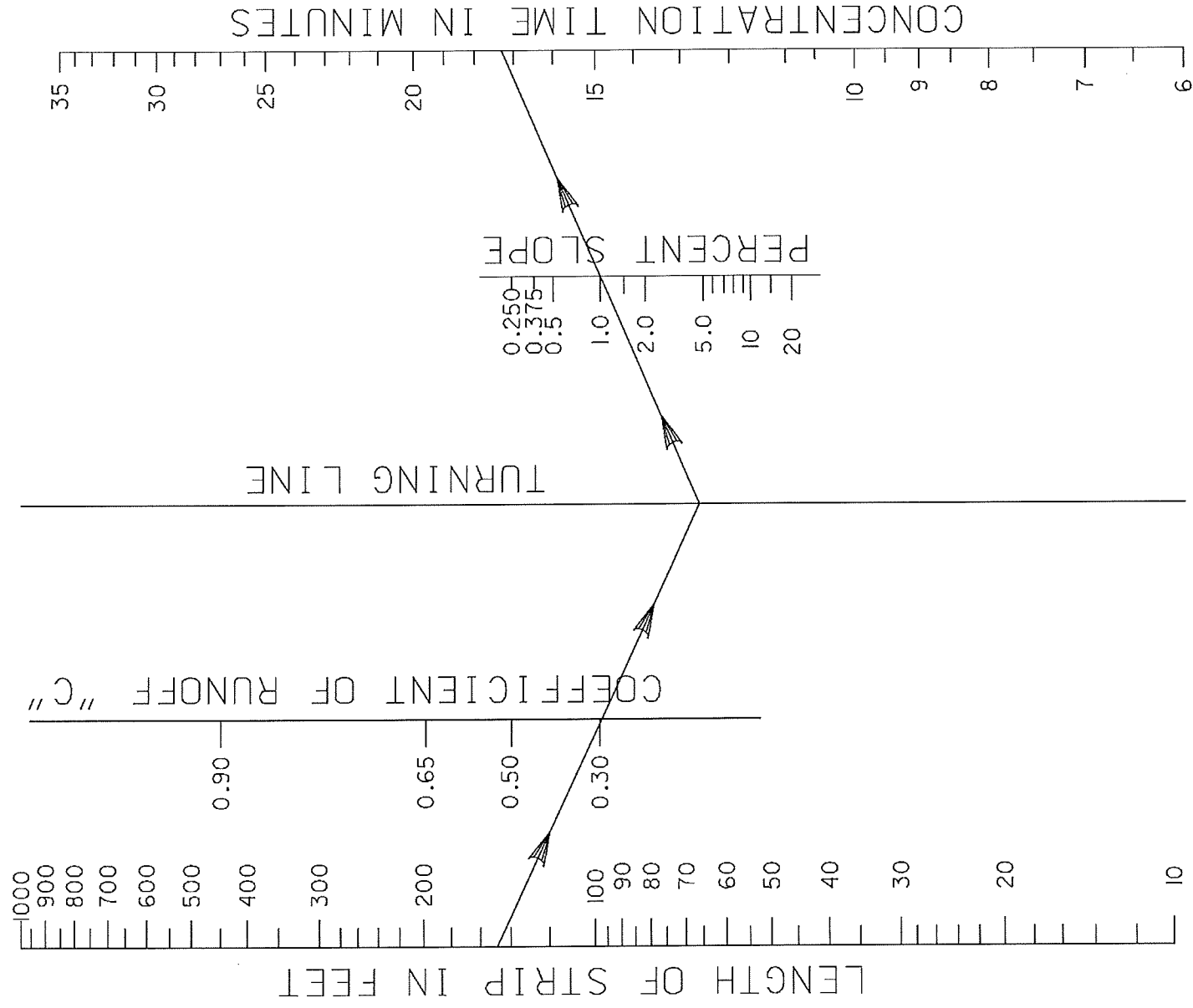


EXHIBIT G

CHAPTER 154: STORMWATER MANAGEMENT ORDINANCE

<u>Section</u>	<u>Table of Contents</u>
154.01	FINDINGS AND PURPOSE
154.02	DEFINITIONS
154.03	INTENT & SCOPE
154.04	PERFORMANCE STANDARDS
154.05	SITE DEVELOPMENT PLAN
154.06	STORMWATER MANAGEMENT PLAN (SMP) REQUIREMENTS
154.07	COMPLIANCE RESPONSIBILITY AND PENALTIES

154.01: FINDINGS AND PURPOSE

- (A) The lands and waters of the City of Beavercreek are limited resources and that their natural quality is of primary importance in promoting and maintaining the health, safety, and general well-being of all life within its jurisdictional boundaries; and
- (B) The City of Beavercreek desires to establish standards, principles, and procedures for the regulation of construction and development related earth disturbing activities that cause or may cause adverse water resource impacts resulting from storm water runoff and soil erosion; and
- (C) In order to promote the public health and safety and sound economic development in the City of Beavercreek and throughout the Great Miami and Little Miami watersheds it is important to provide homebuilders, developers, and landowners with consistent, technically feasible, and economically reasonable standards for erosion control and storm water management; and
- (D) The enactment of this Ordinance by the City of Beavercreek is in partial fulfillment of its responsibility as a local jurisdiction to implement non-point source control activities authorized under Section 208 of the Federal Water Pollution Control Act (P.L. 92-500, 86 Stat. 816), 33 USC 1288, as amended by the Clean Water Act of 1977 (P.L. 95-217, 91 Stat. 156); and
- (E) 40 C.F.R. Parts 9, 122, 123, and 124, referred to as NPDES Storm water Phase II, and Ohio EPA's Phase II Storm Water Program require designated communities, including the City of Beavercreek to develop a Stormwater Management program to address the quality of storm water runoff during and after earth disturbing activities; and
- (F) Article XVIII, Section 3 of the Ohio Constitution grants municipalities the legal authority to adopt rules to abate soil erosion and water pollution by soil sediments and Chapter 1511 of the Ohio Revised Code grants municipalities the legal authority to adopt sediment and erosion control practices; and,

NOW, THEREFORE, THE CITY OF BEAVERCREEK, OHIO HEREBY ORDAINS THAT:

154.02: DEFINITIONS

- (A) All words used in this Ordinance shall have their customary meanings as defined in Webster's New Dictionary and/or the Rainwater and Land Development Manual (current edition), except those specifically defined in this Section.

- (1) Approval Authority: An official, organization, or group designated by the City to review and approve/disapprove Site Development Plans, Calculations, Storm Water Management Plans, and Storm Water Pollution Prevention Plans.
- (2) Authorized Agent: An official, organization, or group designated to provide technical guidance in the development and implementation of Site Development Plans, Calculations, Storm Water management Plans and Storm Water Pollution Prevention Plans and to review and approve/disapprove such plans as authorized.
- (3) Buffer: A designated transition area around water resources or wetlands that is left in a natural vegetated state, so as to protect the water resources or wetlands from runoff pollution. Construction activities in this area are restricted or prohibited.
- (4) Clearing: The clearing, grubbing, scalping, removal of trees and stumps, and removing and disposing of all vegetation and debris within the site, and shall include the conditions resulting therefrom.
- (5) Construction: The erection, alteration, repair, renovation, demolition or removal of any building or structure; and the clearing, stripping, excavating, filling, grading and regulation of sites in connection therewith.
- (6) Critical Storm: A storm which is calculated by means of the percentage increase in volume of runoff by a proposed earth disturbing activity or development area. The critical storm is used to calculate the maximum allowable storm water discharge rate from a site.
- (7) Cut: An excavation. The difference between a point on the original grade and a designated point of lower elevation on the final grade.
- (8) Dam: An embankment area that meets the requirements of the Ohio Department of Natural Resources in accordance with ORC Section 1521.
- (9) Debris: Loose refuse or earth material not suitable for use as presently situated or constituted as determined by the approving agent(s).
- (10) Detention Basin: An impoundment area created by constructing an embankment, excavating a pit, or both, for the purpose of temporarily storing stormwater.
- (11) Detention Facility: A detention basin or alternative structure designed to temporarily store stormwater runoff and gradually release the stored water at a controlled rate.

- (12) Developer: Any individual, subdivider, firm, association, syndicate, partnership, corporation, trust, or any legal entity commencing proceedings under this ordinance to effect the development of land for himself/herself or for another.
- (13) Development: The division of land into two or more parcels, the carrying out of any building, or the making of any material change in the use or appearance of any structure above or below ground surface land through activities or construction, erection, or alteration.
- (14) Development Area: Any contiguous area owned by one person or operated as one development unit included within the scope of these regulations, upon which earth-disturbing activities are planned or underway.
- (15) Earth-Disturbing Activity: Any grading, excavation, filling, or other alteration of the earth's surface where natural or man-made ground cover is destroyed.
- (16) Excavation: Any act by which earth, sand, gravel, rock or any other material is dug into, cut, quarried, uncovered, removed, displaced, relocated or bulldozed and shall include the conditions resulting therefrom.
- (17) Fill: Any act by which earth, sand, gravel, rock or any other material is placed, pushed, dumped, pulled, transported or moved to a new location above the natural surface of the ground or on top of the stripped surface and shall include the resulting grade conditions. The difference in elevation between a point on the original ground and a designated point of higher elevation on the final grade. An embankment.
- (18) Finished Grade: The final grade or elevation of the ground surface conforming to the approved grading plan.
- (19) Grading: The stripping, cutting, filling, stockpiling, or any combination thereof of earth disturbing activity inclusive of land in its cut or filled conditions.
- (20) Mulching: The application of suitable materials on the soil surface to conserve moisture, hold soil in place, and aid in establishing plant cover.
- (21) Non-Structural Controls: Stormwater runoff control and treatment techniques that use natural measures to control runoff and/or reduce pollution levels, and do not require extensive construction efforts and/or do promote runoff control and/or pollutant reduction by eliminating the runoff and/or pollutant source. Examples include minimizing impervious area, buffer strips along streams, and preserving natural vegetation.

- (22) Parcel: Any legally described piece of land created by a partition, subdivision, deed or other instrument recorded with the appropriate entity or agency.
- (23) Peak Rate of Runoff: The maximum rate of runoff for any 24 hour storm of a given frequency.
- (24) Permanent Vegetation: Producing long term vegetative cover, such as, bluegrass, tall fescue, crown vetch, and the like.
- (25) Permittee: Any person to whom approval of a site plan according and pursuant to this chapter is granted, or who is subject to inspection under it.
- (26) Plan: As used in this ordinance shall mean the Storm Water Management Plan, Site Development Plan, and/or the Storm Water Pollution Prevention Plan (SWP3).
- (27) Plans: Profiles, typical cross sections, working drawings and supplemental drawings of site, grading, drainage, runoff control plan, storm water pollution prevention plan, vicinity map, soil map, and other plans as approved or exact reproductions thereof, which show the location, character, dimensions, and details of the work.
- (28) Pollution: The man-induced alteration of the chemical, physical, or biological integrity of air and water resources.
- (29) Pre-Development Conditions: Site conditions as they existed prior to manmade alterations and/or earth disturbing activities.
- (30) Re-Development Conditions: Site conditions as they existed prior to manmade activities and/or earthmoving activities to re-develop a site.
- (31) Retention Basin: An impoundment area created by construction of an embankment, excavating a pit, or both, for the purpose of creating a permanent amenity to hold water with additional capacity to temporarily store storm water.
- (32) Runoff: The portion of rainfall, melted snow or irrigation water that flows across the ground surface and eventually is returned to streams.
- (a) Accelerated Runoff: Increased rate and volume of runoff due to less permeable surface primarily caused by urbanization.
- (b) Peak Rate of Runoff: The maximum rate of runoff for any 24-hour storm of a given frequency.

- (33) Sediment Basin: A barrier, dam or other facility built to reduce the velocity of water in order to settle and retain sediment.
- (34) Site: Any lot or parcel of land or a series of lots or parcels of land adjoining or contiguous or joined together under one ownership where clearing, stripping, grading or excavating is performed.
- (35) Site Development Plan: The written document or set of plans meeting the requirements of this Ordinance that provides information on the location, of the area proposed for development, the site in relation to its general surroundings, and existing characteristics of the site, including limits of earth disturbing activities.
- (36) Steep Slope: A slope over fifteen percent (15%) grade, which is characterized by increased run-off, erosion and sediment hazards.
- (37) Stop-Work Order: An order issued which requires that all work on the site must cease except work associated with bringing the site into compliance with the approved SWP3, Storm Water Management Plan, or Site Development Plan.
- (38) Storm Water Management Plan (SMP): The written document meeting the requirements of this Ordinance regulation that sets forth the plans and practices to be used to minimize storm water runoff from a site and to safely convey or temporarily store and release post-development storm water runoff at an allowable rate to minimize flooding and erosion.
- (39) Storm Water Pollution Prevention Plan (SWP3): The document required by the Ohio EPA for compliance with its NPDES Construction Activity General Permit #OHC00002. The requirements of the SWP3 are required above and in this regulation.
- (40) Storm Frequency: The average period of time in years within which a storm of a given duration and intensity can be expected to be equaled or exceeded.
- (41) Structural Controls: Any human-made facility, structure, or device that is constructed to provide temporary storage and/or treatment of storm water runoff. Examples include retention and detention basins, rock check dams, swales, and constructed wetlands.
- (42) Subdivision:
- (a) The division of any parcel of land shown as a unit or as contiguous units on the last preceding tax roll, into two or more parcels, sites, or lots,

any one of which is less than five acres for the purpose, whether immediate or future, of transfer of ownership, provided, however, that, the division or partition of land into parcels of more than five acres not involving any new streets or easements of access, and the sale or exchange of parcels between adjoining lot owners, where such sale or exchange does not create additional building sites, shall be exempted; or

(b) The improvement of one or more parcels of land for residential, commercial or industrial structures or groups of structures involving the division or allocation of land for the opening, widening or extension of any street or streets, except private streets serving industrial structures; the division or allocation of land as open spaces for common use by owners, occupants or lease holders or as easements for the extension and maintenance of public sewer, water, storm drainage or other public facilities.

(43) Swale: A low lying stretch of vegetated land which gathers and carries surface water. Also, a ditch.

(44) Temporary Vegetation: Short term vegetative cover such as oats, rye, grass, or wheat, used to stabilize the soil surface until final grading and installation of permanent vegetation.

(45) Watercourse: Any natural or artificial waterway (including, but not limited to, streams, rivers, creeks, ditches, channels, canals, conduits, culverts, drains, waterways, gullies, ravines, or washes) in which waters flow in a definite direction or course either continuously or intermittently and including any area adjacent thereto which is subject to inundation by reason of overflow of flood water.

154.03: INTENT AND SCOPE

(A) The intent of this Ordinance is to protect the land and water resources of the City of Beavercreek by established standards to achieve a level of soil erosion and storm water control that will minimize and abate degradation of land and water resources and damage to public and private property resulting from earth disturbing activities. In addition this regulation further intends to:

- (1) Assure that those involved in earth-disturbing activities minimize both soil erosion and the volume and rate of storm water runoff from their sites.
- (2) Preserve to the extent practical the natural drainage characteristics of the site.

- (3) Assure that storm water controls are incorporated into site planning and design at the earliest possible stage and that all storm water management practices are properly designated, constructed, and maintained.
 - (4) Reduce the need for costly maintenance and repairs to roads, embankments, ditches, water resources, wetlands, and storm water management practices.
 - (5) Encourage the construction of storm water management practices that serve multiple purposes such as flood control, erosion control, fire protection, water quality protection, recreation, and habitat preservation.
 - (6) Preserve to the maximum extent practical natural infiltration and groundwater recharge.
- (B) Any person or persons proposing to develop or redevelop land within the City of Beavercreek for any of the uses listed in Section 154.03(C) shall design, develop, and submit a Site Development Plan as described in Section 154.05. Said plan will be evaluated to determine the potential for erosion, runoff, and sedimentation impacts that may result from such development activities and the need for submission of a Storm Water Management Plan (SMP) described in Section 154.06 to minimize these impacts.
- (C) This Ordinance shall apply to both the development and redevelopment of land proposed for the following:
- (1) Residential, institutional, commercial, office, and industrial purposes, including subdivision and land development proposals for non-agricultural uses in rural areas.
 - (2) Recreational facilities, non-agricultural water impoundments and waterway construction or improvement.
 - (3) Public infrastructure uses, including transportation and utilities constructed in conjunction with any development or redevelopment project.
 - (4) Any earth disturbing activity within critical and sensitive natural areas, including floodplains, highly erodible lands (HEL) and wetlands.
- (D) This Ordinance does not apply to earth disturbing activities associated with agricultural activities. Additionally, this Ordinance does not apply to public infrastructure projects initiated by the State of Ohio, Greene County, or the City of Beavercreek.
- (E) No earth disturbing activity subject to regulation under this Ordinance shall be undertaken for any land proposed for development or redevelopment for uses

specified under Section 154.03(C) without an approved Site Development Plan as required under Section 154.05, and if appropriate, a Storm Water Management Plan (SMP) as required under Section 154.06.

- (F) Final approval of a proposed development or redevelopment shall not be given unless:
- (1) A determination is made by the authorized agent(s) based on submission of a Site Development Plan as detailed in Section 154.05 that the proposed earth disturbing activity will not cause accelerated runoff, erosion, and/or sediment impacts harmful to the quality of off-site lands and waters, or
 - (2) A SMP as detailed in Section 154.06 has been approved by the Planning Commission of the City of Beavercreek based on the recommendation of its authorized agent(s) that determines that the proposed earth disturbing activity will not cause accelerated runoff, erosion, and/or sediment impacts harmful to the quality of offsite lands and waters.
- (G) Any person or persons seeking approval for an earth disturbing activity listed below shall prepare a SMP as described in Section 154.06 of this Ordinance.
- (1) Activities disturbing greater than or equal to ten thousand (10,000 s.f.) square feet, or less than ten thousand (10,000 s.f.) square feet if part of a larger common plan of development or sale.
 - (2) Development or redevelopment activities that require the extension of public utilities (roadways, water mains, sanitary sewer mains, storm sewers, etc.)
 - (3) Activities that will modify an existing and/or approved drainage way, drainage structure, and/or drainage easement.
 - (4) Activities that will channelize, straighten, and/or modify a watercourse within the identified 100 year floodplain (studied and unstudied).
- (H) Any person or persons seeking approval to construct a structure shall be exempted from having to prepare a Site Development Plan and a SMP provided they meet all of the following:
- (1) Construction takes place on one parcel.
 - (2) The earth disturbing activity does not affect more than 10,000 square feet of the development site at a time.

- (3) Is not located within 100 feet of a sensitive natural area as described in Section 154.03(C)(4).
- (4) Earth disturbing activities will not modify the general existing site drainage pattern(s), drainage structure, drainage tiles, drainage easements, etc.
- (5) One or both of the following:
 - (a) Specifications are obtained and followed for controlling potential off-site storm water and erosion impacts from small lot building sites set forth by the Planning Commission and/or its authorized agent(s).
 - (b) The parcel is part of an overall development plan which has received approval of a SMP and the builder certifies that they will comply with said Plan. Builder signs certificate at zoning permit stage.

- (l) Exemption under Section 154.03(H) does not exempt any person or persons from other provisions of this Ordinance or liability from their activities.

154.04: PERFORMANCE STANDARDS

- (A) All Erosion and Sediment kept on Site to the greatest extent practical.
 - (1) Erosion and sedimentation caused by accelerated wind or storm water runoff over the site due to earth disturbing activities shall be stabilized and confined to within the boundaries of the development site to the maximum extent practical, within the technical limitations of the BMP's utilized on the site, as determined by the authorized agent.
- (B) Discharge of Untreated Storm Water.
 - (1) To the maximum extent practical, the site shall not discharge untreated storm water directly into a receiving body of water.
- (C) Structural and Nonstructural Best Management Practices (BMP's)
 - (1) Nonstructural storm water management practices shall be used to the maximum extent practical. Such practices may include, but not be limited to, preserving riparian areas, preserving existing vegetation and vegetative buffer strips, phasing of construction, and designation of tree preservation areas.

- (2) Nonstructural and structural storm water management practices shall be designed in accordance with requirements and standards specified in this Ordinance and/or by the authorized agent(s).
- (3) The City Engineer may require that structural and nonstructural storm water management practices be placed in easements and recorded on the property deeds on which they are located. If the structural or nonstructural storm water management measure is required to be placed within an easement, it shall remain unaltered unless first approved by the City Engineer, or his designee.
- (4) In designing storm water detention and retention facilities, water quality benefits shall be considered to the maximum extent practical.
- (5) Acceptable structural storm water management practices are those measures shown in the Subdivision Construction Standards Manual (current edition), or any other measures that are approved by the City Engineer.

(D) Stream and Wetland Riparian Buffers

- (1) The site owner and/or applicant shall leave an undisturbed riparian buffer on both sides of and/or surrounding water resources, except for crossings and other riparian area and wetland impacts approved by the City Engineer. Buffer width will be determined on a case by case using criteria such as floodplain, topography, vegetative cover, canopy cover, and soil types, etc.
- (2) The site owner or applicant shall be responsible for obtaining a determination of 404 permit applicability by the Corp of Engineers prior to application for permit.

(E) Channel Protection

- (1) To protect stream channels from degradation a specific channel protection criteria shall be provided as prescribed in the latest edition of Rainwater and Land Development and as included in the SWP3.

(F) Temporary Stabilization of Disturbed Areas and Soil Stockpiles

- (1) A temporary vegetative cover shall be applied to disturbed areas as specified in Table 1 below

Table 1: Temporary Stabilization of Disturbed Areas and Soil Stockpiles

Area requiring temporary stabilization.	Time frame to apply erosion controls
Any disturbed area not at final grade.	Within 2 working days of the most recent disturbance if that area will remain idle for More than 21 days
For all construction activities, any disturbed area, including soil stockpiles, that will be dormant for more than 21 days but less than one year	Within 7 working days of the most recent disturbance within the area.
Disturbed areas that will be idle over winter.	Prior to onset of winter weather

(2) Application practices include vegetative establishment, mulching, and the early application of gravel base on areas to be paved. Soil stabilization measures should be appropriate for the time of year, site conditions and estimated time of use.

(3) Topsoil removed shall be stored on site and shall be stabilized with quick growing plants or other means, so that it is protected from wind and water erosion. Topsoil shall be maintained in a useable condition for sustaining vegetation and reused on the site.

(G) Permanent Stabilization

(1) A permanent vegetative cover shall be placed on disturbed areas as specified in Table 2 below.

Table 2: Permanent Stabilization

Area required permanent stabilization.	Time frame to apply erosion controls.
Any area that will lie dormant for 6 months or more.	Within 7 working days of the most recent disturbance.
Any area at final grade.	With 2 working days after reaching final grade within that area.

(2) Permanent vegetation shall not be considered established until a ground cover is achieved which is mature enough to control soil erosion and will survive severe weather conditions.

(H) Cut and Fill Slopes

- (1) Cut and fill slopes shall be designed, constructed and stabilized in a manner which will minimize erosion. Consideration should be given to the length and steepness of the slope, the soil type, upslope drainage area, groundwater conditions and other applicable factors. If after final grading excessive erosion takes place, additional slope stabilizing measures by the owner, developer or builder will be required until the problem is corrected. The following guidelines are provided to aid in developing an adequate design.
 - (a) Roughened soil surfaces are generally preferred to smooth surfaces on slopes
 - (b) Diversions should be constructed at the top of long steep slopes which have significant drainage areas above the slope. Diversions or terraces may also be used to reduce slope length.
 - (c) Concentrated storm water should not be allowed to flow down cut or fill slopes unless contained within an adequate channel, flume or slope drain structure.
 - (d) Wherever a slope face crosses a water seepage plane which endangers the stability of the slope, adequate drainage or other protection should be provided.

(I) Protection of Adjacent Properties/Public Right-of-Ways

- (1) Properties, public right-of-ways, and thoroughfares adjacent to the site of an earth disturbing activity shall be protected from sediment deposition. This may be accomplished by preserving a well-vegetated buffer at the perimeter of the site, by installing perimeter controls such as sediment barriers, filters, dikes, sediment basins, or by a combination of such measures.

(J) Sediment Control Structures

- (1) Sediment control structures shall be used to control erosion and trap sediment on a site remaining disturbed for more than 14 days. Such structures may include, but are not limited to, silt fences, storm drain inlet protection, sediment basins and diversions or channels which direct runoff to a sediment basin. All sediment control practices must be capable of ponding runoff in order to be considered functional.
- (2) Sediment control structures shall be constructed as a first step in grading and be made functional before upslope earth disturbing activities take

place. Earthen structures such as dams, dikes, and diversions shall be seeded and mulched as soon as the installation is complete. Sediment control structures shall be functional throughout the course of earth disturbing activity and until the site is stabilized with permanent vegetation.

- (3) Sheet flow runoff from the site shall be intercepted by silt fence or diversions. Silt fence shall be placed on a level contour and shall be capable of temporarily ponding runoff. The relationship between the maximum drainage area to silt fence for a particular slope range is shown in Table 3 below.

Table 3: Maximum Drainage Area to Silt Fence

Maximum drainage area (in acres) to 100 linear feet of silt fence.	Range of slope for a particular drainage area (percent)
0.5	< 2%
0.25	≤ 2% but < 20%
0.125	≤ 20% but < 50%

- (4) Storm water diversion practices shall be used to keep runoff away from disturbed areas and steep slopes. Such devices, which include swales, dikes or berms, may receive storm water runoff from areas up to 10 acres.
- (5) Whenever storm water detention is required the storm water runoff from the site shall pass through a sediment basin or other suitable sediment trapping facility before discharge to a receiving water body. The authorized agent(s) may require sediment basins or traps for smaller disturbed areas where deemed necessary.

(K) Stabilization of Waterways and Outlets

- (1) All on-site storm water conveyance channels shall be designed and constructed to withstand the expected velocity of flow without erosion. Methods adequate to prevent erosion shall also be provided at the outlets of all pipes and paved channels.

(L) Storm Sewer Inlet Protection

- (1) All storm sewer inlets shall be protected so that sediment-laden water will not enter the conveyance system without first being filtered or otherwise treated to remove sediment.

- (M) Working in or Crossing Watercourses
- (1) All activities shall be kept out of watercourses to the extent possible. Where in-channel work is necessary, precautions shall be taken to stabilize the work area during construction to minimize erosion. The channel (including bed and banks) shall be restored to its original cross-section and all disturbed area stabilized immediately after in-channel work is completed.
- (2) Where a watercourse will be crossed regularly during construction, a temporary stream crossing shall be provided, used for the shortest period practical, removed following site construction, and restored as described in Section 154.04 (M)(1) above.
- (N) Maintenance and Removal of Temporary Measures
- (1) All temporary erosion and sediment control practices shall be maintained and repaired to assure continued performance.
- (2) All temporary erosion and sediment control measures shall be removed within thirty (30) days after final stabilization is achieved or after the temporary measures are no longer needed. Trapped sediment and other disturbed soil areas resulting from the removal of temporary measures shall have the final grade re-established and be permanently stabilized to prevent further erosion and sedimentation.
- (O) Control of Construction Site Debris and Wastes
- (1) All owners, applicants, contractors and developers shall control wastes such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste on construction sites and shall keep streets and gutters clear of all sediment and debris from the site.
- (P) Use, Safety, and Maintenance of Storm Water Practices
- (1) Storm Water management practices shall be designed for the ultimate use of the site and function safely and with minimal maintenance.
- (2) If an inspection reveals that a control practice is in need of repair or maintenance, with the exception of a sediment settling pond, it must be repaired or maintained within three (3) days of the inspection, and the receipt of notice. Sediment settling ponds must be repaired or maintained within ten (10) days of the inspection and receipt of notice.

- (Q) Inspection of Storm Water Controls (See Section 154.07(G) for specific requirements).
- (1) All on-site control practices shall be periodically inspected to ensure proper function and to identify failures.
 - (2) On and off-site discharge locations shall be inspected to ascertain whether erosion and sediment control measures are effective in preventing significant impacts to the receiving waters.
- (R) Accessibility and Easements (See Section 154.07(H) for specific requirements)
- (1) All permanent storm water management measures may be required to be contained within easements as determined by the City Engineer. If an easement is required, then the easement shall be sufficient to cover the facility and to provide access for inspection and maintenance.
- (S) Status of Standards
- (1) The standards identified in this Section are general guidelines. Each application shall be reviewed on a case by case basis and some may require additional and more stringent requirements while others may have individual requirements waived by the authorized agent.

154.05: SITE DEVELOPMENT PLAN

- (A) Any person seeking approval of land development proposals for use types listed in Section 154.03(C) shall develop and submit a Site Development Plan as detailed in Section 154.05(C).
- (B) The applicant is encouraged to have a pre-submission meeting with the City's authorized agent(s).
- (C) Site Development Plan Requirements
- (1) Each applicant shall provide information that details the location of the area proposed for development, the site in relation to its general surroundings, predevelopment site conditions, existing characteristics of the site, and the extent of proposed earth disturbing activities. At a minimum the plan shall include the following elements:
 - (a) General location map prepared from a 2,000 scale (one-inch = 2,000 feet) USGS topographic base map that shows the area proposed for development and pertinent adjacent areas and features.

- (b) A description of the nature and type of the earth disturbing/construction activity (e.g. residential, commercial, industrial, etc.)
- (c) A photocopy of the appropriate soil survey sheet found in the USDA Soil Survey of Greene County with location of site identified.
- (d) Total area of the site and the area of the site that is expected to be disturbed (i.e. grubbing, cleaning, excavation, filling or grading, including off-site borrow areas).
- (e) Surface water locations, including springs, wetlands, streams, lakes, water, wells, etc. on or within 200 feet of the site, including the boundaries of wetlands or stream channels and first subsequent names receiving water(s) the permittee intends to fill or relocate for which the permittee is seeking approval from the Army Corp of Engineers and/or Ohio EPA.
- (f) The general directions of surface water flow and 100-year floodplain when applicable.
- (g) All improvements, including buildings, retaining walls, sidewalks, streets, parking lots, driveways, utilities, and storm water basins, drainage impoundments, channels and outlets, etc.
- (h) An estimate of the impervious area and percent imperviousness created by the earth disturbing activity.
- (i) Any additional information that may be required by the City Engineer for a complete review of the proposed plan.

(D) Site Development Plan Submission, Review and Action.

- (1) Submission of a Site Development Plan by an applicant seeking approval initiates the review process.
- (2) The City's authorized agent(s) shall review the Site Development Plan and conduct a site inspection of the proposed site.
- (3) Review of the Site Development Plan shall be completed within fifteen (15) working days of submittal, unless submitted as part of a Planned Unit Development, or Subdivision.
- (4) Following its review the authorized agent(s) shall:
 - (a) Approve the Site Development Plan; or

- (b) Conditionally approve the Site Development Plan pending additional information and/or the incorporation of required changes; (or)
- (c) Require the submission of a Storm Water Management Plan (SMP) based on written findings of the authorized agent(s).

154.06: STORMWATER MANAGEMENT PLAN (SMP) REQUIREMENTS

- (A) Storm Water Management Plans (SMPs) are intended to provide information on all soil erosion and runoff control activities and Best Management Practices (BMP's) to be used and incorporated on the site both during and after site development. This information includes, but is not limited to, site grading, storm water management facilities and practices, erosion and runoff control information, maintenance plans, and other measures that focus on managing the effects of earth disturbing activities that occur as a result of site development, or other earth disturbing activities.
- (B) Each SMP shall provide site designs that meet the Performance Standards presented in Section 154.04 and provide practical treatment for both water quality and quantity of storm water from the site as appropriate.
- (C) In general, SMP's need to address:
 - (1) Erosion and Sediment Control: Providing measures to insure that earth disturbing activities at the site during and after development will be managed in a manner that will not result in increased erosion and sedimentation from the site, to the maximum extent practical, resulting in impacts to water quality and that meet the Performance Standards specified in Section 154.04.
 - (2) Runoff Control: Providing measures to insure that the quantity of surface water runoff from the development site during and after construction will mimic the predevelopment conditions and that meet the Performance Standards specified in Sections 154.04 and 154.06V.
- (D) If a SMP is required under Section 154.03 (H) or 154.05 (D) (4) (c), such Plan shall specifically include all the following:
 - (1) The minimum elements required in the Site Development Plan described in Section 154.05 (C) (1) (a-i).
 - (2) The contents of the **Storm Water Pollution Prevention Plan (SWP3)** required by the Ohio EPA's NPDES Construction Activity Permit #OHC000002 and incorporated by reference herein. This Plan may be

submitted as developed for the Ohio EPA, in conjunction with the other requirements of Section 154.06 (D). The contents of the Ohio EPA's **SWP3** include, but are not limited to:

- (a) A description of prior land uses at the site.
- (b) Existing data describing the soils on the site and, if available, the quality of any discharge from the site.
- (c) A determination of runoff coefficients for both the pre-construction and post construction site conditions.
- (d) For all large earth-disturbing activities (involving the disturbance of five or more acres of land or will disturb less than five acres, but part of a larger common plan of development or sale which will disturb five or more acres of land), and a description of post construction BMP(s) chosen and designed to detain and treat a water quality volume (WQV) equivalent to the volume of runoff from a 0.75-inch rainfall (See Ohio EPA Construction Activity Permit for Methodology).
- (e) For all small earth-disturbing activities (which disturb one or more, but less than five acres of land and is not a part of a larger common plan of development or sale which will disturb five or more acres of land), a description of measures that will be installed during the development process to control pollutants in storm water discharges that will occur after construction operations have been completed.
- (f) For all small earth disturbing activities greater than 10,000 square feet but less than one (1) acre, a description of measures that will be installed during the development process to control pollutants in storm water discharges that will occur after construction operations have been completed.
- (g) An implementation schedule which describes the sequence of major construction operations (i.e., grubbing, excavating, grading, utilities and infrastructure installation) and the implementation of erosion, sediment and storm water management practices or facilities to be employed during each operation of the sequence.
- (h) For subdivided developments where the SWP3 does not call for a centralized sediment control capable of controlling multiple individual lots, a detail drawing of a typical individual lot showing standard individual lot erosion and sediment control practices.

- (i) A detailed description of the storm water controls to be incorporated and how these meet or exceed the appropriate Performance Standards presented in Section 154.04. This shall include the identification of which entity (developer, contractor, owner) is responsible for implementation of each individual control (e.g.), Contractor A will clear land and install perimeter controls and Contractor B will maintain perimeter controls until final stabilization).
- (j) A detailed maintenance plan that describes procedures (e.g. inspections) needed to ensure the continued performance of control practices. Such plans must ensure that pollutants collected within structural post-construction practices, be disposed of in accordance with local, state, and federal regulations.
- (k) A site map that includes:
 - 1) Limits of earth-disturbing activity of the site including associated off-site borrow or spoil areas.
 - 2) Soil types on the site, including locations of unstable or highly erodible soils.
 - 3) Existing and proposed contours. A delineation of drainage watersheds expected during and after major grading activities as well as the size of each drainage watershed, in acres. Site maps shall include off-site drainage watersheds that pass through the development site.
 - 4) Existing and planned locations of buildings, roads, parking facilities and utilities.
 - 5) The location of all erosion and sediment control practices, including areas likely to require temporary stabilization during site development.
 - 6) Sediment and storm water management basins noting their sediment settling volume and contributing drainage area.
 - 7) Permanent storm water management practices to be used to control pollutants in storm water after construction operations have been completed.
 - 8) Areas designated for the storage or disposal of solid, sanitary, and toxic wastes, including dumpster areas, cement truck washout areas, and vehicle fueling and maintenance.
 - 9) The location of designated construction entrances where vehicles will access the site.
 - 10) The location of any -in-stream activities, including stream crossings.

- (3) Proof of authorization and conformance with other applicable local, state and federal requirements. Copies of pertinent Notices of Intent (NOI), permits, public notices and letters of authorization must be included with SMP submissions. These may include, but are not limited to, Ohio EPA NPDES Permits authorizing storm water discharges associated with construction activity, Ohio EPA Phase II STORMWATER Permits, Section 401 and 404 Clean Water Act Permits, Ohio EPA Isolated Wetland Permit, and Ohio Dam Safety Law Permits.
- (4) Supplemental requirements as provided in Section 154.06 (F).
- (E) Storm water discharge to critical areas with sensitive resources (i.e. wetlands, steep slopes, scenic river designation, recharge areas, etc.) may be subject to additional criteria, or may need to utilize or restrict certain storm water practices.
- (F) Supplemental Requirements
- (1) Determination of Post Development Runoff
- (a) Each SMP shall include an evaluation of pre-development conditions together with post-development impacts that quantifies the volume and rate of runoff from the site by sub-drainage areas. This evaluation shall be prepared according to methods prescribed in NRCS Technical Release 55 (TR-55). The evaluation shall:
- 1) Show delineation and sequence of sub-drainage units which comprise the area proposed for development.
 - 2) Indicate the hydraulic length of slope per individual sub-drainage unit and the length of the natural or manmade watercourse which accommodates the surface runoff from each sub-drainage unit.
 - 3) Indicate within the legend the average percent slope, erosion factor (K) and runoff curve number (CN) per individual sub-drainage unit for a 24-hour storm of a one-year frequency.
 - 4) Include a hydrograph for a 24-hour storm of the critical frequency to be controlled as determined according to Section 154.06 (F) (1) (c) and all calculations made pertinent to evaluating the effects of the proposed development on the pre-development runoff conditions of the site.
 - 5) Indicate off-site sub-drainage units which flow through the site.
- (b) Calculations for the design of storm water management facilities shall demonstrate the following for each sub-drainage unit:

- 1) The peak rate of runoff from the Critical Storm and all more frequent storms occurring on the site does not exceed the peak rate of runoff from a one (1) year frequency, twenty-four (24) hour storm occurring on the same site under pre-development conditions.
 - 2) Storms of less frequent occurrence than the Critical Storm up to the 100 year storm shall have its peak runoff rates no greater than the peak runoff rates from equivalent storms under pre-development conditions. Consideration of the 1, 2, 5, 10, 25, 50, and 100 year storms in design and construction will be considered meeting this standard.
 - 3) The plan shall show the storm water flow path when the capacity of the storm sewer system is exceeded. The designer shall ensure that storm water is properly conveyed to the storm water control structure.
- (c) Calculation of a critical storm for each sub-drainage unit of the site shall be determined as follows:
- 1) Calculate by the use of NRCS Technical Release 55, the total runoff from a one-year frequency, 24-hour storm occurring on the development area before and after development.
 - 2) Submit computerized calculations utilizing "Pond Pack" as developed by Haested's Methods or other software package that is approved by the City Engineer.
 - 3) From the volumes determined in 1) above, determine the percentage increase in volume of runoff due to the proposed development, and using this percentage, select the 24-hour critical storm from the table below. If the percentage of increase in volume of runoff is (see chart below):

% Equal to or Greater Than	% Less Than	The Critical Storm for Peak Rate Control
-	10	1 year
10	20	2 years
20	50	5 years
50	100	10 years
100	250	25 years
250	500	50 years
500	-	100 years

- (d) The City's authorized agent(s) shall approve or reject any calculation method based on its technical validity for the given situation.
- (2) Off-Site Storm Water Control Facilities
- (a) Exceptions to requiring permanent on-site runoff control on the site may be considered by the Planning Commission and the authorized agent(s) provided the applicant can prove that:
- 1) The intent and standards of this Ordinance for runoff control can be best achieved by the utilization of off-site stormwater control facilities.
 - 2) Runoff from the site can be conveyed to off-site storm water facilities in a manner and by means which satisfies or surpasses the standards of this Ordinance.
 - 3) The applicant has ownership of the right to use the off-site facility in question.
- (G) Storm Water Management Plan Submission, Review and Action
- (1) The applicant is encouraged to have a pre-submission meeting with the City's authorized agent(s).
 - (2) Submission of two (2) sets of SMP and other supporting data required by this regulation to the Planning Commission/City Engineer and its authorized agent(s) completes the applicant's responsibilities and initiates the review process.
 - (3) The SMP shall be reviewed by the Planning Commission/City Engineer and/or its authorized agent(s) to:

- (a) Verify background information furnished by the applicant and evaluate the proposed development in relation to existing site conditions.
- (b) Assess the SMP in relation to the Performance Standards and requirements of this Ordinance.
- (4) Upon submission of the SMP, the City of Beavercreek Planning Commission/City Engineer and authorized agent(s) shall complete a review of the SMP by the next regularly scheduled Planning Commission meeting, provided that the applicant has submitted all information required at least 20 working days prior to a regularly scheduled meeting, or if not related to a specific development in the PUD or Subdivision process, review of the SMP will be completed by the City Engineer within 20 working days after submission date.
- (5) The City of Beavercreek Planning Commission/City Engineer shall either:
 - (a) Approve the SMP as submitted by the applicant; or
 - (b) Conditionally approve the SMP and require the submission of additional and/or revised information by the applicant in order to fully meet the intent and standards of this Ordinance; or
 - (c) Disapprove the SMP.
- (6) Revisions to conditionally approved SMP's shall be prepared and submitted by the applicant to the City of Beavercreek Planning Commission/City Engineer and/or its authorized agent(s) for review.
- (7) Action by the City of Beavercreek Approval Authority and the authorized agent(s) approving or disapproving the SPM is a final order for purposes of judicial review.

154.07: COMPLIANCE RESPONSIBILITY

- (A) Performance Liability
 - (1) No provision of this Ordinance shall limit, increase or otherwise affect the liability of the applicant nor impose any liability upon the City of Beavercreek not otherwise imposed by law.
- (B) No Release from other Requirements.

- (1) No condition of this permit shall release the applicant from any responsibility or requirements under other federal, state, or local environmental regulations. If requirements vary, the most restrictive requirement shall prevail.
- (C) Proceeding with Activity
 - (1) Soil-disturbing activities regulated under this regulation shall not begin until all necessary state and federal permits and appropriate approvals of Site Development Plans or Storm Water Management Plans have been granted to the site owner/applicant.
- (D) Performance Responsibility
 - (1) The applicant is responsible for carrying out all provisions of the approved Site Development Plan or SMP and for meeting all the standards and requirements of this regulation.
- (E) Enforcement
 - (1) All development sites are subject to inspections by the City of Beavercreek authorized agent(s) to ensure compliance with the approved Site Development Plan or SMP.
 - (2) After each inspection, a status report shall be prepared and distributed to the appropriate person(s).
 - (3) If it is found that the operations are being conducted in violation of the approved Site Development Plan and SMP, a stop-work order may be issued until the identified violations cease.
 - (4) After the issuance of a stop-work order provided for in Section (3) above, but before the imposition of any fines, the applicant shall have the opportunity to request a hearing before the City of Beavercreek City Engineer to show cause why work should not be stopped. A hearing shall be scheduled at the time that a request for such a hearing is made to the City of Beavercreek City Engineer.
 - (5) Following the issuance of a stop-work order, the City of Beavercreek authorized agent(s) shall determine if and when the development may proceed. Any determination by the authorized agent(s) pursuant to this section is a final order for purposes of judicial review.

(F) Penalties Subsequent to Issuance of Stop-Work Order.

- (1) Subsequent to the issuance of a stop-work order, one or more of the following penalties may be imposed.
 - (a) If the earth disturbing activity involves a subdivision, the applicable penalties (including fines) provided for in the subdivision regulations of the City of Beavercreek shall apply.
 - (b) The authorized agent(s) may request the legal representative of the City of Beavercreek to seek an injunction or other appropriate relief to abate excessive erosion or sedimentation and secure compliance with this Ordinance. In granting such relief, the court may order the construction of sediment control improvement and/or the implementation of other control measures and/or fines as identified in Section 154.07 (L) (1) or any other relief the court determines.
 - (c) The City of Beavercreek may apply the proceeds of any cash deposit or performance bond proceeds in accordance with the permit provisions.

(G) Internal Inspections

- (1) All controls on the site shall be inspected by the owner and/or applicant at least once every seven (7) calendar days and within 24 hours after any storm event greater than one-half inch of rain per 24 hour period. The site owner and/or applicant shall assign qualified inspection personnel experienced in the installation and maintenance of erosion and runoff controls to conduct these inspections to ensure that all storm water control practices are functional, that all provisions of the SMP and this regulation are being met, and whether additional control measures are required.
- (2) The site owner shall maintain for three (3) years following the final stabilization of the site a record summarizing inspections, names and qualifications of personnel making the inspections, the date(s) of inspections, major observations relating to the implementation of the SMP and a certification as to whether the site in compliance with SMP and identify any incidents of non-compliance.

(H) Ownership and Maintenance of Storm Water Facilities

- (1) In cases where storm water control facilities are proposed on single private properties, the City's authorized agent(s) shall review and approve a suitable inspection and maintenance agreement. This agreement shall

bind all current and subsequent owners of land served by the storm water facilities.

- (2) In the case of proposed subdivisions, inspection and maintenance agreements shall be approved before the City of Beavercreek accepts the final plat of the proposed subdivision. This agreement shall bind all current and subsequent owners of land served by the storm water facilities and may be in the form of subdivision covenants or Homeowner Association documents.
- (3) All inspection and maintenance agreements shall do the following:
 - (a) Designate the party(ies) responsible for the maintenance of all storm water management facilities and practices including mowing, landscaping, debris pick-up, and to ensure all inlet and outlet structures are free of obstructions and in good repair.
 - 1) For subdivisions, unless otherwise approved by the City, responsible party(ies) this shall be an entity of common ownership (e.g. Land/homeowner's Association) within the proposed subdivision. Each parcel sold in the proposed subdivision shall require continued membership in the Land/Homeowners Association.
 - (2) Prohibit unauthorized alterations of all storm water management facilities.
 - (3) Provide adequate access to all storm water management facilities for inspection by the City's authorized agent(s) and corrective actions by the owner.
 - (4) All storm water management facility easements shall be on the final plat, prior to approval by the City, and a reference shall be made to the entity or individual(s) responsible for their maintenance.
 - (5) The owner/developer shall submit four (4) sets of as-builts of all stormwater facilities and improvements to the City Engineer.
 - (6) The Planning Commission may require the owner and/or the applicant to follow the maintenance procedure outlined in Chapter 6131.63 of the Ohio Revised Code. The City's authorized agent(s) may require of the owner and/or applicant any one or all of the following prerequisites:
 - (a) Benefit two or more property owners.
 - (b) Are designed for cost-effective maintenance.

- (c) Are determined by the Planning Commission or authorized agent(s) to be appropriate additions to this jurisdiction's existing storm drainage system.
 - (d) Are not better suited for private maintenance by an individual or group of property owner(s), with ultimate responsibility for maintenance in the event of default on the part of the owner(s) remaining with jurisdiction.
- (7) The following conditions shall apply to all drainage easements:
- (a) Easements shall be approved by the authorized agent(s) prior to approval of the final plat and shall be recorded with said plat.
 - (b) Unless otherwise required by the authorized agent(s) prior to approval of the final plat and shall be recorded with said plat.
 - (c) Unless otherwise required by the authorized agent(s), storm water management facilities, including basin, ponds or other retention/detention practices, shall be on separate lots held and maintained by an entity of common ownership (Land/Homeowners Association).
 - (d) Those lots that contain and/or are crossed by a drainage easement shall have the following restriction - "Any lot area reserved for drainage purposes shall at all times be kept free of any obstructions to the flow of water. No improvements or modifications within the identified drainage easement area will be allowed without the approval of the City Engineer. Maintenance of the drainage easement area, storm water control facility(ies), and ditches shall be the responsibility of the owner(s) of the lot on which these facilities and/or ditches are located."

(I) Schedule of Fees and Bonds

- (1) The City of Beavercreek shall establish a schedule of fees, charges, bonds, expenses, and collection procedure for same and other matters pertaining to this Ordinance. The schedule of fees shall be posted at the applicable City of Beavercreek offices. Until all applicable fees, review fees, charges, bonds, and expenses have been paid in full, no action shall be taken on any application or appeal.

(J) Complaints

- (1) The City's authorized agent(s) shall investigate any complaint related to earth disturbing activities covered by this Ordinance.

(K) Violations

- (1) No person shall violate or cause or knowingly permit to be violated any of the provisions of this Ordinance, or fail to comply with any of its provisions or with any lawful requirements of any public authority made pursuant to it, or knowingly use or cause or permit the use of any lands in violation of this Ordinance or in violation of any approval permit granted under this Ordinance.

(L) Penalties

- (1) Violation of any provision of this or any amendment or supplement thereto, or failure to comply with any of the requirements herein shall constitute a misdemeanor. Any person or persons violating any of the provisions herein shall upon conviction be fined not less than twenty-five (25) dollars nor more than one hundred (100) dollars or imprisoned for not more than thirty (30) days, or both and in addition shall pay all costs and expenses involved in the case. Each day such violation continues shall be considered a separate offense.
- (2) Upon notice from the City of Beavercreek and/or its authorized agent(s), that work is being done contrary to this Ordinance, such work shall immediately stop. Such notice shall be in writing and shall be given to the applicant, and shall state the conditions under which such work may resume; provided, however, in instances where immediate action is deemed necessary for the public safety or the public interest, the City's authorized agent may require that work be stopped upon verbal order pending issuance of the written order.
- (3) The imposition of any other penalty provided herein shall not preclude the City by or through its Law Director and/or any of its assistants, from instituting an appropriate action or proceeding in a Court of proper jurisdiction to prevent an unlawful development, or to restrain, correct, or abate a violation, or to require compliance with the provisions of this regulation or other applicable laws, ordinances, rules, or regulations, or the orders of the authorized agent(s), including the use of and forfeiture by the developer of all cash deposits, bonds, etc. for the purpose of performing corrective actions.

(M) Effective Date and Validity

- (1) This Ordinance shall become effective within the City of Beavercreek on the earliest date permitted by law. If any section subsection, paragraph, clause, phrase, or provision of this Ordinance is adjudged invalid or held unconstitutional, such a decision shall not affect or void any of the remaining portions.

EXHIBIT H

STREET DESIGN STANDARDS FOR CUL-DE-SAC TYPE LOCAL STREETS

<u>Design Feature</u>	<u>Required Minimum</u>
Right-of-Way (feet)	60
Pavement Width (feet) (Measured b/c to b/c)	27
Sidewalk Width (feet)	4
Minimum Vertical Sight Distance (feet)	150
Minimum Horizontal Sight Distance (feet)	150
Maximum Street Grade (%)	8
Minimum Street Grade (%)	0.50
Maximum Cul-de-Sac Length (feet)	900
Minimum Cul-de-Sac Right-of-Way Radius (feet)	60
Minimum Cul-de-Sac Radius (feet)	40
Minimum Centerline Radius of Roadway (feet)	200

EXHIBIT I

STREET DESIGN STANDARDS FOR LOCAL TYPE STREETS

<u>Design Feature</u>	<u>Required Minimum</u>
Right-of-Way (feet)	60
Pavement Width (feet) (Measured b/c to b/c)	27
Sidewalk Width (feet)	4
Minimum Vertical Sight Distance (feet)	150
Minimum Horizontal Sight Distance (feet)	150
Maximum Street Grade (%)	8
Minimum Street Grade (%)	0.50
Minimum Centerline Radius of Roadway (feet)	200

EXHIBIT J

STREET DESIGN STANDARDS FOR COLLECTOR TYPE STREETS

<u>Design Feature</u>	<u>Required Minimum</u>
Right-of-Way (feet)	70
Pavement Width (feet) (Measured b/c to b/c)	36
Sidewalk Width (feet)	5
Minimum Vertical Sight Distance (feet)	250
Minimum Horizontal Sight Distance (feet)	250
Maximum Street Grade (%)	8
Minimum Street Grade (%)	0.50
Minimum Centerline Radius of Roadway (feet)	350
Minimum Spacing When Intersecting an Arterial Street (feet)	1320

EXHIBIT K

INTERSECTION DESIGN STANDARDS

Maximum Approach Speed	25 MPH
Clear Sight Distance (Length Along Each Leg of Approach)	Minimum Intersection Sight Distance
Vertical Alignment with Intersection	3% (Max)
Minimum Angle of Intersection Note: Streets shall remain in the angle of the intersection for at least 100 feet beyond the point of intersection.	80 Degrees (90 Preferred)
Minimum B/C Radius	
Local - Local	25 feet
Local - Collector	25 feet
Collector - Collector	30 feet
Collector - Arterial	35 feet
Minimum Centerline Offset of Adjacent Intersections	
Local - Local	150 feet
Local - Collector	200 feet
Collector - Collector	300 feet
Collector - Arterial	1320 feet

EXHIBIT L

**APPROVED TREE LIST FOR PLANTING WITHIN
PUBLIC RIGHT-OF-WAYS**

Any trees or other landscaping planted within the public Right-of-Way shall comply with all requirements of Chapter 97 of the City of Beavercreek Codified Ordinances.

The City of Beavercreek, Public Service Division, maintains a listing of all approved tree species that may be planted within the Public Right-of-Way. Any trees or other plant materials planted within the public Right-of-Way shall meet all current requirements as specified by the Public Service Division.

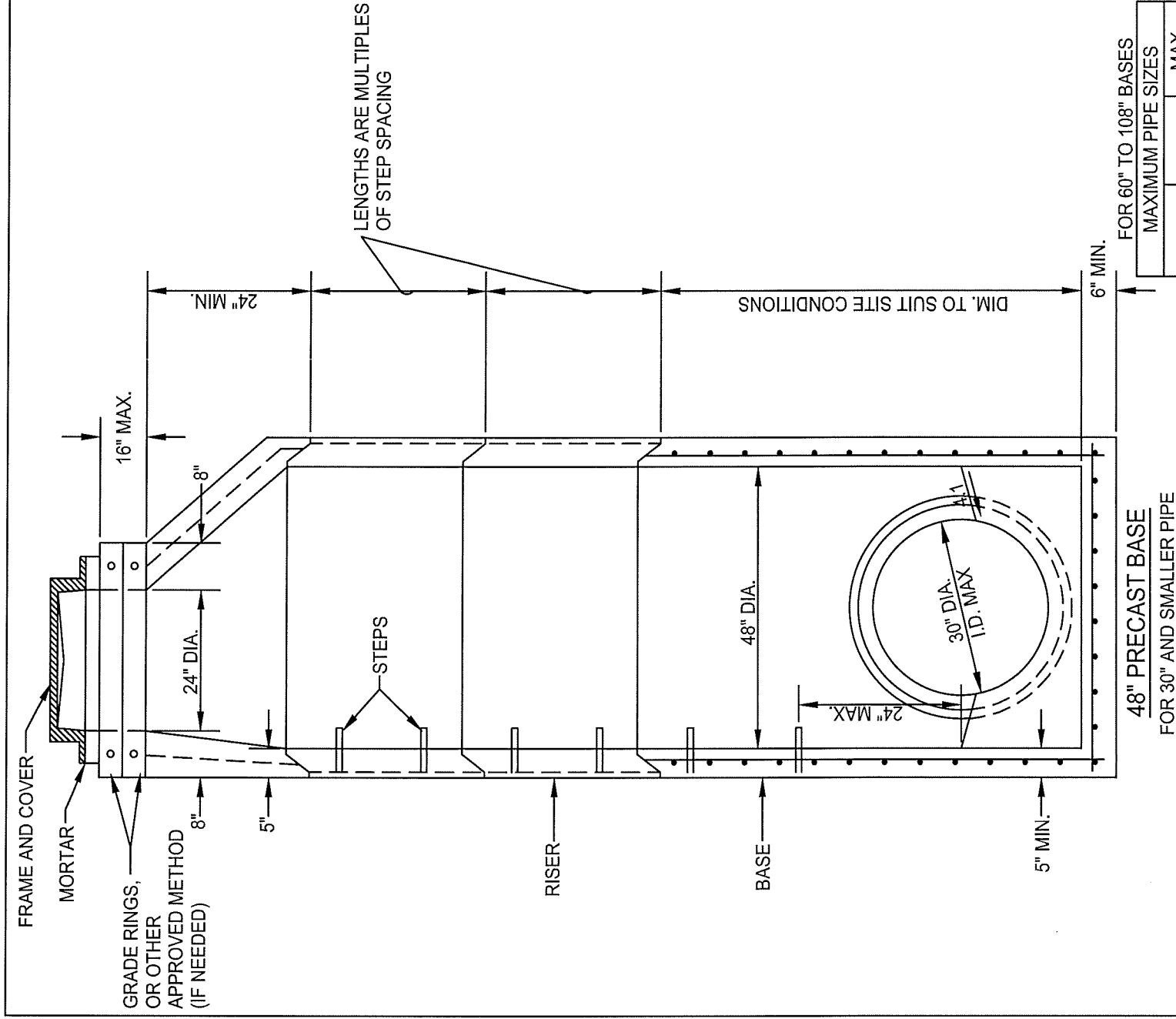
EXHIBIT M

NOT USED

EXHIBIT N

STANDARD CONSTRUCTION DRAWINGS FOR SUBDIVISION CONSTRUCTION

NOTE: REFERENCES TO ODOT STANDARD CONSTRUCTION DRAWINGS
ON SUBDIVISION CONSTRUCTION PLANS ARE ENCOURAGED.



48" PRECAST BASE

FOR 30" AND SMALLER PIPE

FOR 60" TO 108" BASES

MAXIMUM PIPE SIZES		
BASE I.D.	MIN 1"	MAX. PIPE SIZE
60"	5"	36"
72"	6"	48"
84"	7"	54"
90"	7.5"	60"
96"	8"	66"
108"	9"	72"

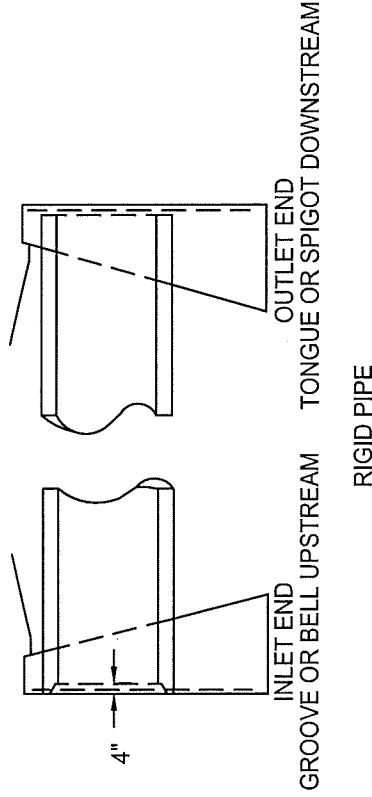
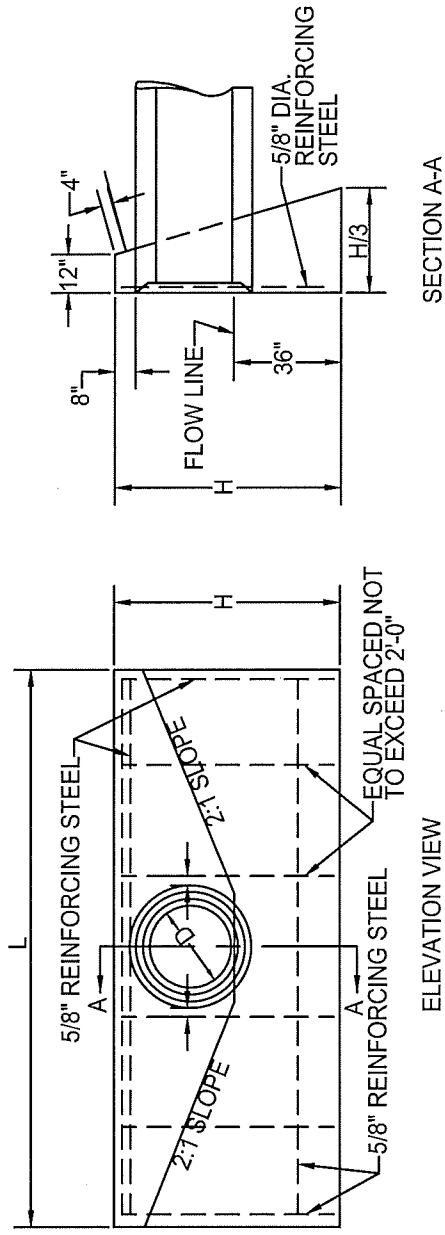
NOTES

1. OPENING FOR INLET AND OUTLET PIPES SHALL BE PROVIDED, EITHER WHEN THE UNIT IS CAST OR LATER, TO MEET PROJECT REQUIREMENTS.
2. BOTTOM CHANNELS MAY BE FORMED OF CONCRETE, PRECAST IN THE BASE OR FIELD CONSTRUCTED.
3. FRAME AND LID SHALL BE NEENAH R-1767, HEAVY DUTY, OR APPROVED EQUAL. CASTING SHALL BE PAINTED BLACK WITH PORTER PAINT INDUSTRIAL ENAMEL 7-809 OR APPROVED EQUAL.



City of Beavercreek
Standard Construction Drawing
PRECAST STORM MANHOLE

BEAVERCREEK
 MANHOLE
 SECTION
 DR-100



NOTES

1. TYPE "A" HEADWALL WHERE REQUIRED WILL BE PROVIDED FOR NONSKEWED CULVERTS HAVING A DIAMETER OR RISE OF 36 INCHES OR LESS.
2. CONCRETE SHALL BE CLASS "C".
3. REINFORCING STEEL BARS SHALL BE 5/8 INCH DIAMETER.
4. DIMENSIONS AND QUANTITIES ARE SHOWN FOR CIRCULAR SECTIONS ONLY. IT WILL BE NECESSARY TO DETERMINE DIMENSIONS FOR THE TYPE "A" HEADWALL REQUIRED FOR REINFORCED ELLIPTICAL CONCRETE PIPE IN ACCORDANCE WITH THE EQUATIONS LISTED ON THIS DRAWING.
5. CHAMFER ALL EXPOSED CORNERS 3/4 OF AN INCH.
6. WHERE THE SOIL BORINGS INDICATE A BEARING CAPACITY OF LESS THAN 2600 POUNDS PER SQUARE FOOT, IT WILL BE NECESSARY TO INCREASE THE WIDTH OF THE BASE.
7. THE MINIMUM COVER FOR REINFORCING STEEL SHALL BE TWO INCHES.

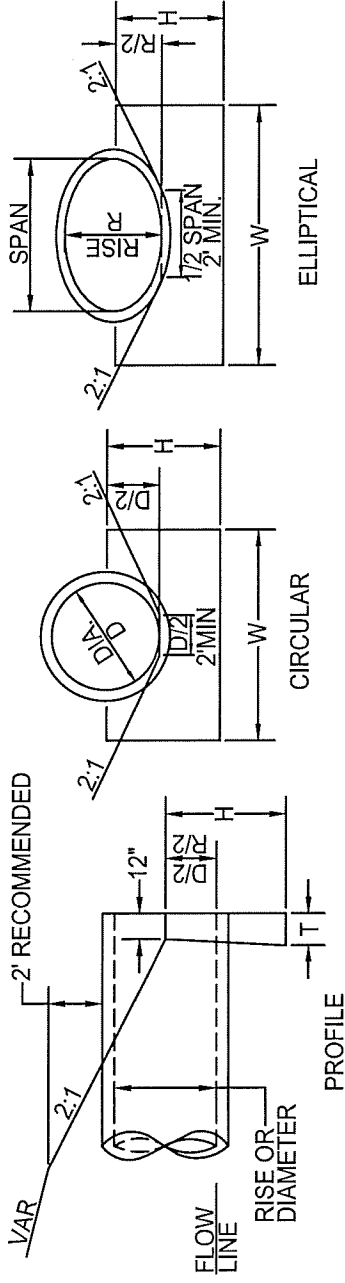
$$\begin{aligned}
 L \text{ CIRCULAR SECTIONS} &= 5D + 4T \\
 L \text{ ELLIPTICAL} &= 4R + 4T + S \\
 H \text{ CIRCULAR SECTIONS} &= D + T + 44" \\
 H \text{ ELLIPTICAL} &= R + T + 44" \\
 D &= \text{DIAMETER OF PIPE} \\
 R &= \text{RISE OF PIPE} \\
 S &= \text{SPAN OF PIPE} \\
 T &= \text{THICKNESS OF BARREL} \\
 L &= \text{LENGTH OF HEADWALL} \\
 H &= \text{HEIGHT OF HEADWALL}
 \end{aligned}$$

DIAMETER	DIMENSIONS		QUANTITIES	
	H	L	ONE HEADWALL CONCRETE CU. YDS.	REINFORCING STEEL LBS.
15"	5'-2"	7'-0"	1.7	41
18"	5'-5"	8'-4"	2.2	57
21"	5'-8"	9'-8"	2.8	62
24"	5'-11"	11'-0"	3.3	69
30"	6'-5"	13'-8"	4.7	92
36"	7'-0"	16'-4"	6.5	105



City Of Beaver Creek Standard Construction Drawing HEADWALL TYPE A

REVISION
HW-A
SECTION
DR-101



CONCRETE PIPE

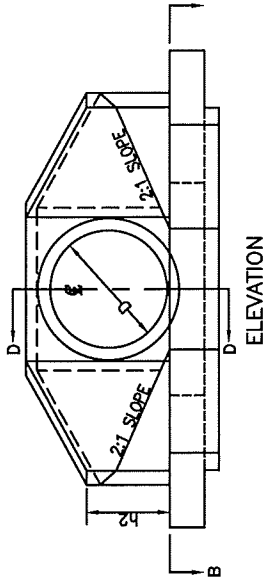
ALL CONCRETE SHALL BE CLASS "C".

HEADWALL FOR CONCRETE PIPE											
CIRCULAR						ELLIPTICAL					
D	W	H	T	CONC CU YDS	SPAN	RISE	W	H	T	CONC CU YD	
12"	2'-0"	3'-0"	12"	.20							
15"	2'-6"	3'-2"	12"	.25							
18"	3'-0"	3'-3"	12"	.31	23"	14"	3'-0"	3'-2"	12"	.29	
21"	3'-6"	3'-4"	12"	.37							
24"	4'-0"	3'-6"	12"	.43	30"	19"	3'-7"	3'-4"	12"	.35	
27"	4'-6"	3'-8"	12"	.49	34"	22"	3'-11"	3'-5"	12"	.38	
30"	5'-0"	3'-9"	12"	.56	38"	24"	4'-6"	3'-6"	12"	.44	
33"	5'-6"	3'-10"	12"	.62	42"	27"	4'-8"	3'-7"	12"	.45	
36"	6'-0"	4'-0"	12"	.69	45"	29"	5'-2"	3'-8"	12"	.49	
39"	6'-6"	4'-2"	12"	.77	49"	32"	5'-5"	3'-10"	12"	.52	
42"	7'-0"	4'-3"	12"	.84	53"	34"	5'-11"	4'-0"	14"	.66	
48"	8'-0"	4'-6"	14"	1.09	60"	38"	6'-10"	4'-2"	14"	.82	
54"	9'-3"	4'-9"	14"	1.32	68"	43"	8'-0"	4'-4"	16"	1.01	
60"	10'-6"	5'-6"	16"	1.93	76"	48"	9'-2"	5'-0"	16"	1.34	
66"	11'-9"	5'-9"	18"	2.42	83"	53"	10'-4"	5'-2"	18"	1.65	
72"	13'-0"	6'-0"	18"	2.77	91"	58"	11'-6"	5'-5"	18"	1.97	
78"	14'-3"	6'-3"	20"	3.37	98"	63"	12'-7"	5'-7"	20"	2.38	
84"	15'-6"	6'-6"	22"	4.05	106"	68"	13'-9"	5'-10"	20"	2.69	

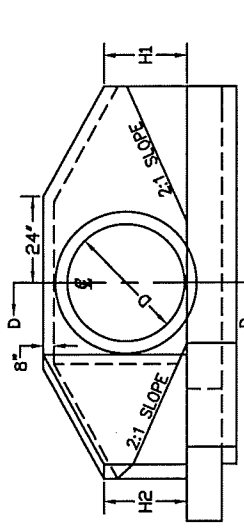


City Of Beavercreek
Standard Construction Drawing
HEADWALL TYPE B

HW-B
SECTION
DR-102

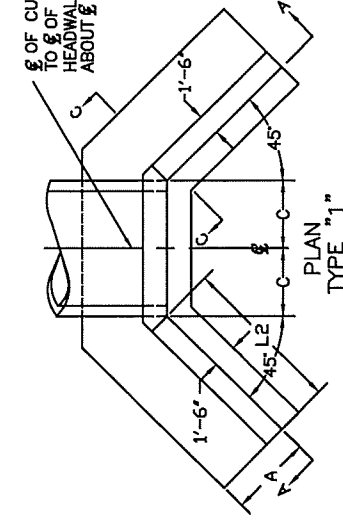


ELEVATION

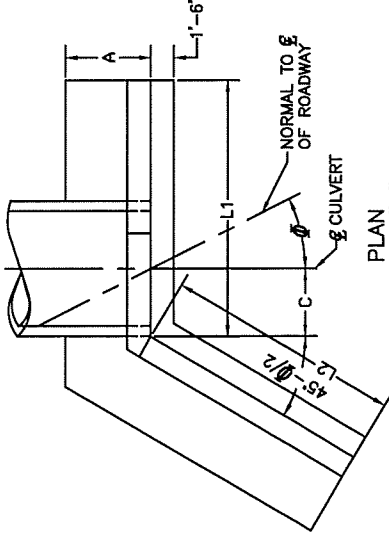


ELEVATION

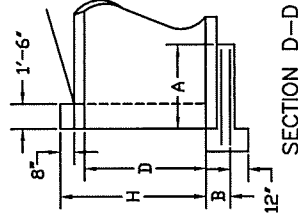
℄ OF CULVERT NORMAL
TO ℄ OF ROADWAY.
HEADWALL IS SYMMETRICAL
ABOUT ℄.



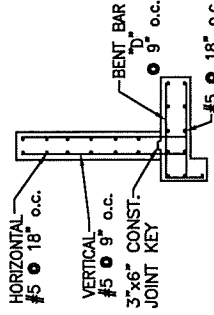
PLAN
TYPE "#1"



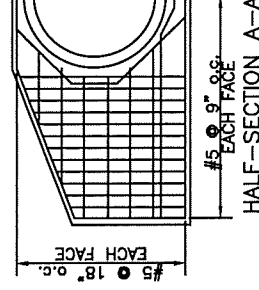
PLAN
TYPE "#2"



SECTION D-D



SECTION C-C



HALF-SECTION A-A

- 1) TYPE C HEADWALL WHERE REQUIRED WILL BE PROVIDED FOR SKEWED AND NONSKEWED CULVERTS HAVING A DIAMETER OR RISE OF 42 TO 84 INCHES.
- 2) TYPE 1 IS USED WHEN THE SKEW ANGLE IS 10 DEGREES OR LESS AND TYPE 2 WHEN THE SKEW ANGLE IS 11 DEGREES OR GREATER.
- 3) ALL CONCRETE SHALL BE CLASS "C".
- 4) ALL REINFORCING STEEL BARS SHALL BE 5/8" ROUND.
- 5) DIMENSIONS AND QUANTITIES ARE SHOWN FOR CIRCULAR SECTIONS ONLY WHEN USED WITH REINFORCED ELLIPTICAL CONCRETE PIPE OR CORRUGATED METAL ARCHES. IT WILL BE NECESSARY TO DETERMINE SUCH DIMENSIONS AND QUANTITIES WHICH SHALL GENERALLY CONFORM WITH THOSE LISTED FOR THE NEAREST SIZE CIRCULAR PIPE. THE DIMENSIONS ESTABLISHED BY VERTICAL DIAMETER SHALL APPLY TO SPAN.
- 6) CHAMFER ALL EXPOSED CORNERS 3/4 OF AN INCH.
- 7) WHERE SOIL BORINGS INDICATE A BEARING CAPACITY OF LESS THAN 2600 POUNDS PER SQUARE FOOT, IT WILL BE NECESSARY TO INCREASE THE WIDTH OF THE FOOTING.
- 8) THE MINIMUM COVER FOR REINFORCING STEEL SHALL BE 2 INCHES.

NOTES

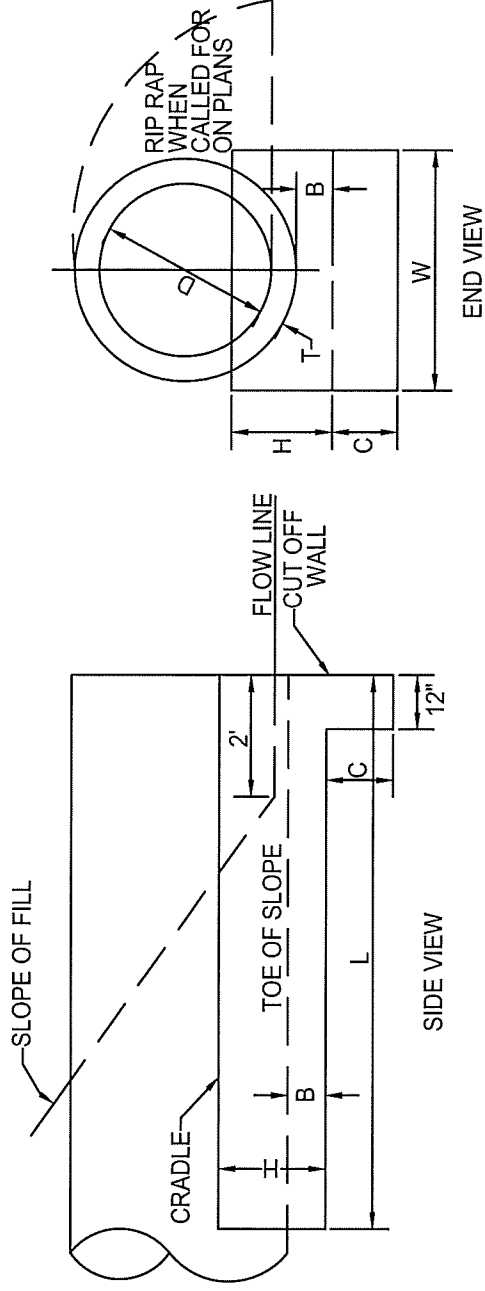
- 1) TYPE C HEADWALL WHERE REQUIRED WILL BE PROVIDED FOR SKEWED AND NONSKEWED CULVERTS HAVING A DIAMETER OR RISE OF 42 TO 84 INCHES.
- 2) TYPE 1 IS USED WHEN THE SKEW ANGLE IS 10 DEGREES OR LESS AND TYPE 2 WHEN THE SKEW ANGLE IS 11 DEGREES OR GREATER.
- 3) ALL CONCRETE SHALL BE CLASS "C".
- 4) ALL REINFORCING STEEL BARS SHALL BE 5/8" ROUND.
- 5) DIMENSIONS AND QUANTITIES ARE SHOWN FOR CIRCULAR SECTIONS ONLY WHEN USED WITH REINFORCED ELLIPTICAL CONCRETE PIPE OR CORRUGATED METAL ARCHES. IT WILL BE NECESSARY TO DETERMINE SUCH DIMENSIONS AND QUANTITIES WHICH SHALL GENERALLY CONFORM WITH THOSE LISTED FOR THE NEAREST SIZE CIRCULAR PIPE. THE DIMENSIONS ESTABLISHED BY VERTICAL DIAMETER SHALL APPLY TO SPAN.
- 6) CHAMFER ALL EXPOSED CORNERS 3/4 OF AN INCH.
- 7) WHERE SOIL BORINGS INDICATE A BEARING CAPACITY OF LESS THAN 2600 POUNDS PER SQUARE FOOT, IT WILL BE NECESSARY TO INCREASE THE WIDTH OF THE FOOTING.
- 8) THE MINIMUM COVER FOR REINFORCING STEEL SHALL BE 2 INCHES.

PIPE DIAM D	θ=0°				θ=15°				θ=30°				θ=45°			
	H	A	B	C	BAR d	L2	n2	CV CONC RCP	STEEL LBS	L1	L2	n1	n2	CV CONC RCP	STEEL LBS	PIPE DIAM D
42"	4'11"	3'3"	1'6"	2'6"	#5	3'7"	3'1"	6.7	598	8'0"	4'5"	3'8"	3'3"	7.3	633	42"
48"	5'5"	3'6"	1'8"	2'9"	#5	4'4"	3'4"	8.2	793	10'0"	5'4"	4'1"	3'5"	8.8	801	48"
54"	5'11"	3'9"	1'8"	3'0"	#5	5'2"	3'7"	10.0	1069	11'4"	6'3"	4'6"	3'8"	10.5	1024	54"
60"	6'6"	4'0"	1'8"	3'3"	#5	5'11"	3'11"	11.8	1149	12'7"	7'2"	4'10"	4'1"	12.3	1157	60"
72"	7'7"	4'6"	1'7"	3'9"	#7	7'5"	4'5"	16.2	1763	15'1"	8'11"	5'7"	4'3"	16.6	1788	72"
84"	8'8"	5'0"	1'10"	4'3"	#8	9'0"	5'0"	22.8	2595	17'7"	10'9"	6'4"	5'1"	23.3	2511	84"



City of Beavercreek Standard Construction Drawing HEADWALL TYPE C

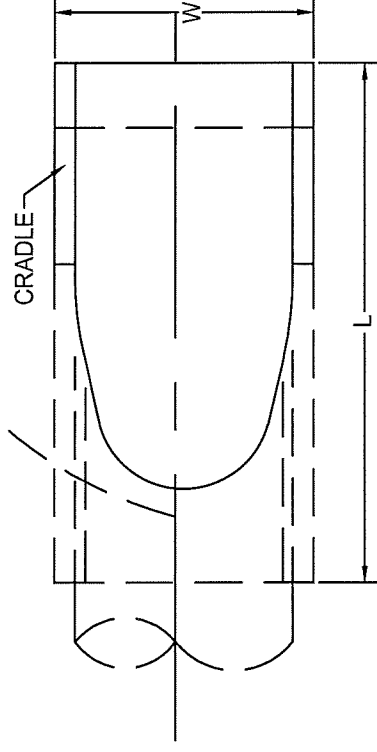
REVISION
HW-C
SECTION
DR-103



NOTES

1. LENGTH OF CRADLE TO BE 10'-0" FOR FILLS UP TO 15'-0" DEEP AND EQUAL TO THE DEPTH OF FILL FOR DEPTHS 15'-0" AND OVER.
2. RIP RAP MAY BE PLACED AT INLET AND OUTLET OF CULVERT AS DETERMINED BY THE ENGINEER.

RIP RAP WHEN CALLED FOR ON PLANS



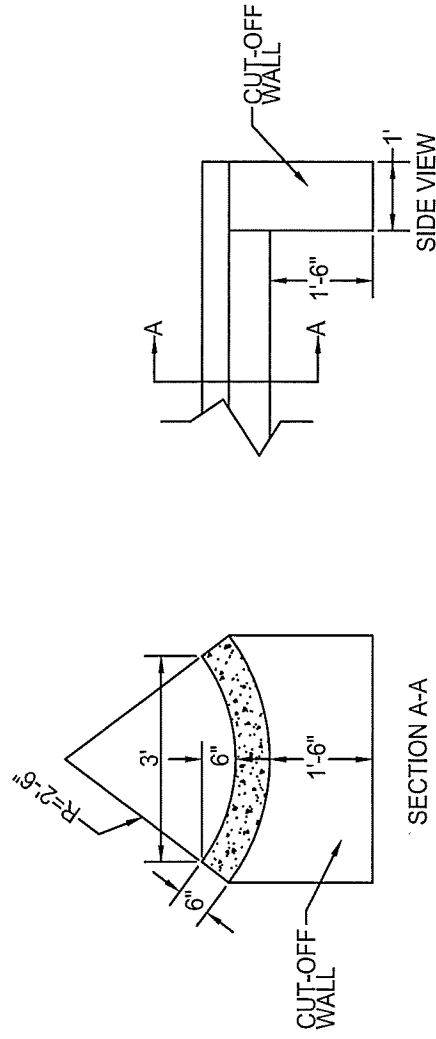
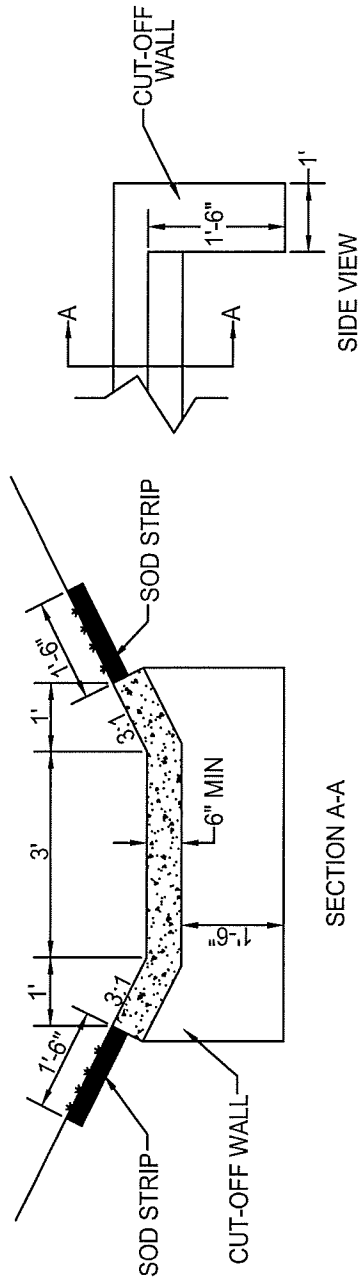
CRADLE DIMENSIONS AND QUANTITIES

D	B	C	H	W	CUBIC YARDS CLASS "C" CONCRETE	
					TWO CUT-OFF WALLS	PER LIN. FT. OF CRADLE
12"	6"	14"	0'11"	11'0"	0.2	0.0476
15"	6"	1'4"	1'0"	2'1"	0.2	0.0580
18"	6"	1'4"	1'2"	2'5"	0.2	0.0801
24"	8"	1'3"	1'4"	2'11"	0.3	0.0924
27"	8"	1'3"	1'5"	3'3"	0.3	0.0144
30"	8"	1'3"	1'6"	3'6"	0.3	0.1181
33"	8"	1'3"	1'7"	3'10"	0.3	0.1325
36"	8"	1'3"	1'8"	4'1"	0.4	0.1462
39"	8"	1'3"	1'9"	4'4"	0.4	0.1606
42"	8"	2'2"	1'11"	4'8"	0.7	0.1768
48"	8"	2'2"	2'1"	5'3"	0.8	0.2110
54"	8"	1'11"	2'4"	5'11"	0.9	0.2972
60"	8"	1'11"	2'9"	6'6"	0.9	0.3398
66"	10"	1'9"	3'0"	7'3"	0.9	0.4468
72"	10"	1'8"	3'2"	7'10"	0.10	0.4980
84"	10"	1'7"	3'6"	8'11"	0.11	0.6126



City Of Beavercreek Standard Construction Drawing PIPE CRADLE & CONCRETE ENCASEMENT

REVISION
HW-D
SECTION
DR-104



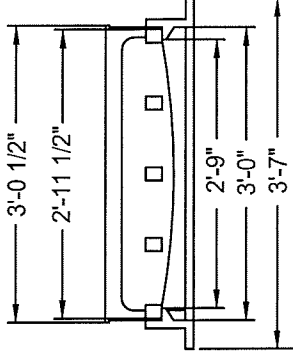
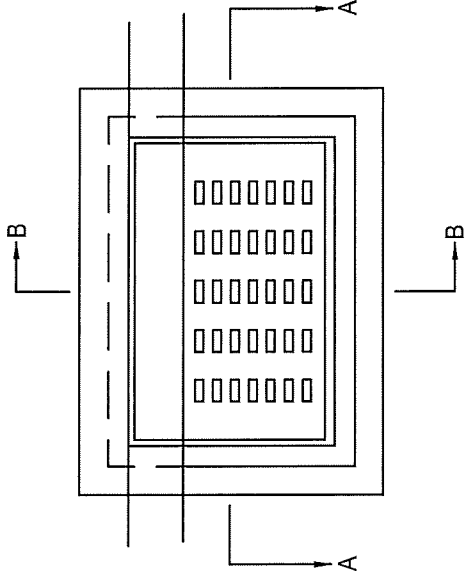
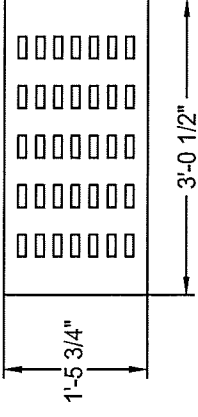
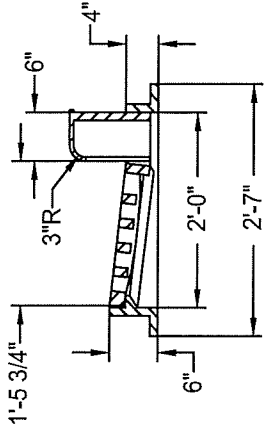
City Of Beavercreek
Standard Construction Drawing
PAVED GUTTER

GENERAL
SECTION
GUTTER
DR-105

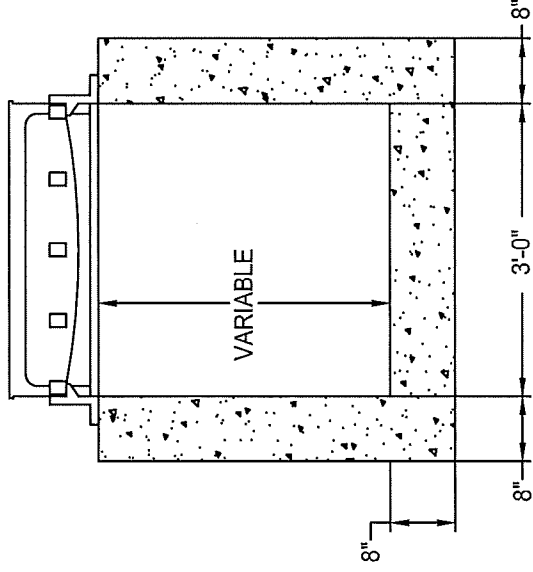
NOTES

1. CASTING SHALL BE NEENAH R-3290, OR ITS APPROVED EQUAL.
2. THE CASTING SHALL BE PAINTED BLACK WITH PORTER PAINT INDUSTRIAL ENAMEL 7-809, OR ITS APPROVED EQUAL.
3. THE BEARING AREA OF THE FRAME AND GRATE SHALL BE SO FITTED AND FINISHED AS TO PROVIDE A FIRM AND EVEN SEAT FOR ALL PORTIONS OF THE GRATE IN THE FRAME. NO PROJECTIONS SHALL EXIST ON THE BEARING AREA.
4. THE CASTING AND GRATE SHALL SEAT WITHOUT ROCKING.
5. THE FRAME AND GRATE SHALL BE FITTED AND MARKED BEFORE DELIVERY TO THE PROJECT SITE.
6. ALL CATCH BASIN BOXES SHALL BE PRECAST CONCRETE, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
7. NEENAH R-3000 ENVIRONOTICE PLATES, APPROVED EQUAL, OR APPROVED CASTING, SHALL BE PROVIDED ON ALL CATCH BASINS.

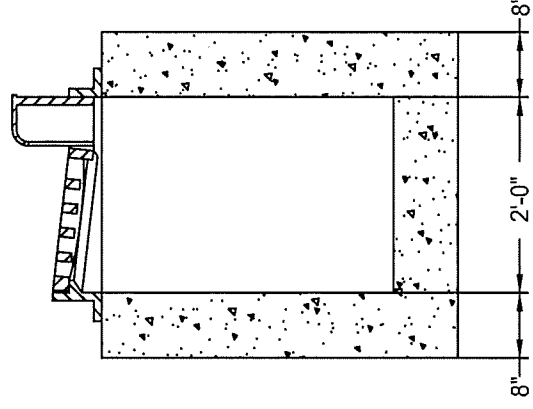
CASTING



CURB BOX
ADJUSTABLE 6" TO 9"



SECTION A-A

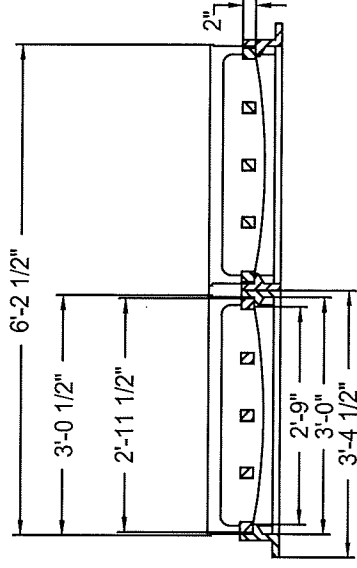
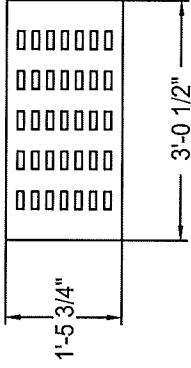
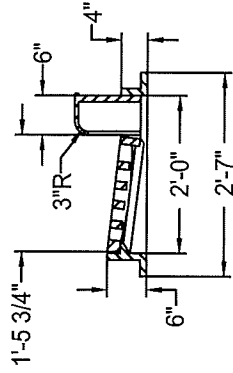


SECTION B-B



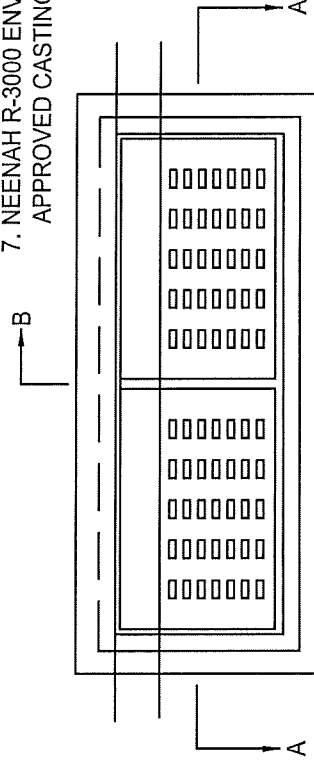
City Of Beavercreek
Standard Construction Drawing
CATCH BASIN TYPE 1

DETAIL CB-1
SECTION DR-106

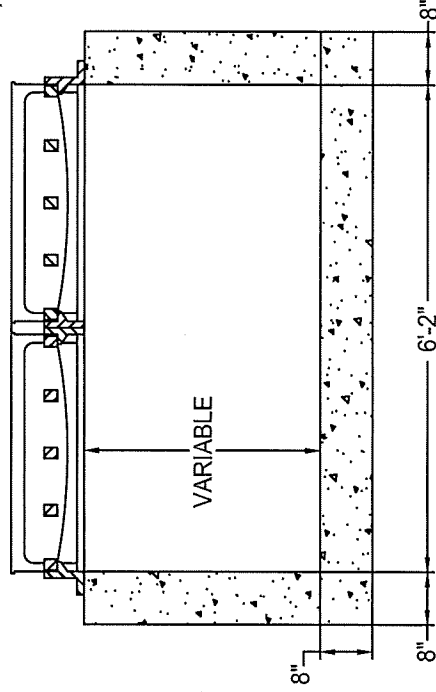


NOTES

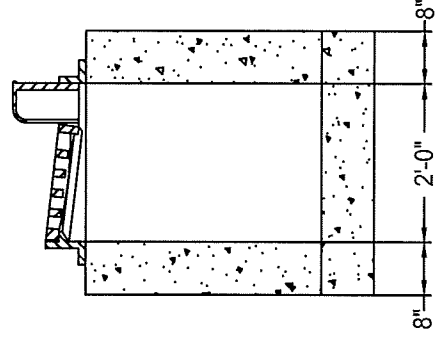
1. CASTING SHALL BE NEENAH R-3295-A, OR ITS APPROVED EQUAL.
2. THE CASTING SHALL BE PAINTED BLACK WITH PORTER PAINT INDUSTRIAL ENAMEL 7-809, OR IT APPROVED EQUAL.
3. THE BEARING AREA OF THE FRAME AND GRATE SHALL BE SO FITTED AND FINISHED AS TO PROVIDE A FIRM AND EVEN SEAT FOR ALL PORTIONS OF THE GRATE IN THE FRAME. NO PROJECTIONS SHALL EXIST ON THE BEARING AREA.
4. THE CASTING AND THE GRATE SHALL SEAT WITHOUT ROCKING.
5. THE FRAME AND GRATE SHALL BE FITTED AND MARKED BEFORE DELIVERY TO THE PROJECT SITE.
6. ALL CATCH BASIN BOXES SHALL BE PRECAST CONCRETE, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
7. NEENAH R-3000 ENVIRONOTICE PLATES, APPROVED EQUAL, OR APPROVED CASTING SHALL BE PROVIDED ON ALL CATCH BASINS.



CURB BOX
ADJUSTABLE 6" TO 9"



SECTION A-A



SECTION B-B



City Of Beaver Creek
Standard Construction Drawing
CATCH BASIN TYPE 2

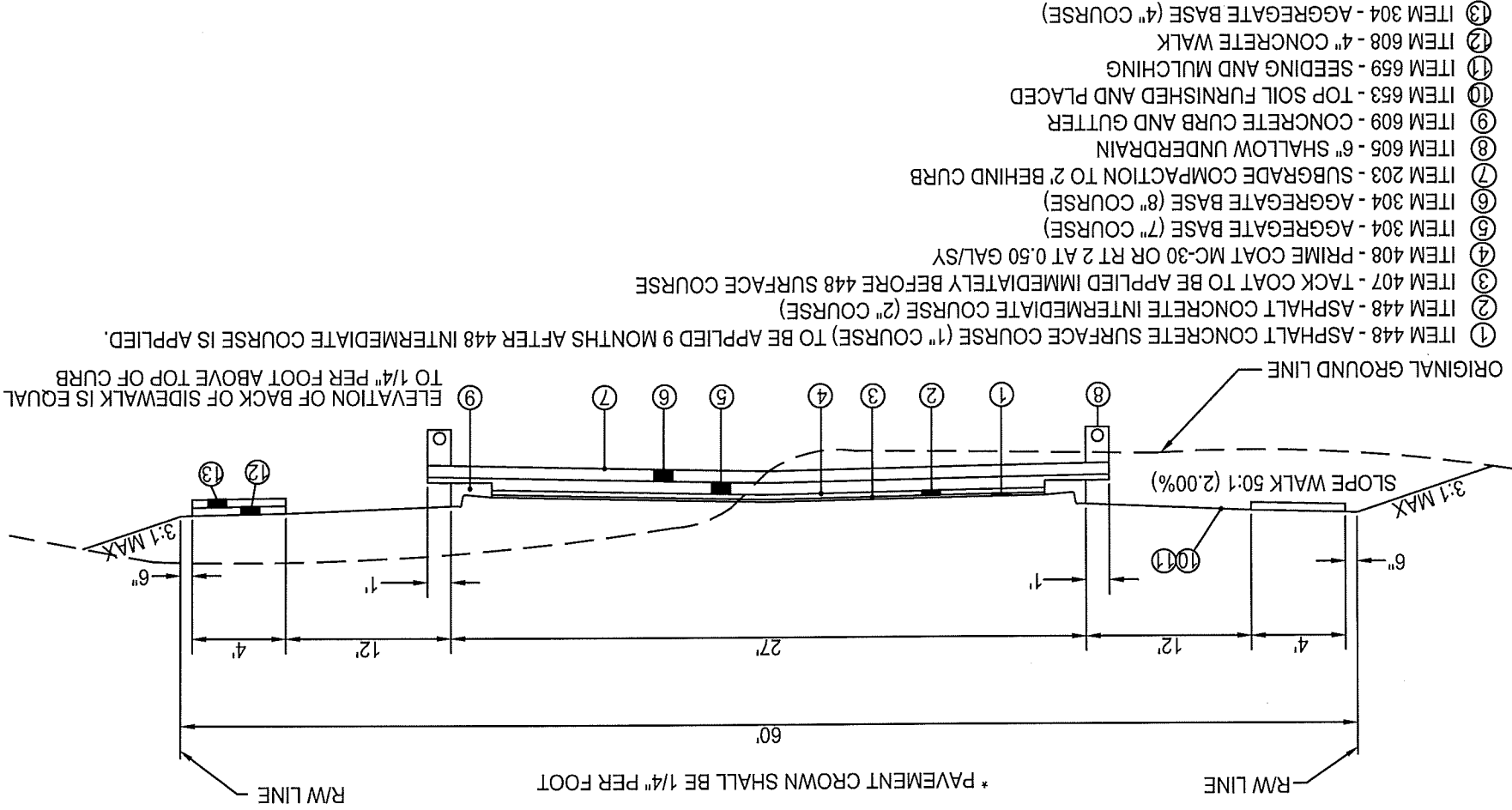
DETAIL CB-2
SECTION DR-107



City Of Beavercreek
LOCAL - RESIDENTIAL STREET

LOCAL
SECTION
RW-100

N-10



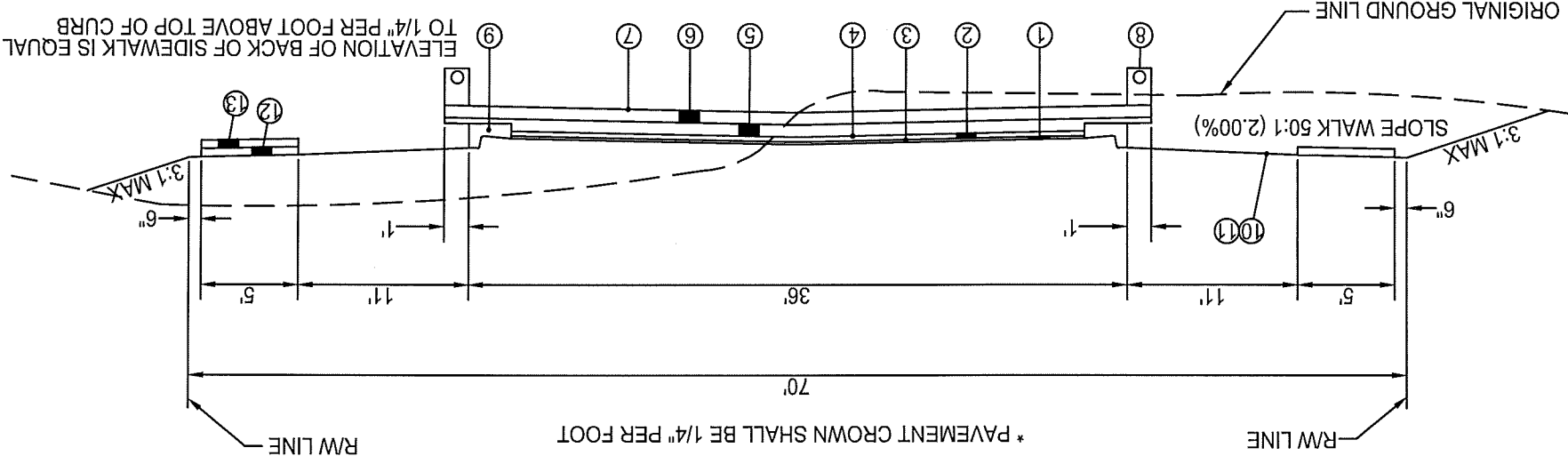
- NOTES:
1. ITEM 448 SURFACE COURSE SHALL NO BE APPLIED UNTIL ITEM 448 INTERMEDIATE COURSE HAS BEEN IN PLACE AT LEAST 9 MONTHS. ANY ITEM 448 INTERMEDIATE COURSE DETERIORATION OR SETTLEMENT THAT HAS DEVELOPED DURING THIS PERIOD SHALL BE REMOVED AND REPLACED BEFORE THE ITEM 448 SURFACE COURSE IS APPLIED.
 2. ALL CONSTRUCTION METHODS AND MATERIALS SHALL BE IN CONFORMANCE WITH THE CURRENT EDITION OF THE STATE OF OHIO, DEPARTMENT OF TRANSPORTATION, CONSTRUCTION AND MATERIAL SPECS.
 3. ALL TRENCHES WITHIN THE RIGHT-OF-WAY MUST BE BACKFILLED WITH COMPACTED GRANULAR MATERIAL.
 4. APPLY A 4" RIBBON OF AC-20 WHERE THE ITEM 448 SURFACE COURSE MEETS THE CURB WITHIN FIVE (5) DAYS AFTER PAVING.
 5. FULL DEPTH ASPHALT AND CONCRETE ROADWAY TYPICAL SECTIONS SHALL BE APPROVED BY THE CITY ENGINEER.



City of *Beaver Creek*
COLLECTOR TYPE STREET

PLAN
COLLECT
SECTION
RW-101

N-11



- ① ITEM 448 - ASPHALT CONCRETE SURFACE COURSE (1\"/>
- ② ITEM 448 - ASPHALT CONCRETE INTERMEDIATE COURSE (2\"/>
- ③ ITEM 407 - TACK COAT TO BE APPLIED IMMEDIATELY BEFORE 448 SURFACE COURSE
- ④ ITEM 408 - PRIME COAT MC-30 OR RT 2 AT 0.50 GAL/SY
- ⑤ ITEM 304 - AGGREGATE BASE (7\"/>
- ⑥ ITEM 304 - AGGREGATE BASE (8\"/>
- ⑦ ITEM 203 - SUBGRADE COMPACTION TO 2\"/>
- ⑧ ITEM 605 - 6\"/>
- ⑨ ITEM 609 - CONCRETE CURB AND GUTTER
- ⑩ ITEM 653 - TOP SOIL FURNISHED AND PLACED
- ⑪ ITEM 659 - SEEDING AND MULCHING
- ⑫ ITEM 608 - 4\"/>
- ⑬ ITEM 304 - AGGREGATE BASE (4\"/>

NOTES:

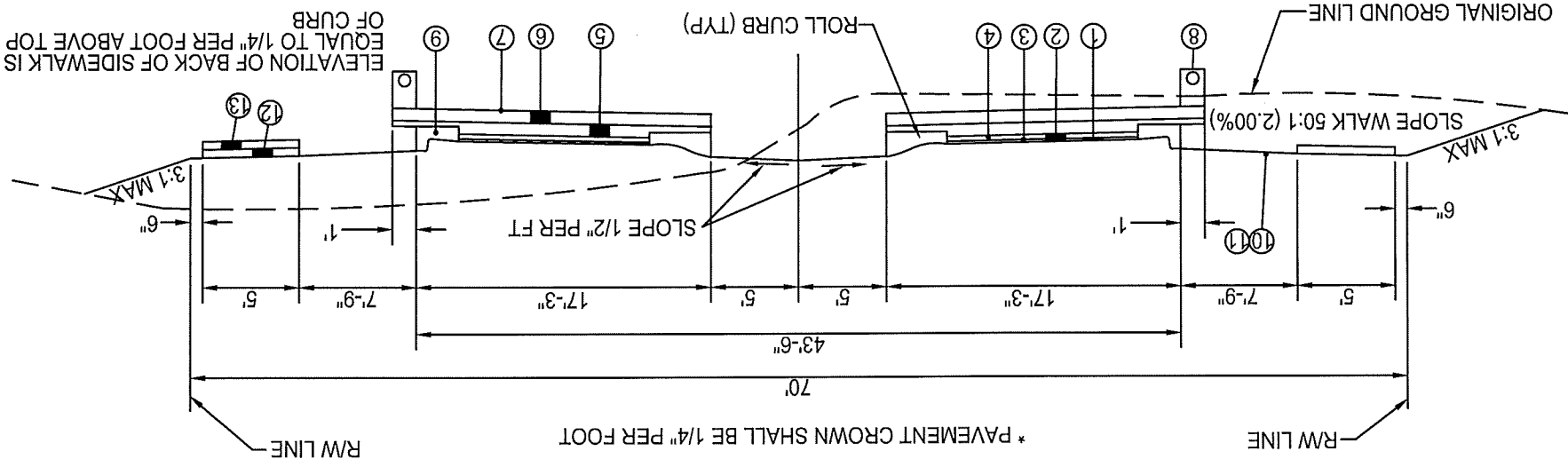
- 1. ITEM 448 SURFACE COURSE SHALL NOT BE APPLIED UNTIL ITEM 448 INTERMEDIATE COURSE HAS BEEN IN PLACE AT LEAST 9 MONTHS. ANY ITEM 448 INTERMEDIATE COURSE DETERIORATION OR SETTLEMENT THAT HAS DEVELOPED DURING THIS PERIOD SHALL BE REMOVED AND REPLACED BEFORE THE ITEM 448 SURFACE COURSE IS APPLIED.
- 2. ALL CONSTRUCTION METHODS AND MATERIALS SHALL BE CONFORMANCE WITH THE CURRENT EDITION OF THE STATE OF OHIO, DEPARTMENT OF TRANSPORTATION, CONSTRUCTION AND MATERIAL SPECS.
- 3. ALL TRENCHES WITHIN THE RIGHT-OF-WAY MUST BE BACKFILLED WITH COMPACTED GRANULAR MATERIAL.
- 4. APPLY A 4\"/>
- 5. FULL DEPTH ASPHALT AND CONCRETE ROADWAY TYPICAL SECTIONS SHALL BE APPROVED BY THE CITY ENGINEER.



City Of Beaver Creek
BOULEVARD STREET

BLVD
SECTION
RW-102

N-12



- ① ITEM 448 - ASPHALT CONCRETE SURFACE COURSE (1\"/>
- ② ITEM 448 - ASPHALT CONCRETE INTERMEDIATE COURSE (2\"/>
- ③ ITEM 407 - TACK COAT TO BE APPLIED IMMEDIATELY BEFORE 448 SURFACE COURSE
- ④ ITEM 408 - PRIME COAT MC-30 OR RT 2 AT 0.50 GAL/SY
- ⑤ ITEM 304 - AGGREGATE BASE (7\"/>
- ⑥ ITEM 304 - AGGREGATE BASE (8\"/>
- ⑦ ITEM 203 - SUBGRADE COMPACTION TO 2' BEHIND CURB
- ⑧ ITEM 605 - 6\"/>
- ⑨ ITEM 609 - CONCRETE CURB AND GUTTER
- ⑩ ITEM 653 - TOP SOIL FURNISHED AND PLACED
- ⑪ ITEM 659 - SEEDING AND MULCHING
- ⑫ ITEM 608 - 4\"/>
- ⑬ ITEM 304 - AGGREGATE BASE (4\"/>

NOTES:

- 1. ITEM 448 SURFACE COURSE SHALL NOT BE APPLIED UNTIL ITEM 448 INTERMEDIATE COURSE HAS BEEN IN PLACE AT LEAST 9 MONTHS. ANY ITEM 448 INTERMEDIATE COURSE DETERIORATION OR SETTLEMENT THAT HAS DEVELOPED DURING THIS PERIOD SHALL BE REMOVED AND REPLACED BEFORE THE ITEM 448 SURFACE COURSE IS APPLIED.
- 2. ALL CONSTRUCTION METHODS AND MATERIALS SHALL BE IN CONFORMANCE WITH THE CURRENT EDITION OF THE STATE OF OHIO, DEPARTMENT OF TRANSPORTATION, CONSTRUCTION AND MATERIAL SPECS.
- 3. ALL TRENCHES WITHIN THE RIGHT-OF-WAY MUST BE BACKFILLED WITH COMPACTED GRANULAR MATERIAL.
- 4. APPLY A 4\"/>
- 5. FILL DEPTH ASPHALT AND CONCRETE ROADWAY TYPICAL SECTIONS SHALL BE APPROVED BY THE CITY ENGINEER.

GENERAL: This drawing shows curb ramp types, details, and placement examples for curb ramp construction, including the installation of detectable warnings.

Curb ramp types are shown on Sheet 2 and include Perpendicular, Parallel, and Combined types as specified to be constructed in the locations shown on the project plans.

Curb ramps added to an existing intersection or walk should be individually detailed on the project plans to assure that the design is appropriate for site constraints and all items can be constructed to ADA standards. The contractor may adjust placement of curb ramps if existing field conditions warrant with the approval of the Engineer.

DETECTABLE WARNINGS: Install Detectable Warnings on each curb ramp with approved materials, as shown on Sheet 3. Install these proprietary products as per manufacturer's written instructions.

DRAINAGE: Contractor is to ensure the base of each constructed curb ramp allows for proper drainage, without exceeding allowable cross slope or ramp slopes. Vertical change in level exceeding 1/4" between the 1) pavement and gutter, and 2) gutter and ramp, are not allowed.

SURFACE TEXTURE: Texture concrete surfaces by course brooming transverse to the ramp slopes to be rougher than the adjacent walk.

JOINTS: Provide expansion joints in the curb ramp as extensions of walk joints and consistent with Item 608.03 requirements for new concrete walks. Lines shown on this drawing indicate the ramp edges and slope changes, and do not necessarily indicate joint lines.

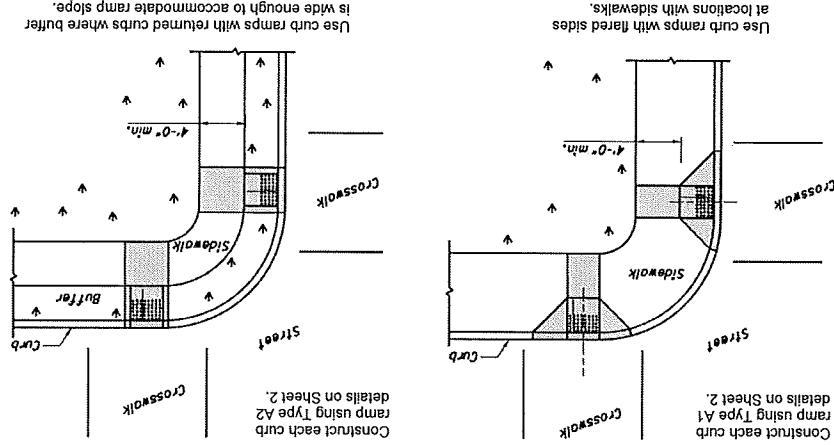
PAYMENT: Measure and pay for the ramp area within the shaded limits of this drawing as Item 608 Curb Ramp, Square Foot. This includes the cost of the ramp curbing, detectable warnings, landing areas, and any additional materials, installation, grading, forming, and finishing required within the shaded area.

Work beyond the shaded ramp/landing area is paid as curb (609) and walk (608). Removal of existing curb, walk for existing curb ramps are paid under Item 202.

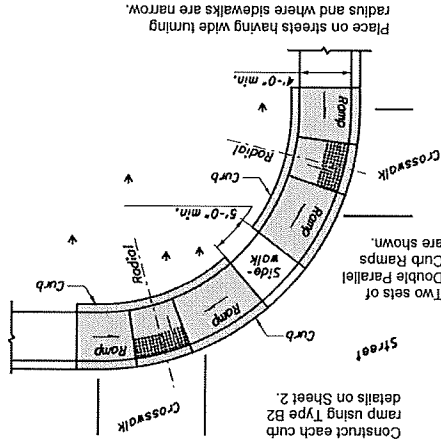
For at-grade crossing locations where only detectable warnings are required in order to achieve ADA compliance, measure and pay for the strip of detectable warnings as Item 608 Detectable Warning, Square Foot. The work to cast the tiles in place will also require removal of existing pavement (Item 202) to the nearest joint, or if no joint exists, a minimum of 4 feet.

NOTES

PERPENDICULAR CURB RAMP

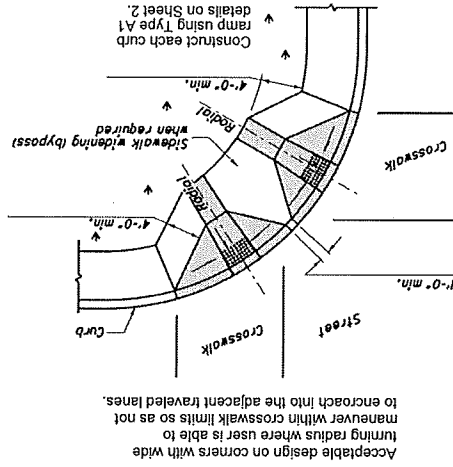


PARALLEL CURB RAMP

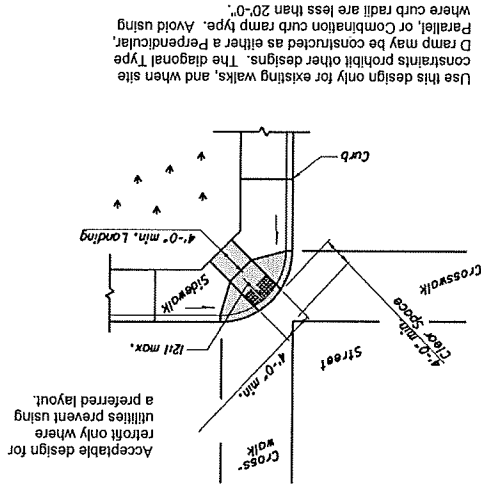


PREFERRED CONSTRUCTION PLACEMENT

PERPENDICULAR RAMP



DIAGONAL RAMP (Type D)



ACCEPTABLE CONSTRUCTION PLACEMENT

The running slope of the map is preferred to be 12:1 or flatter. In existing sidewalks or vaults, right-of-way limits), it may be reduced as follows:

A) 10:1 for a max. rise of 6",
B) 8:1 for a max rise of 3",
C) 6:1 over a max. run of 2'-0" for historic areas where a flatter slope is not feasible. To prevent chasing the grade indefinitely, the transition from existing sidewalk to the shaded curb ramp area is not required to exceed 15 feet in length.

While the ramps may be skewed to the crosswalk, the entire lower landing area must fall within the crosswalk, the ramp serves and cannot be located in the traveled lane of opposing traffic.

The counter slope of the gutter or street at the foot of a curb ramp, landing, or blended transitions shall be 20:1 or flatter.

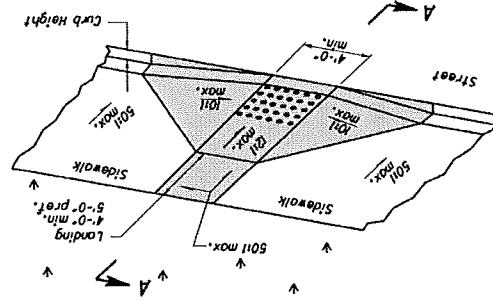
The bottom edge of the ramp shall change planes perpendicular to the landing.

The edge of the curb shall be flush with the edge of the adjacent pavement and gutter. Surface slopes that meet grade breaks shall also be flush.

Ramp landings shall be 4' min. x 4' min. with a 50:1 or flatter cross slope and running slope.

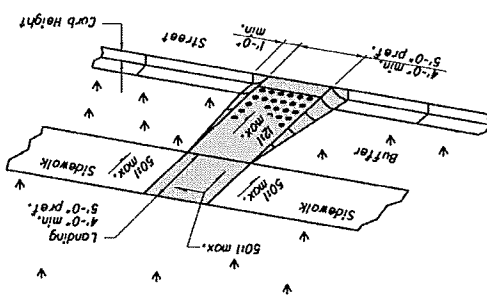
NOTES

See Sheet 3 for Sections.

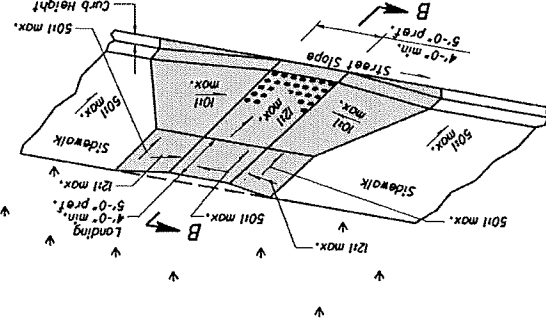


Type A1 (Perpendicular with flared sides)

PERPENDICULAR CURB RAMP DETAILS

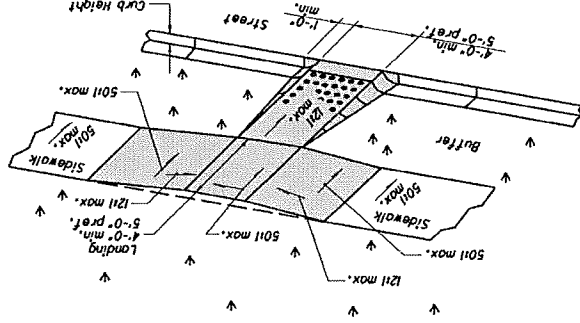


Type A2 (Perpendicular with returned curb)

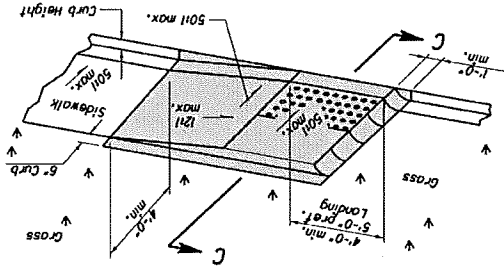


Type C1 (Combined with flared sides)

COMBINED CURB RAMP DETAILS

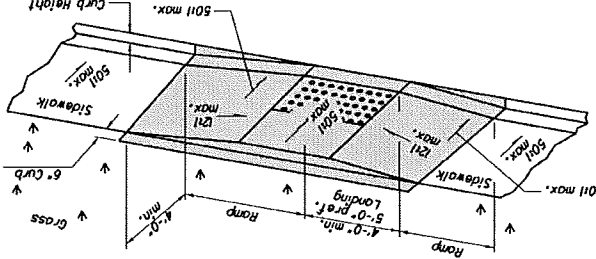


Type C2 (Combined with returned curb)

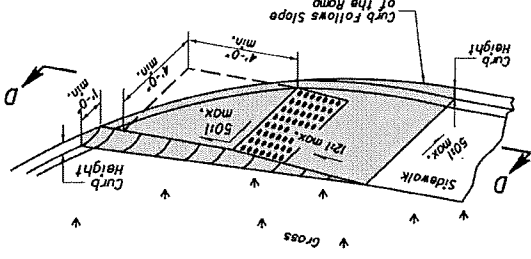


Type B1 (Single sided Parallel)

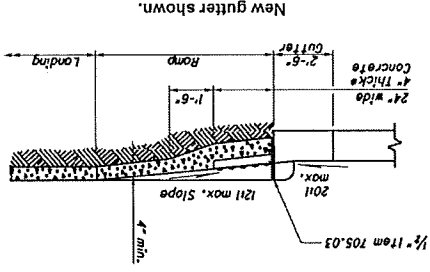
PARALLEL CURB RAMP DETAILS



Type B2 (Double sided Parallel)

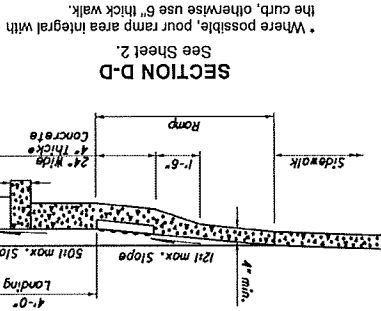


Type B3 (Single sided Parallel)



SECTION A-A
NORMAL DETAIL

See Sheet 2.



SECTION D-D

See Sheet 2.

DETECTABLE WARNING NOTES

GENERAL: Detectable warnings are a distinctive surface pattern of truncated domes which are detectable by cane or underfoot to alert people with vision impairments of their approach to streets and hazardous drop-offs.

PLACEMENT: Detectable warnings are to be installed at any location where pedestrians might cross paths with vehicular traffic lanes, such as the base of curb ramps or at blended curbs. A 24" strip of domes is to be installed for the full width of the ramp or walk. Typical street corner placement locations are shown on Sheet 1.

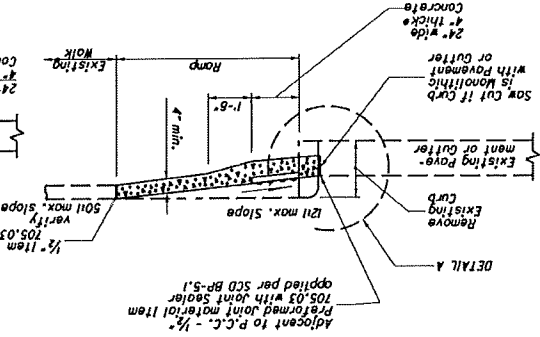
The depth of concrete underneath detectable warning products shall be a minimum of 4". See DETAIL A.

ALIGNMENT: Truncated domes should be aligned with the primary direction of the ramp as shown on the DETECTABLE ALIGNMENT DETAIL. Normally, the detectable warnings should be flush with the back of curb, but in sheaved conditions at least one corner of the 24" strip should be adjacent to the back of curb. For non-standard layouts, detectable warning materials may have to be mitered and placed segmentally.

PRODUCTS & COLORS: Color of the detectable warnings should contrast with surrounding concrete walk and ramp. Black is not an acceptable color. Approved products as per manufacturer's Service's Detectable Warnings Approved List. Install products as per manufacturer's printed instructions.

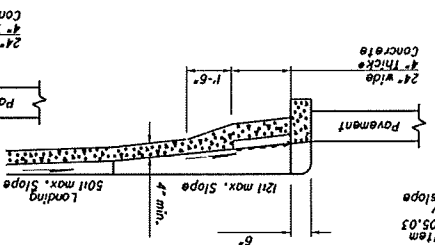
SECTION D-D
EXISTING WALK DETAIL

See Sheet 2.



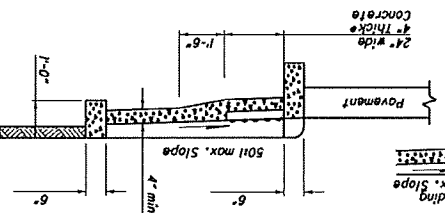
SECTION B-B

See Sheet 2.

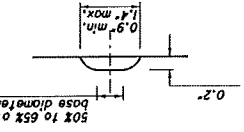
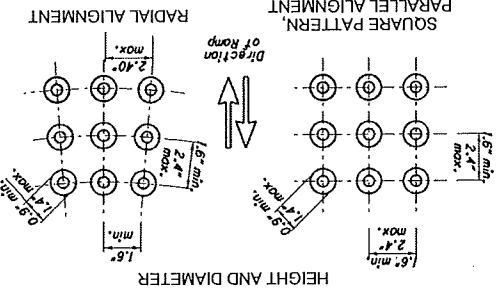


SECTION C-C

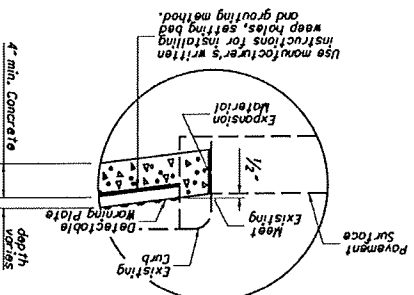
See Sheet 2.



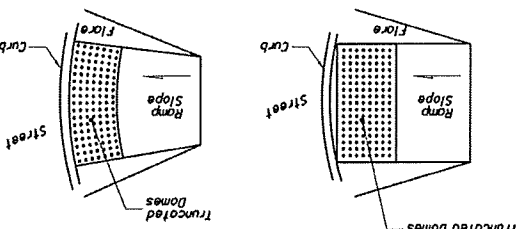
TRUNCATED DOMES DETAILS



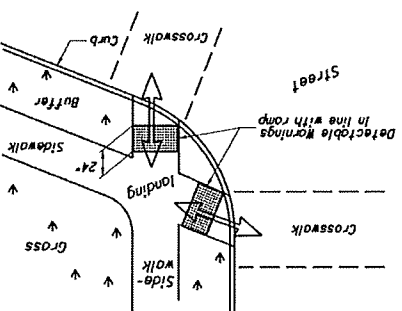
DETAIL A

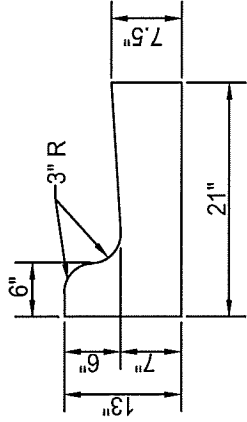


DOMES ALIGNMENT ON RADUSED CURB

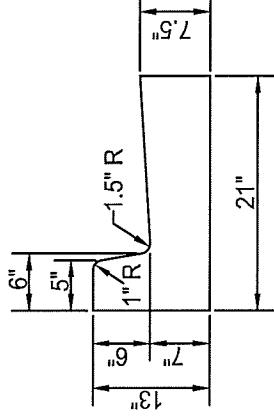


DETECTABLE WARNING ALIGNMENT

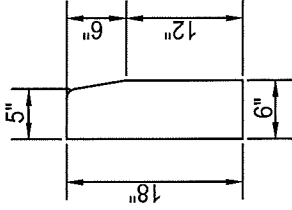




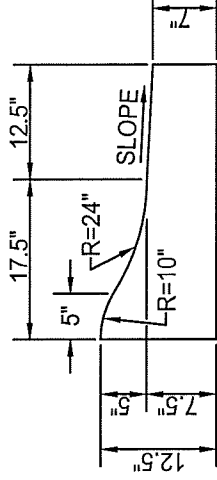
3" RADIUS CURB & GUTTER



1" RADIUS CURB & GUTTER



BARRIER CURB



ROLL CURB AND GUTTER

NOTE: ROLL CURB & GUTTER MAY ONLY BE USED FOR BOULEVARD MEDIANS.

1. ANY VARIANCES FROM THESE STANDARDS REQUIRES APPROVAL BY THE CITY ENGINEER.
2. THE USE OF EXTRUDED CURB IS PROHIBITED.
3. ALL CURB SHALL HAVE JOINTS AT A MAXIMUM OF EVERY 7 FEET.
4. CRUSHED AGGREGATE SHALL BE PLACED UNDER THE CURB WHEN DETERMINED NECESSARY BY THE ENGINEER.
5. ONE-HALF INCH VINYL EXPANSION JOINT MATERIAL, OR OTHER APPROVED EXPANSION JOINT MATERIAL SHALL BE USED WITH COMBINED CURB AND GUTTER AND BARRIER CURBS AS FOLLOWS:
 - EACH SIDE OF DEPRESSED CURB
 - AT P.C. POINTS AND MEDIAN RADII
 - AT EACH SIDE OF DRIVE APPROACH AND CATCH BASINS
 - MAXIMUM SPACING SHALL NOT EXCEED 50 FEET
 - THE MATERIAL SHALL BE PLACED STRAIGHT AND SQUARE THROUGHOUT THE ENTIRE CURB SECTION
6. ALL CURBS SHALL BE BACKFILLED PRIOR TO PAVING AND/OR BEFORE THEY ARE TO SUPPORT ANY VEHICULAR TRAFFIC.
7. DRAIN TILE THROUGH THE CURB SHALL BE INSTALLED ONLY WHEN APPROVED BY THE ENGINEER. DRAIN TILE THROUGH CURB SHALL HAVE A MIN. OF 3" OF COVER. UNLESS APPROVED BY THE ENGINEER, A DUMMY JOINT SHALL BE PLACED OVER THE OPENING AND THE GUTTER PANEL.
8. ALL CONCRETE SHALL BE ODOT CLASS "C".

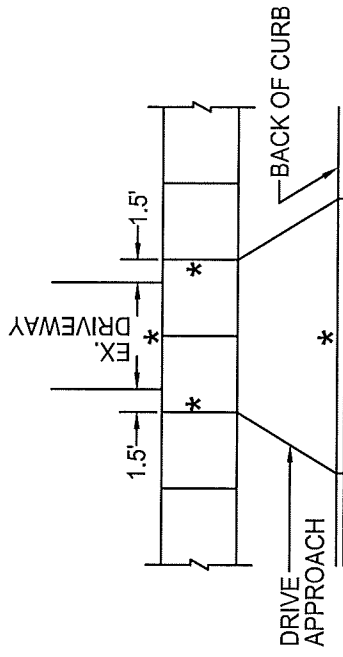
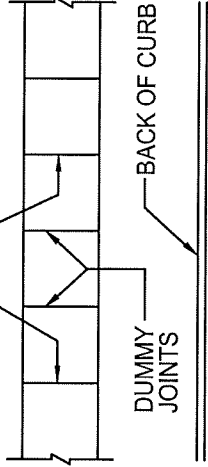


City Of Beavercreek
Standard Construction Drawing
CURB & GUTTER DETAILS

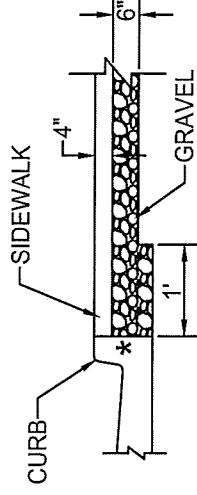
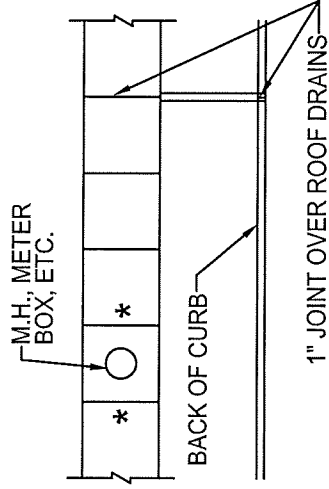
SECTION
 CURB
 RW-104

GROOVES 1" DEEP EVERY
15' FINISHED WITH A
RADIUS OF 3/8"

JOINT SPACING = 5'



* 1/2" VINYL EXPANSION JOINT MATERIAL



(TO BE USED WHERE CURB & SIDEWALK ARE ADJOINING)

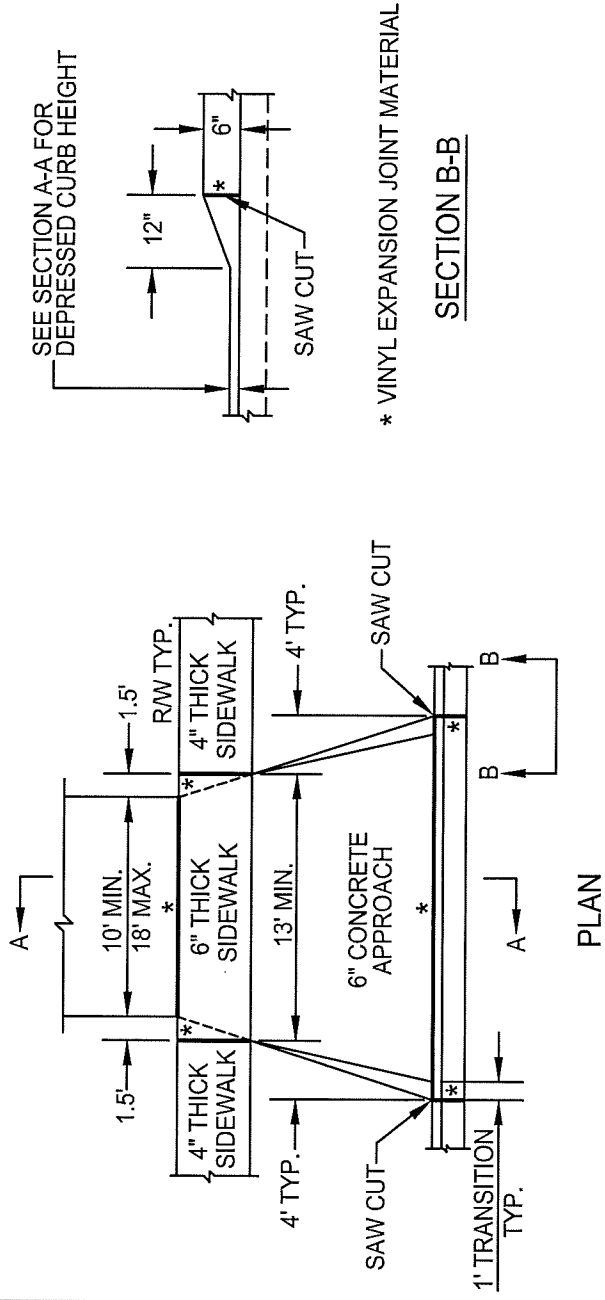
1. SIDEWALKS SHALL BE 4 FEET WIDE ON LOCAL STREETS AND 5 FEET WIDE ON ALL OTHER STREETS, OR WIDTH AS DETERMINED BY THE CITY ENGINEER.
2. SIDEWALK SHALL BE 4" THICK EXCEPT THRU DRIVEWAYS, WHICH SHALL BE 6" THICK.
3. VINYL EXPANSION JOINT MATERIAL SHALL BE PLACED AS SHOWN, WITH A MINIMUM SPACING OF 100' OR AS DIRECTED BY THE ENGINEER.
4. 4" GRAVEL BASE SHALL BE PLACED UNDER SIDEWALKS, OR AS APPROVED BY THE ENGINEER.
5. ALL CONCRETE SHALL BE ODOT CLASS "C".
6. PROVIDE A BROOM FINISH TO ALL EXPOSED SURFACES.
7. PROVIDE A MINIMUM OF 2" EDGING AROUND ALL EXPOSED SURFACES.
8. SIDEWALKS SHALL BE SLOPED AT 50:1 (2.00%) TOWARD THE STREET, OR AS APPROVED BY THE ENGINEER.



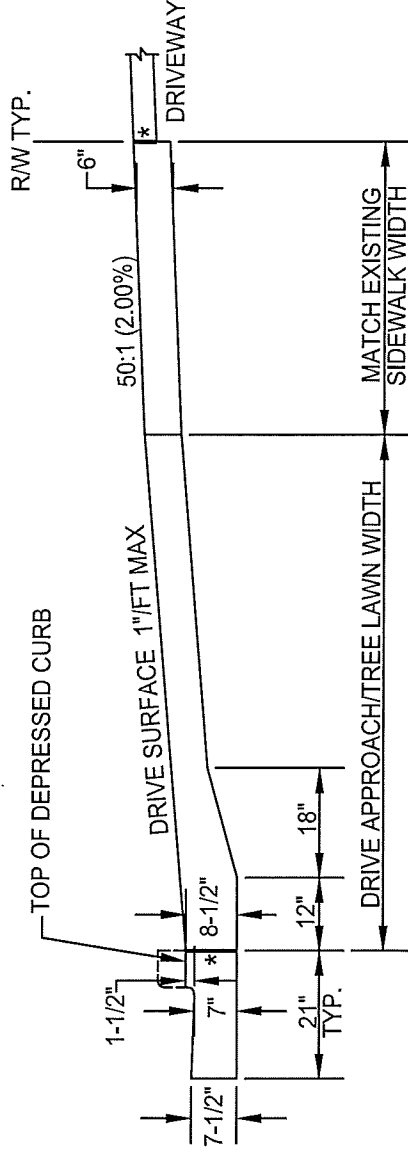
City Of Beavercreek
Standard Construction Drawing
CONCRETE SIDEWALK DETAIL

DATE
WALK
REVISION
RW-105

DRIVE APPROACH DETAILS



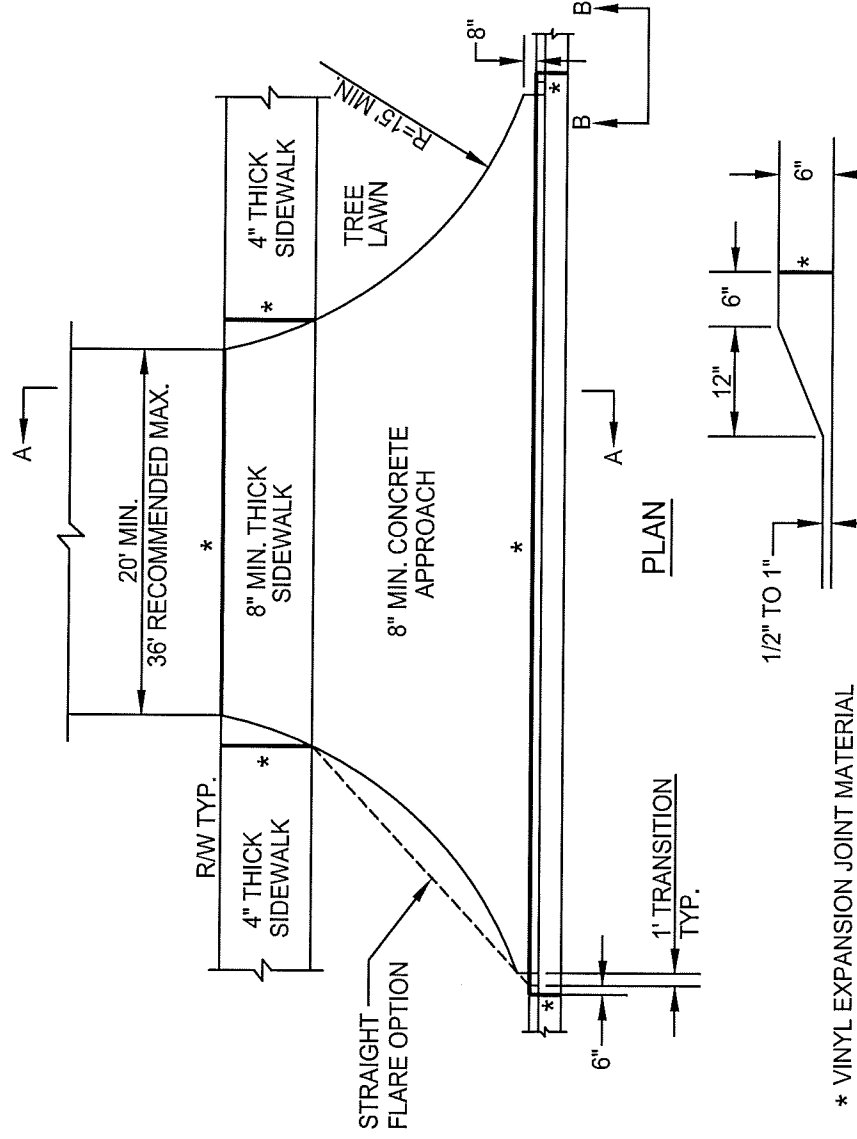
PLAN



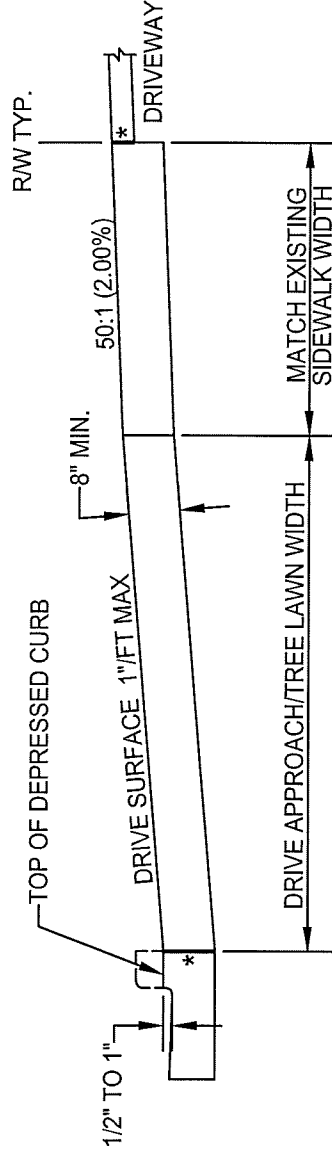
SECTION A-A

NOTES

1. MAXIMUM JOINT SPACING SHALL BE 12 FEET LONGITUDINALLY AND TRANSVERSELY.
2. THE FLARE ON RESIDENTIAL DRIVE APPROACHES SHALL BE A MINIMUM OF 4 FEET/ ON RESIDENTIAL STREETS WHERE THE TREE LAWN IS LESS THAN 4 FEET, THE FLARE SHALL BE AT A 45° ANGLE. ON ALL OTHER STREETS (I.E. NON-RESIDENTIAL) WHERE THE TREE LAWN IS LESS THAN 8 FEET, THE FLARE SHALL BE A 45 ° ANGLE. IF THE TREE LAWN IS GREATER THAN 8 FEET, THE FLARE SHALL BE AT THE DISCRETION OF THE ENGINEER.
3. 3" OF GRAVEL SHALL BE PLACED UNDER DRIVE APPROACHES IF DETERMINED NECESSARY BY THE ENGINEER.
4. ALL CONCRETE SHALL BE ODOT CLASS "C". THE CONTRACTOR SHALL PROVIDE A BROOM FINISH AND EDGING TO ALL EXPOSED SURFACES.
5. WHERE ASPHALT CONCRETE PAVEMENT IS DISTURBED, THE ASPHALT SHALL HAVE A SAWED EDGE, BE REPLACED AND SEALED AS DIRECTED BY THE ENGINEER.
6. SAW CUT CURBS AT BOTH ENDS. SAW CUT SHALL HAVE CLEAN AND STRAIGHT EDGES, AND SHALL BE THE FULL DEPTH OF THE CURB. HORIZONTAL CURB SAW CUTS TO PRODUCE DROP CURB IS PROHIBITED.
7. VINYL EXPANSION JOINT MATERIAL SHALL BE PLACED AS SHOWN.



SECTION B-B



SECTION A-A

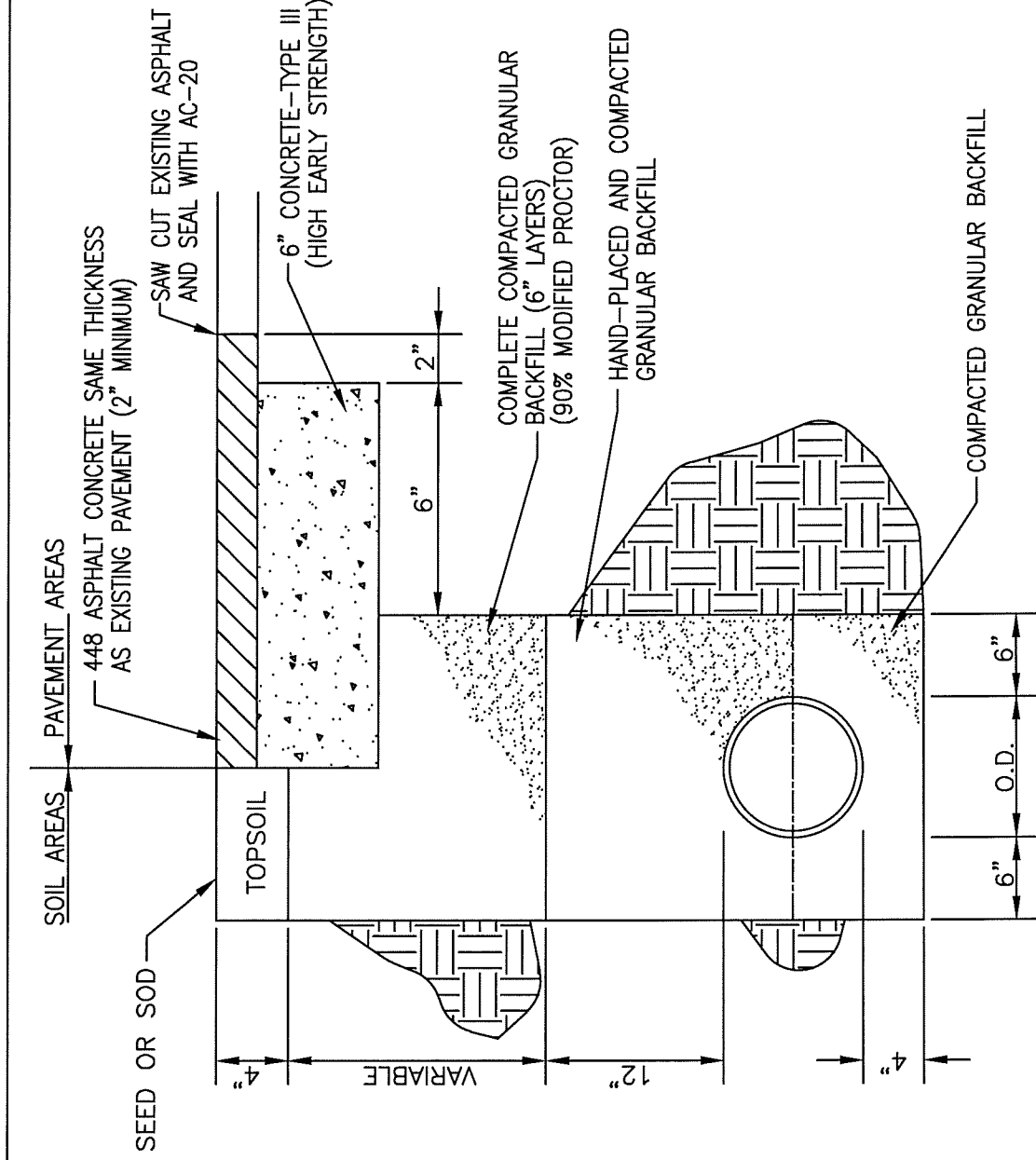
NOTES

1. MAXIMUM JOINT SPACING SHALL BE 12 FEET LONGITUDINALLY AND TRANSVERSELY.
2. 3" OF GRAVEL SHALL BE PLACED UNDER DRIVE APPROACHES IF DETERMINED NECESSARY BY THE ENGINEER.
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6. VINYL EXPANSION JOINT MATERIAL SHALL BE PLACED AS SHOWN.



City Of Beaver Creek
Standard Construction Drawing
COMMERCIAL SERVICE DRIVE APPROACH

DRIVE
RW-107



NOTE: IN THE PAVEMENT AREAS, THE 448 ASPHALT CONCRETE SHALL BE PLACED THE SAME DAY THE CONCRETE IS POURED. IF THE CONTRACTOR IS UNABLE TO COMPLETE THE RESTORATION THE SAME DAY, TEMPORARY MEANS SHALL BE USED TO OPEN THE ROAD TO TRAFFIC (TEMPORARY PATCH GRAVEL, STEEL PLATES, ETC.). THE CONTRACTOR WILL ASSUME RESPONSIBILITY FOR MAINTAINING THE TEMPORARY PATCH UNTIL THE FINAL 448 ASPHALT IS IN PLACE.

GENERAL NOTES:

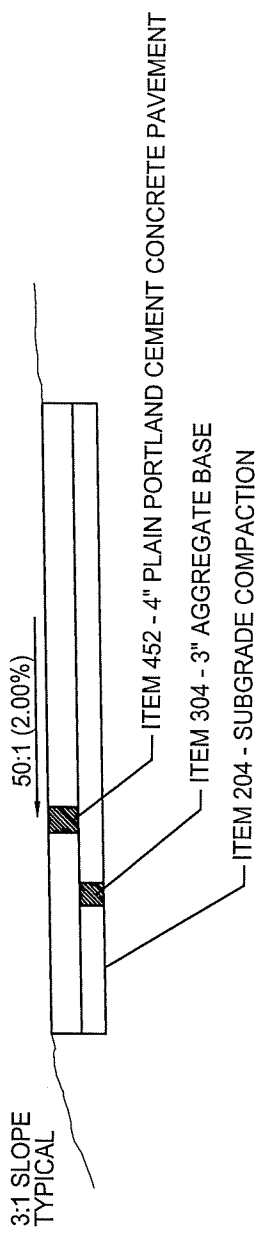
1. A STREET CUT PERMIT SHALL BE OBTAINED FROM THE CITY OF BEAVERCREEK DEPARTMENT OF ENGINEERING & INSPECTION PRIOR TO OPENING OF A CITY ROADWAY.
2. TRAFFIC SHALL BE MAINTAINED AT ALL TIMES. ALL TRAFFIC CONTROL DEVICES SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE OHIO MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES.
3. CLOSING OF A CITY ROAD REQUIRES THE APPROVAL OF THE CITY ENGINEER. REQUESTS FOR CLOSING SHALL BE MADE IN WRITING AND SUBMITTED TO THE CITY ENGINEER TWO (2) WEEKS PRIOR TO THE CLOSING.
4. THE CITY OF BEAVERCREEK SHALL INSPECT THE OPEN TRENCH PRIOR TO BACKFILLING.
5. ALL BACKFILL MATERIAL SHALL BE COMPACTED IN UNIFORM LAYERS TO INSURE AGAINST SETTLEMENT.
6. ITEM 407-TACK COAT SHALL BE PLACED ON THE CONCRETE SURFACE AT THE RATE OF 0.1 GAL/SY PRIOR TO THE PLACING OF THE 448 ASPHALT CONCRETE.
7. ALL JOINTS SHALL BE SEALED WITH AN AC-20 SEAL OR APPROVED EQUAL.
8. UPON COMPLETION OF THE JOB, THE AREA SHALL BE CLEANED OF ALL DIRT, MUD AND DEBRIS.
9. ON ALL THOROUGHFARES, HIGH EARLY CONCRETE MAY BE USED WITH CITY ENGINEER APPROVAL.
10. LOW STRENGTH MORTAL BACKFILL (PER ODOT SPEC 613) SHALL BE USED AS DIRECTED ON THOROUGHFARES & ARTERIALS, UNLESS WAIVED BY THE ENGINEER.



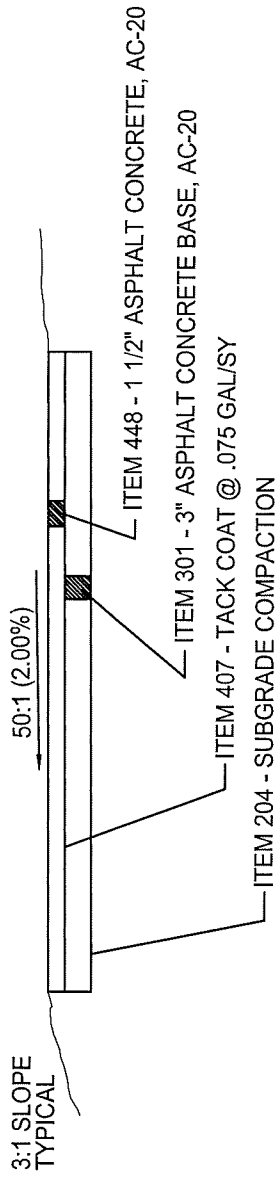
City Of Beaver Creek
Standard Construction Drawing
TRENCH RESTORATION

TRENCH
SECTION
RW-108

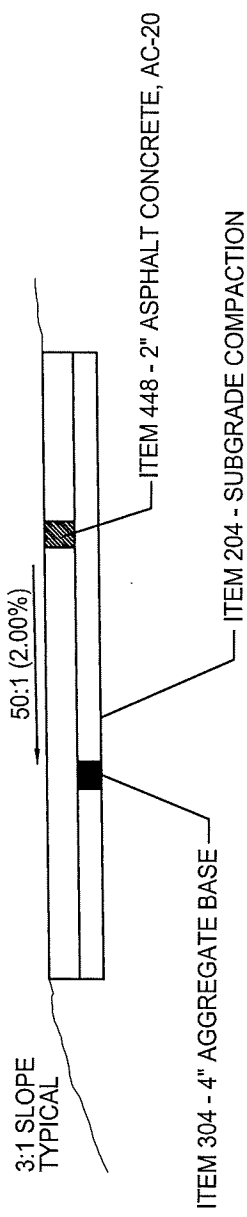
CONCRETE PAVEMENT



ASPHALT PAVEMENT WITH BITUMINOUS AGGREGATE BASE



ASPHALT PAVEMENT ON COMPACTED SUBGRADE



NOTE
MINIMUM SIDEPATH WIDTH IS 8'



City Of Beaver Creek
Standard Construction Drawing
SIDEPATH TYPICAL SECTIONS

BEAVER CREEK
CONSTRUCTION
BIKE
RW-109

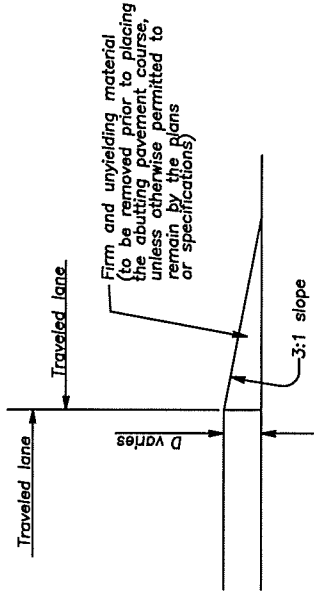
GENERAL NOTES

1. IT IS INTENDED THAT THIS DRAWING BE USED FOR TREATMENT OF DROP-OFFS THAT DEVELOP DURING CONSTRUCTION OPERATIONS, AND THAT ARE NOT OTHERWISE PROVIDED FOR IN THE CONSTRUCTION PLANS. WHERE THE PLANS DO NOT PROVIDE SPECIFIC ITEMS FOR LABOR, EQUIPMENT, OR MATERIALS TO IMPLEMENT THE DROP-OFF TREATMENTS SPECIFIED HEREON, THEY SHALL BE INCLUDED FOR PAYMENT IN THE LUMPS SUM BID FOR ITEM 614 - MAINTAINING TRAFFIC.
2. WHILE THE NEED FOR CERTAIN ADVISORY SIGNING IS NOTED HEREON, IT IS NOT INTENDED THAT THIS BE INDICATIVE OF ALL SIGNING THAT MAY BE REQUIRED TO ADVISE OR WARN MOTORISTS, AND ALL REQUIREMENTS OF THE OHIO MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (OMUTCD) MUST BE FULFILLED.
3. IN URBAN OR OTHERWISE HEAVILY DEVELOPED AREAS ARE WHERE PEDESTRIANS AND/OR BICYCLISTS MAY BE PRESENT IN SIGNIFICANT NUMBERS, ADDITIONAL SIGNING AND PROTECTIVE MEASURES OTHER THAN THOSE SHOWN HEREON MAY BE REQUIRED.
4. THE DROP-OFF TREATMENT SELECTED FOR USE AT ANY GIVEN LOCATION SHALL BE AS APPROPRIATE FOR THE PREVAILING CONDITIONS AT THE SITE.
5. WHERE CONCRETE BARRIER IS SPECIFIED, IT SHALL BE IN ACCORDANCE WITH STANDARD CONSTRUCTION DRAWING RW-4.2 AND ITEM 622.
6. WHEN DRUMS ARE SPECIFIED FOR A DROP-OFF CONDITION, A MINIMUM NUMBER OF FOUR DRUMS SHALL BE USED. SPACING SHALL BE AS INDICATED IN THE PLANS OF AS SPECIFIED IN THE OMUTCD.
7. WHEN WB-9 (LOW SHOULDER) SIGNS OR WB-11 (UNEVEN LANES) SIGNS ARE REQUIRED, THEY SHALL BE PLACED 750' IN ADVANCE OF THE CONDITION, ON ALL INTERSECTING ENTRANCE RAMPS WITHIN THE LIMITS OF THE CONDITION AND IMMEDIATELY BEYOND ALL INTERSECTING ROADWAYS WITHIN THE LIMITS OF THE CONDITION. WHEN THE DROP-OFF CONDITION EXTENDS MORE THAN ONE-HALF MILE, ADDITIONAL SIGNS SHOULD BE ERCTED AT INTERVALS OF ONE MILE OR LESS.
8. FOR LOCATIONS, SUCH AS RAMPS, LANE SHIFTS, LANE CLOSURES, ETC., WHERE TRAFFIC IS REQUIRED TO NEGOTIATE ANY DIFFERENCE IN ELEVATION BETWEEN PAVEMENTS, A 3:1 SLOPE TREATMENT SIMILAR TO THE OPTIONAL WEDGE TREATMENT SHALL BE PROVIDED.
9. PORTABLE CONCRETE BARRIER SHALL BE PLACED ON THE SAME LEVEL AS THE TRAFFIC SURFACE AND SHALL NOT ENCROACH ON LANE WIDTH(S) DESIGNED AS THE MINIMUM REQUIRED FOR TRAFFIC USE. WHERE DRUMS ARE USED, AND THEIR PRESENCE WOULD REDUCE TRAVELED LANE WIDTHS TO LESS THAN 10', DRUMS MAY BE PLACED ON THE OPPOSITE LEVEL FROM THAT OF TRAFFIC PROVIDED THE DROP-OFF DEPTH DOES NOT EXCEED 5" AND APPROVAL IS GRANTED BY THE PROJECT ENGINEER.
10. PAVEMENT REPAIRS (OR SIMILAR WORK):
 - A. LENGTHS GREATER THAN 60 FEET - UTILIZE APPROPRIATE TREATMENT FROM CONDITION 1.
 - B. LENGTHS OF 60 FEET OR LESS - REPAIRS SHALL BE EFFECTED IN ACCORDANCE WITH ITEM 253. DRUMS MAY BE USED AS A SEPARATOR ADJACENT TO THE TRAVELED LANE

OPTIONAL WEDGE TREATMENT

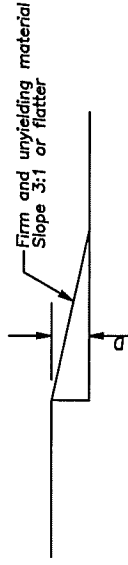
(MILLING OR RESURFACING)

1. THIS TREATMENT MAY BE USED WHEN PERMITTED FOR CONDITION 1 ONLY.
2. WB-11 SIGNS ARE REQUIRED.



OPTIONAL SHOULDER TREATMENT

1. THIS TREATMENT MAY NOT BE USED WITHIN A BITUMINOUS SHOULDER WHERE A HOT LONGITUDINAL JOINT PER 401.15 IS REQUIRED.
2. WB-9 SIGNS REQUIRED.



City Of Beavercreek
Standard Construction Drawing
DROPOFFS IN WORK ZONE

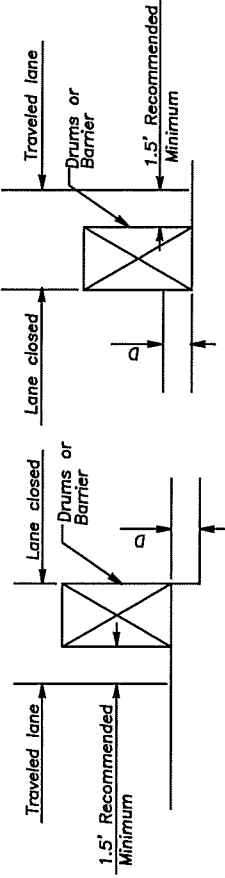
REVISION
1 OF 3
SECTION
RW-110A

CONDITION I DROP-OFFS BETWEEN TRAVELED LANES

- THESE TREATMENTS ARE TO BE USED FOR RESURFACING, PAVEMENT PLANING, EXCAVATION, ETC. BETWEEN OR WITHIN TRAVELED LANES.

D (in.)	TREATMENT
≤ 1*	Erect OW-171 and OWP-171 signs.
> 1*-3	1) Lane closure utilizing drums as shown below OR 2) Optional Wedge Treatment
> 3-5	Lane closure utilizing drums as shown below.
> 5	Lane closure utilizing portable concrete barrier as shown below.

* Cones may be used for daytime only conditions.



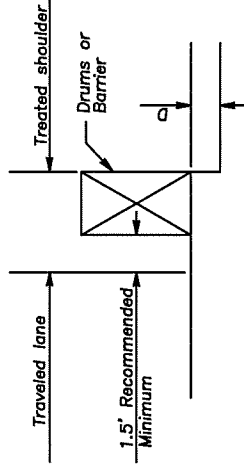
CONDITION II

DROP-OFFS WITHIN GRADED SHOULDER AREA

- THE TREATMENTS INDICATED BELOW ARE FOR USE IN CONJUNCTION WITH RESURFACING, PLANING, OR EXCAVATIONS WITHIN THE GRADED SHOULDER AREA.
- THE GRADED SHOULDER AREA IS THAT FLAT OR GRADUALLY SLOPING AREA BETWEEN THE EDGE OF A NORMALLY TRAVELED LANE AND THE MORE STEEPLY SLOPING DITCH FORESLOPE OR EMBANKMENT SLOPE. ITS SURFACE MAY BE SOIL OR TURF, AND/OR IT MAY BE INCLUSIVE OF A "TREATED" AREA (IMPROVED WITH AGGREGATES, ASPHALTIC MATERIALS, OR CONCRETE). FOR THE PURPOSES HEREIN, ITS MAXIMUM WIDTH SHALL BE CONSIDERED TO BE TWELVE (12) FEET.

D (in.)	TREATMENT
≤ 1*	1) If edgelines are present, no treatment necessary OR 2) Erect OW-171 and OWP-171 signs.
> 1*-5	1) If min. lane width* requirements can be met, maintain lanes utilizing drums as shown below OR 2) If min. lane width* requirements cannot be met, close adjacent lane utilizing drums OR 3) Optional Shoulder Treatment.
> 5-12 Daylight only	If min. lane width* requirements can be met, maintain lanes utilizing drums as shown below.
> 5-24	1) If min. lane width* requirements can be met, maintain lanes utilizing portable concrete barrier as shown below. OR 2) If min. lane width* requirements cannot be met, close adjacent lane utilizing drums.
> 24	Lane closure utilizing portable concrete barrier as shown below.

* Minimum lane widths shall be 10' unless otherwise specified in the plans.



City of Beavercreek
Standard Construction Drawing
DROPOFFS IN WORK ZONE

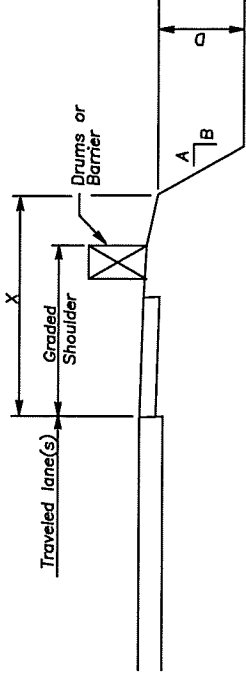
REVISION
2 OF 3
SECTION
RW-110B

CONDITION III DROPOFFS BEYOND GRADED SHOULDER OR BACK OF CURB

1. SEE NOTE 2 UNDER CONDITION II.
2. USE CHART A OR B BELOW, AS APPLICABLE.

USE FOR: 1. UNCURBED FACILITIES.
CHART A

2. CURBED FACILITIES, WHERE:
A. CURBS ARE LESS THAN 6" IN HEIGHT.
B. CURBS ARE 6" OR GREATER IN HEIGHT AND THE LEGAL SPEED IS GREATER THAN 40 MPH.

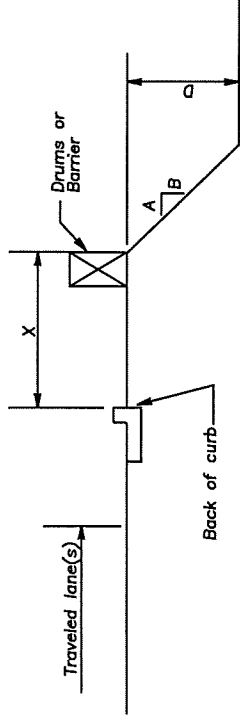


X (Ft.)	D (In.)	A/B	TREATMENT REQUIRED	
			DAY	NIGHT
0-4	Any	Any	(a)	(a)
4-30	Any	3:1 or Flatter	None	None
4-12	<3	Steeper than 3:1	None	None
4-12	>3-<12	Steeper than 3:1	Drums	Drums
4-12	>12	Steeper than 3:1	Drums	Barrier
>12-20	<12	Steeper than 3:1	None	None
>12-20	>12-<24	Steeper than 3:1	Drums	Drums
>12-20	>24	Steeper than 3:1	Drums	Barrier
>20-30	<24	Steeper than 3:1	None	Drums
>20-30	>24	Steeper than 3:1	Drums	Barrier
>30	Any	Any	None	None

(a) Use treatment specified under Condition II.

USE FOR: UNCURBED FACILITIES WHERE THE CURB IS 6" OR GREATER IN HEIGHT AND THE LEGAL SPEED IS 40 MPH OR LESS.

CHART B

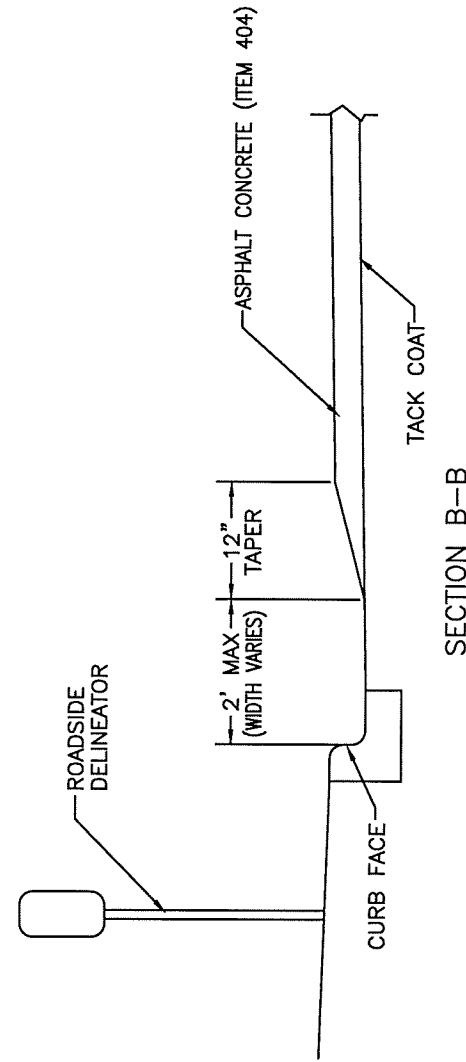
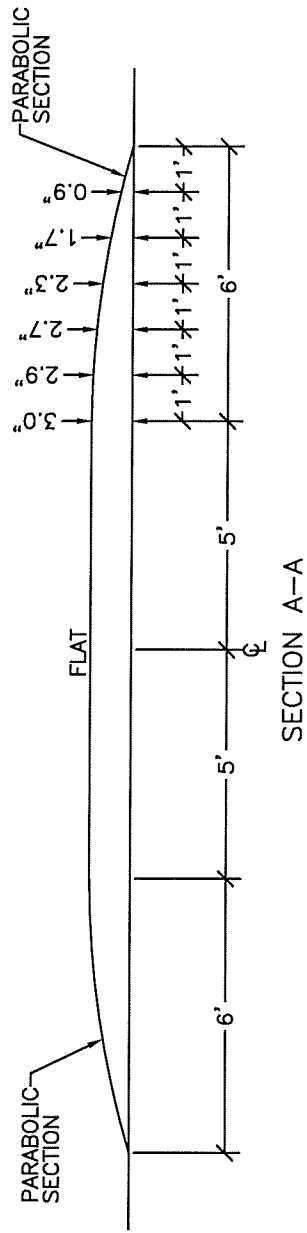
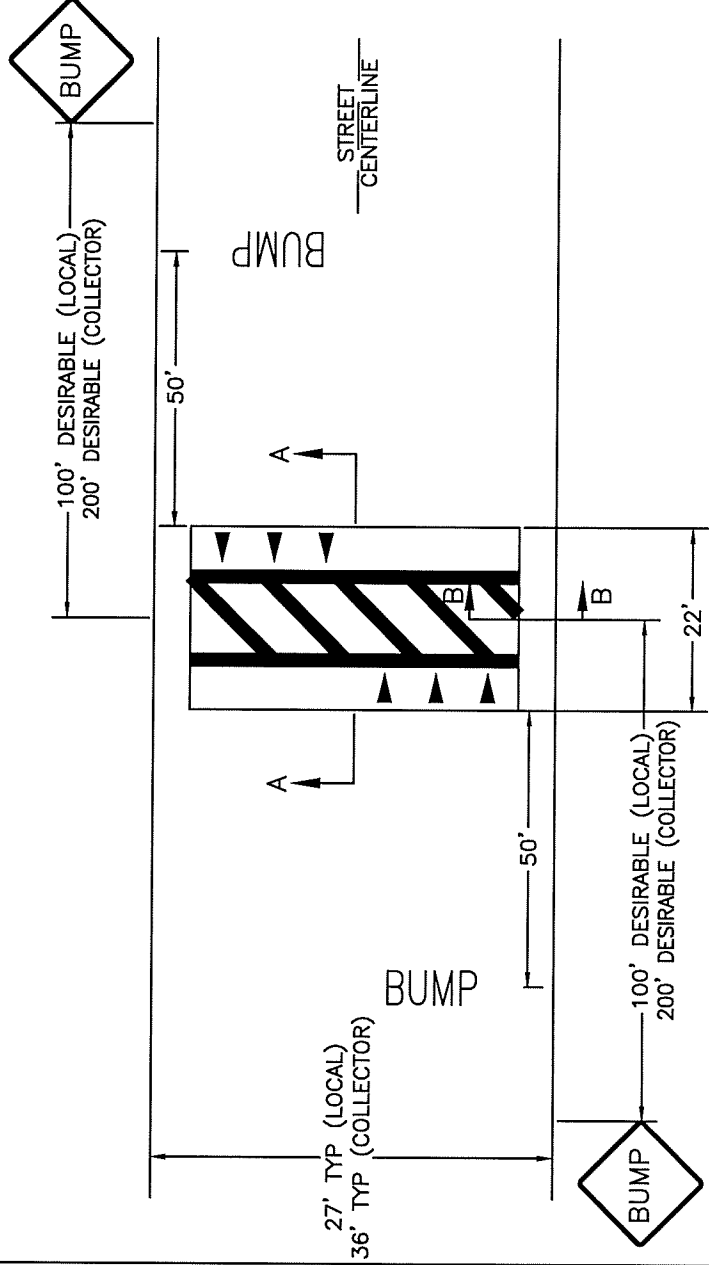


X (Ft.)	D (In.)	A/B	TREATMENT REQUIRED	
			DAY	NIGHT
0-10	<12	Any	None	Drums
0-10	>12	Any	Drums	Drums
>10	Any	Any	None	None



City Of Beavercreek
Standard Construction Drawing
DROPOFFS IN WORK ZONE

3 OF 3
SECTION
RW-110C



NOTE: THE SIGNAGE AND PAVEMENT MARKINGS SHOWN ARE GENERIC IN NATURE. IT IS THE RESPONSIBILITY OF THE DESIGNER TO PROPERLY ENGINEER THE LOCATION AND TYPE OF MARKINGS AND SIGNAGE TO SUIT SITE CONDITIONS.

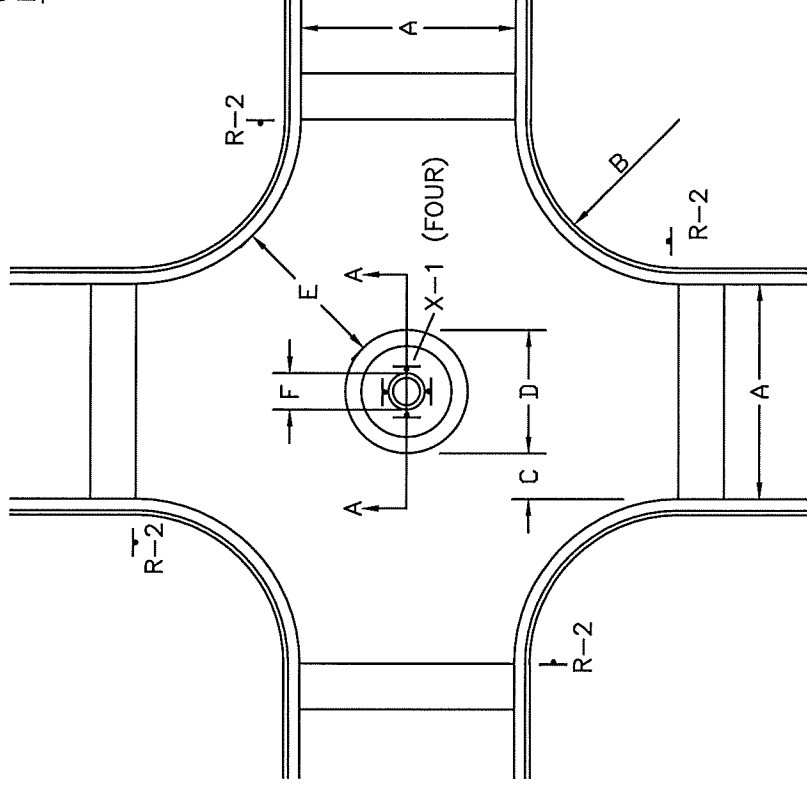


City Of Beavercreek
Standard Construction Drawing
22' LOCAL SPEED TABLE

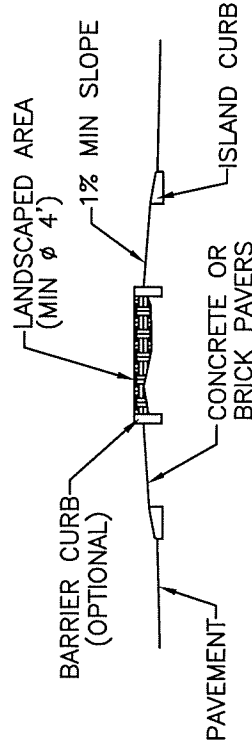
TABLE
TC-100

OPTIMUM CRITERIA

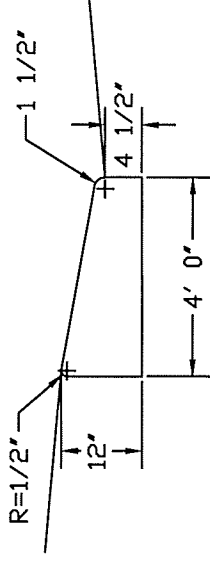
OFF-SET DISTANCE	OPENING WIDTH
5.5' MAX.	16' MIN
5.0'	17' ±
4.5'	18' ±
4.0'	19' ±
3.5' OR LESS	20'



- LEGEND:
- A ROADWAY WIDTH
 - B CURB RADIUS RETURN
 - C OFF-SET DISTANCE
 - D CIRCLE DIAMETER
 - E OPENING WIDTH
 - F RAISED ISLAND DIAMETER
(4 FEET MIN.)



SECTION A-A



ISLAND CURB DETAIL

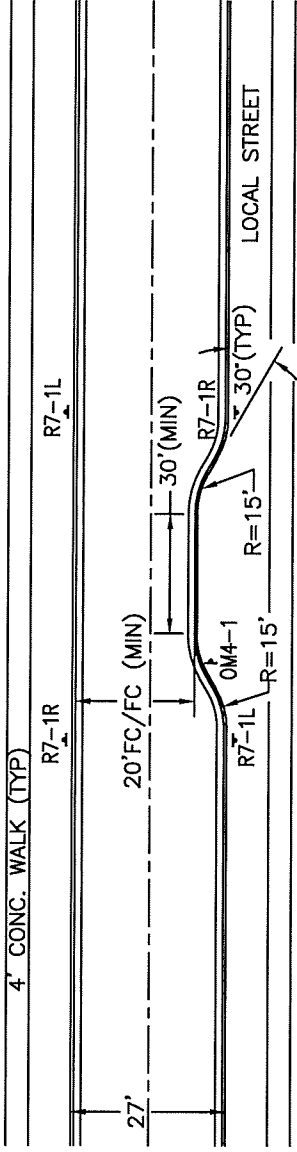
NOTE: THE SIGNAGE AND PAVEMENT MARKINGS SHOWN ARE GENERIC IN NATURE.
IT IS THE RESPONSIBILITY OF THE DESIGNER TO PROPERLY ENGINEER THE
LOCATION AND TYPE OF MARKINGS AND SIGNAGE TO SUIT SITE CONDITIONS.



City Of Beavercreek
Standard Construction Drawing
TRAFFIC CIRCLE GUIDELINES

ISLAND
SECTION
TC-101

CURB EXTENSION LOCAL STREET



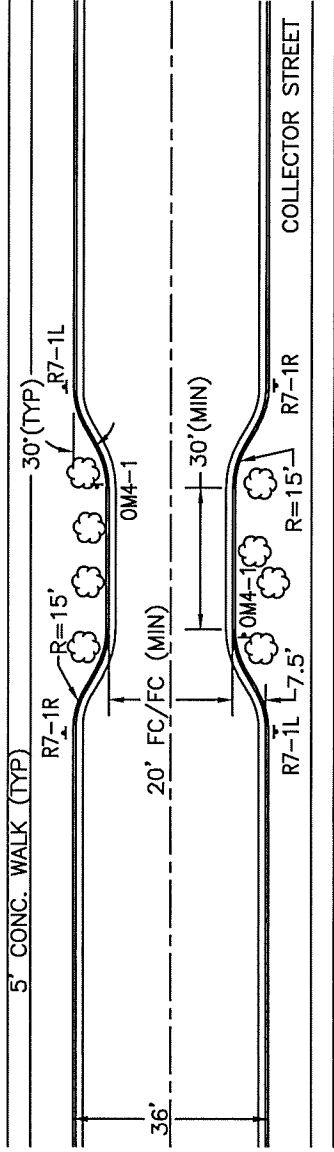
NOTES:

1. THE LENGTH OF CURB EXTENSIONS MUST RECOGNIZE SITE CONDITIONS, e.g. DRIVEWAY LOCATIONS.
2. ADDITIONAL SIGNAGE AND VERTICAL DELINEATION MAY BE NECESSARY, DEPENDING ON SITE CONDITIONS.

SIGN DESCRIPTIONS:

R7-1R	NO PARKING
R7-1L	NO PARKING
OM4-1	END OF ROADWAY MARKER
W11-2	PED. CROSSING

CURB EXTENSION COLLECTOR STREET



NOTE: THE SIGNAGE AND PAVEMENT MARKINGS SHOWN ARE GENERIC IN NATURE. IT IS THE RESPONSIBILITY OF THE DESIGNER TO PROPERLY ENGINEER THE LOCATION AND TYPE OF MARKINGS AND SIGNAGE TO SUIT SITE CONDITIONS.



City Of Beavercreek
Standard Construction Drawing
CURB EXTENSION

CHOKER
SECTION
TC-102

Diagram illustrating the placement and dimensions of signs at a four-way intersection. The diagram shows the intersection of a Local Street and a Conc. Walk (Typ).

Sign Placement and Dimensions:

- Sign R4-7b:** Located on the Conc. Walk (Typ) side. Dimensions include a 27' offset from the curb, a 50' (MIN) length, and a radius of $R=250'$.
- Sign R7-1R:** Located on the Local Street side. Dimensions include a 10' (MIN) length, a 6' offset from the curb, and a radius of $R=3.0'$.
- Sign R7-1L:** Located on the Conc. Walk (Typ) side. Dimensions include a 10' (MIN) length, a 6' offset from the curb, and a radius of $R=1.5'$.
- Sign R1-1:** Located on the Conc. Walk (Typ) side. Dimensions include a 27' offset from the curb and a radius of $R=1.5'$.

Optional Crosswalk Lines: Indicated by dashed lines.

Sign Descriptions:

- R4-7b: KEEP RIGHT
- R7-1R: NO PARKING
- R7-1L: NO PARKING
- W11-2: PED. CROSSING

TAPER LENGTHS FOR MEDIAN ISLANDS: SHALL BE CALCULATED BY THE FOLLOWING FORMULA:

$$L = \frac{W^2}{8 \cdot R}$$

SIGN DESCRIPTIONS:

R4-7b	KEEP RIGHT
R7-1R	NO PARKING
R7-1L	NO PARKING
W11-2	PED. CROSSING

TAPER LENGTHS

TAPER LENGTHS FOR MEDIAN ISLANDS SHALL BE CALCULATED BY THE FOLLOWING FORMULA:

$$L = \frac{WS^2}{60}$$

WHERE: L=TAPER LENGTH (FT)
S=DESIGN SPEED (MPH)
W=OFFSET WIDTH (FT)

NOTE: THE MAXIMUM LENGTH OF THE MEDIAN ISLAND AFFECTED BY ADJACENT DRIVEWAY AND INTERSECTION LOCATIONS.

4' CONC. WALK (TYP)

R7-1L

10' (MIN)
MEASURED F/C TO F/C

R=1.5'

R4-7b

R=250'

R4-7b

6'

100' (MIN)

R7-1L

LOCAL STREET

R7-1R

NOTE: THE SIGNAGE AND PAVEMENT MARKINGS SHOWN ARE GENERIC IN NATURE. IT IS THE RESPONSIBILITY OF THE DESIGNER TO PROPERLY ENGINEER THE LOCATION AND TYPE OF MARKINGS AND SIGNAGE TO SUIT SITE CONDITIONS.



**City Of Beavercreek
Standard Construction Drawing
RAISED MEDIAN ISLAND**

ISLAND	TC-103
DETAIL	SECTION

LOCATION AND ELEVATION: When given on the plans, the location and the elevation are at the top center of the grate. The office holes should be placed at the elevations as shown on the plans.

BASE MATERIALS: The basin dimensions, materials, and grate are to be per ODOT Standard Construction Drawing CB-1.2, except as detailed herein. Side inlet windows shall not be used. All aggregate shown shall meet ODOT CMS 203.02 H, NATURAL GRANULAR MATERIALS and specified gradations.

RISER PIPE: Use schedule 40 Polyvinyl Chloride Conduit. Perforations shall be only as detailed in the plans.

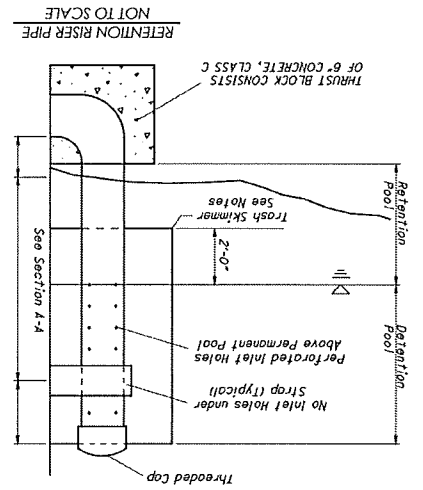
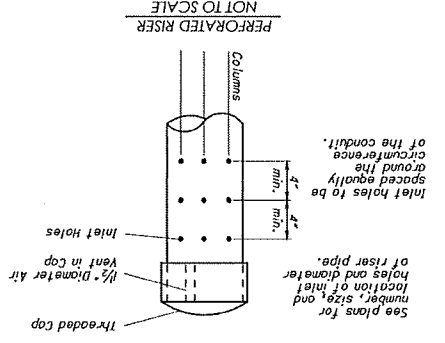
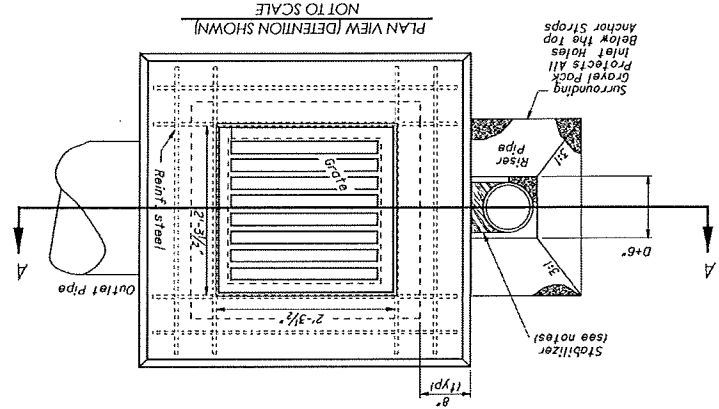
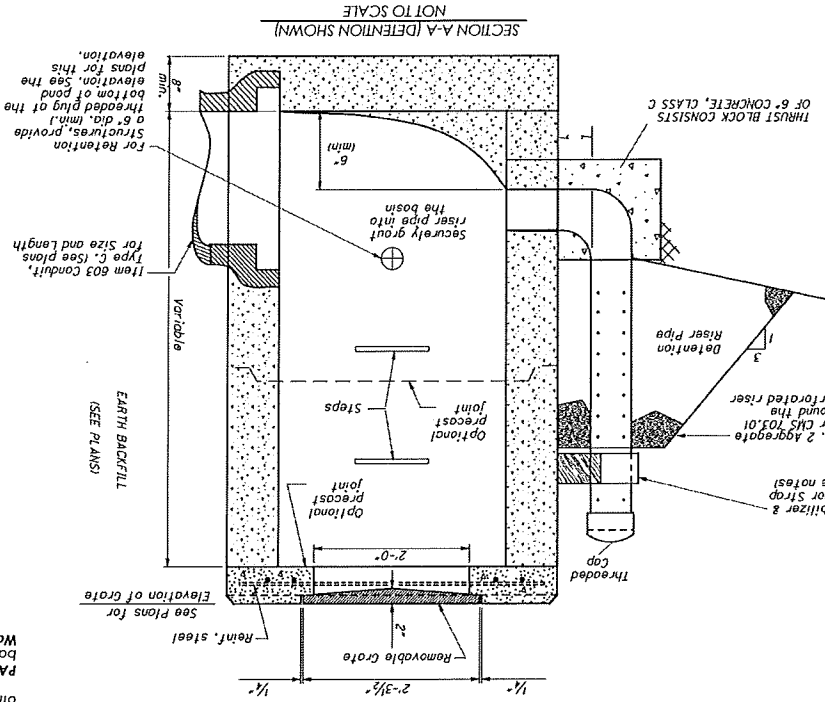
TRASH SKIMMER: Use trash skimmer screens to protect the perforated riser. It must extend from the top of the riser to 2' below the permanent pool level and be open at the top and bottom. The radius of the trash skimmer shall be 3 times the diameter of the riser pipe or as shown on the plans. Trash skimmer shall be stainless steel or galvanized steel per ODOT CMS 711.02. Maximum perforation size shall be 2 inches. Securely fasten trash skimmer to the basin using hardware galvanized per ODOT CMS 711.02.

STABILIZER AND ANCHOR STRAP: Securely fasten the riser pipe to the basin in the vertical position using a stabilizer and anchor strap that consists of a universal clamp or a strap and block. All metal components shall be galvanized or stainless steel. All other materials shall be not resistant.

PAVEMENT: All materials and labor, including excavation and backfill, shall be paid for at the contract price for Item 604 - Water Quality Basin, Retention (Detention).

NOTES

MAXIMUM NUMBER OF PERFORATED COLUMNS		RISER DIAMETER (in.)		HOLE DIAMETER, INCHES	
12	24	1/4"	1/2"	3/4"	1"
10	20	1/4"	1/2"	3/4"	1"
8	16	1/4"	1/2"	3/4"	1"
6	12	1/4"	1/2"	3/4"	1"
4	8	1/4"	1/2"	3/4"	1"
2	4	1/4"	1/2"	3/4"	1"



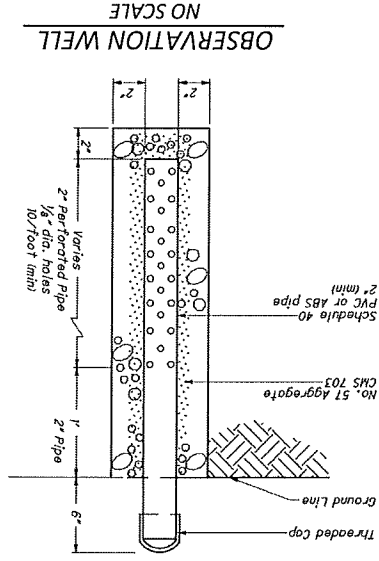
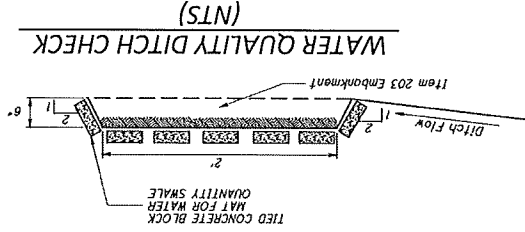
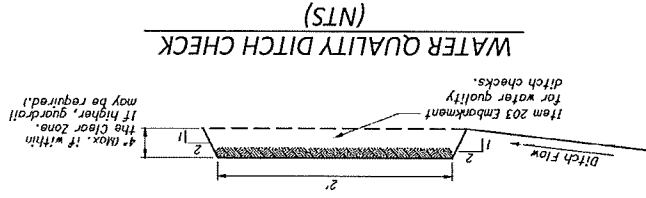
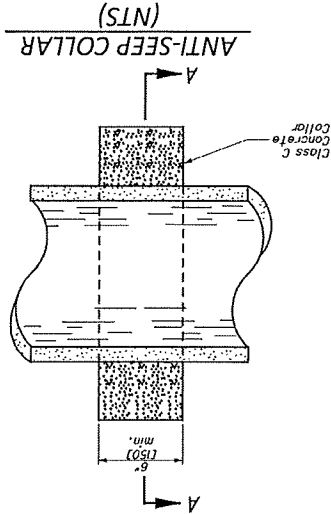
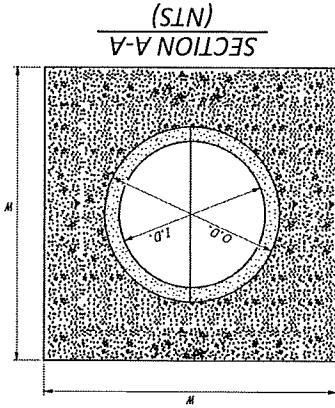
City of Beavercreek
Standard Construction Drawing
WATER QUALITY BASINS



City Of Beavercreek
Standard Construction Drawing
WATER QUALITY MISCELLANEOUS DETAILS

1 OF 1
SECTION
WQ-101

N-30



CONCRETE - C.Y.	DIMENSION OF COLLAR W X W (FT.)		DIAETER (I.D.) (FT.)		
	3X3	4X4	5X5		
	0.15	0.28	0.45	1	
	N/A	0.24	0.40	2	
	N/A	N/A	0.33	3	

ANTI-SEEP COLLARS: An anti-seep collar shall be provided as shown in the plans. Payment for the collar shall be at the contract price for ITEM 602, CONCRETE MASONRY.

WATER QUALITY DITCH CHECK: A water quality ditch check shall be placed as shown in the plans. All embankment used shall conform to ODOT CMS 703.16.A. Payment for this work shall be at the contract price for ITEM 203, EMBANKMENT, FOR WATER QUALITY DITCH CHECK.

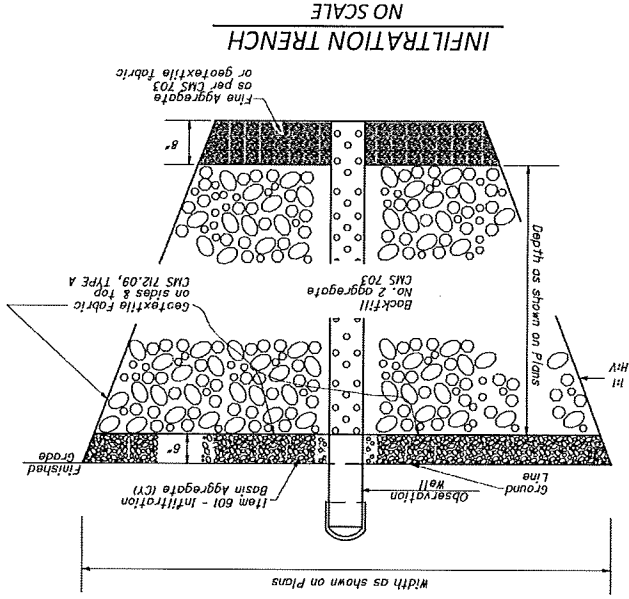
WATER QUALITY DITCH CHECK: A water quality ditch check shall be placed as shown in the plans. All embankment used shall conform to ODOT CMS 703.16.A. Payment for this work shall be at the contract price for ITEM 203, EMBANKMENT, FOR WATER QUALITY DITCH CHECK and ITEM 601, TIED CONCRETE BLOCK MAT FOR WATER QUALITY SWALE.

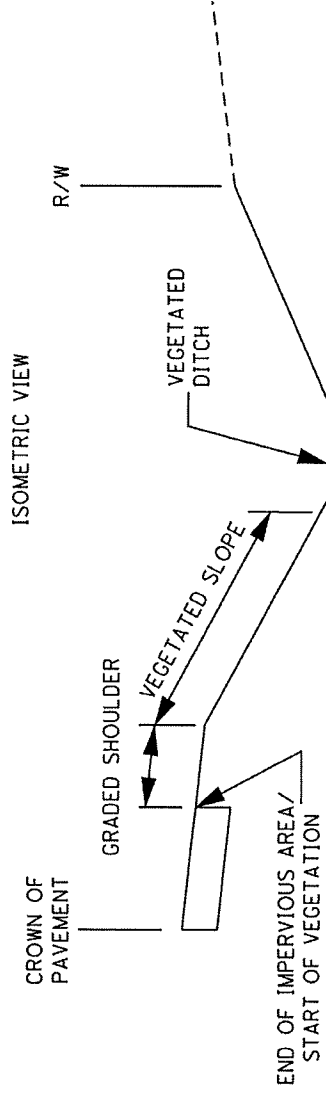
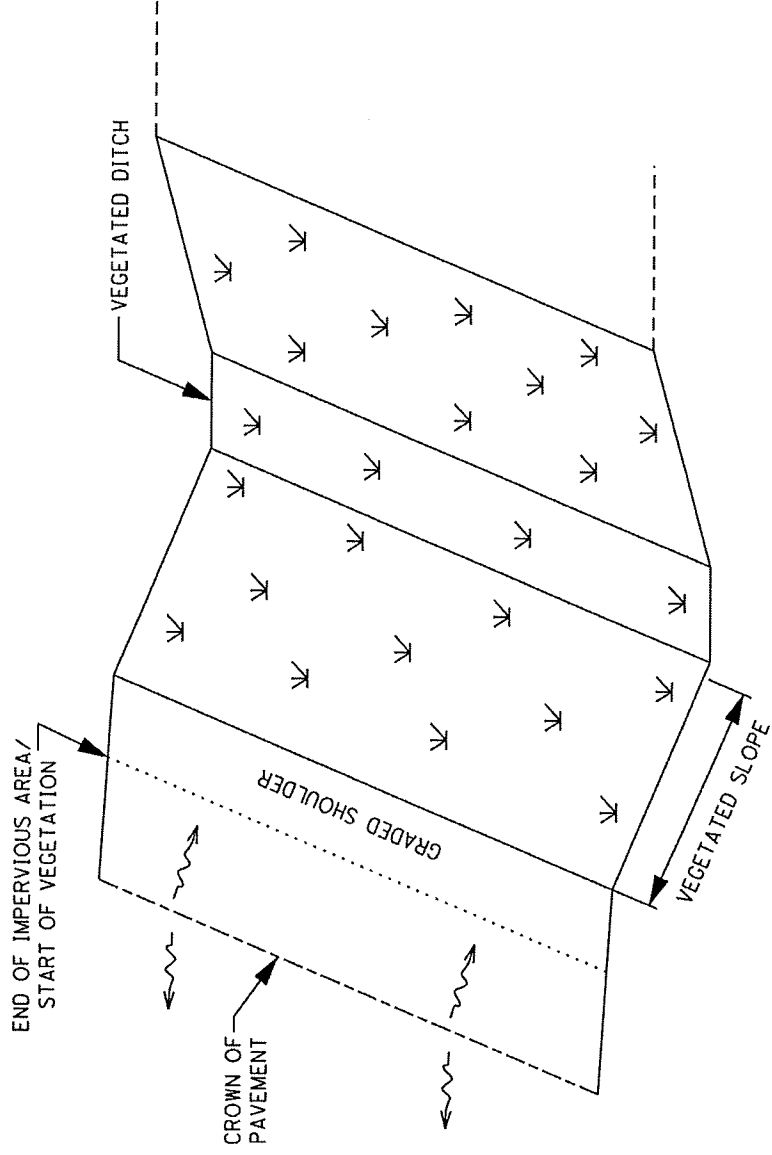
OBSERVATION WELL: The observation well shall be constructed to a depth & location as shown in the plans. All materials and labor including excavation and backfill shall be paid for at the contract price for ITEM 604 OBSERVATION WELL.

INFILTRATION TRENCH: The infiltration trench shall be constructed to the dimensions shown on the plan. The top 6 inch covering shall be paid for at the contract price for ITEM 601, INFILTRATION BASIN AGGREGATE.

All other materials and labor, including excavation, geotextile fabric, and backfill shall be paid for at the contract price for ITEM 203 SPECIAL, INFILTRATION TRENCH.

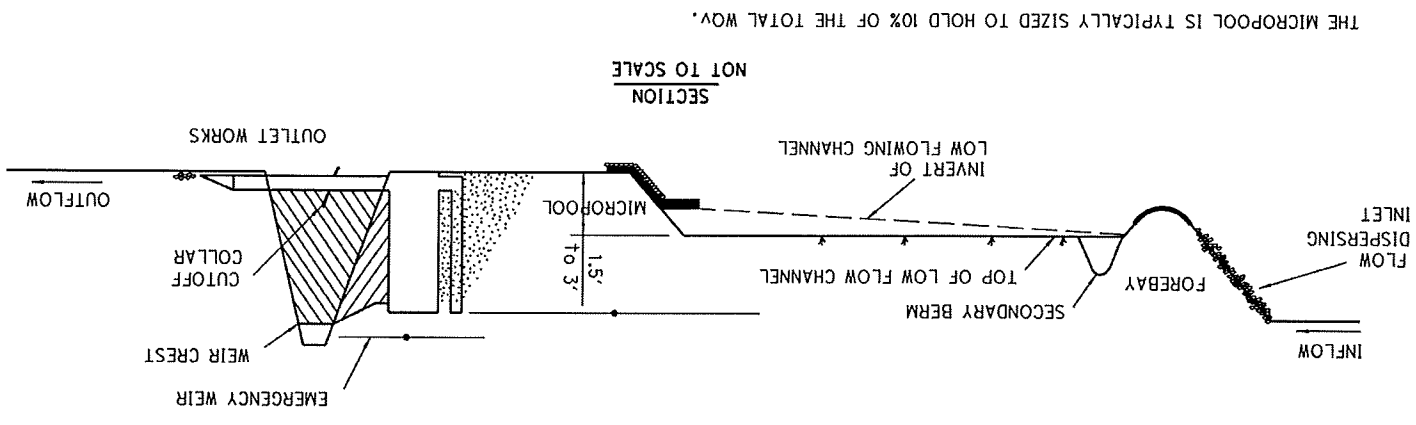
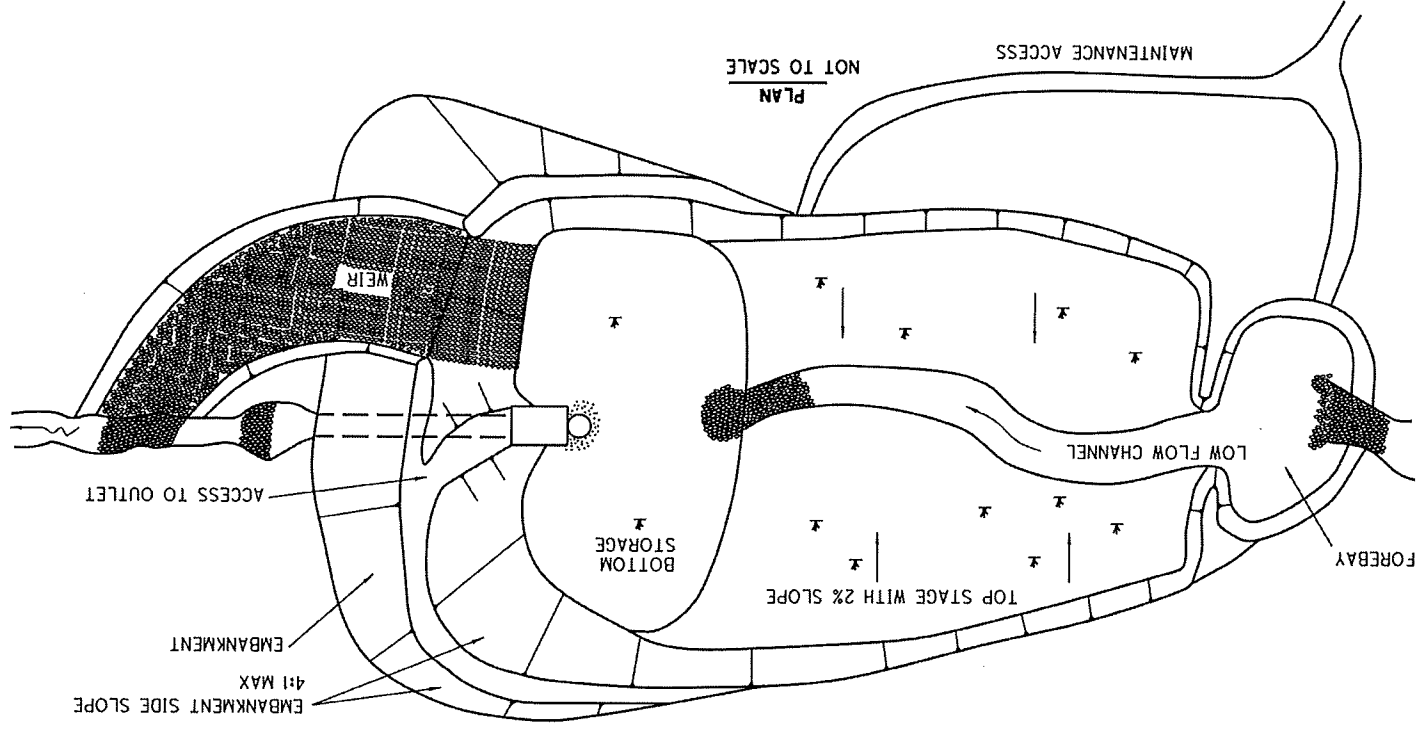
NOTES





City Of Beavercreek
Standard Construction Drawing
VEGETATED BIOFILTER

DETAIL
BIOFILTER
SECTION
WQ-102



City Of Beavercreek
 Standard Construction Drawing
CONCEPTUAL DETENTION BASIN FOR WATER QUALITY

DETAIL BASIN
 SECTION WQ-103

GIVEN:

$$WQV = 0.20 \text{ AC-FT}$$

$$K = 3.3 \times 10^{-5} \text{ FT/SEC}$$

$$D = 4.0 \text{ FT}$$

$$h = 1 \text{ FT}$$

$$Q_{10} = 23 \text{ CFS}$$

$$T = 40 \text{ HOURS}$$

- SOLVE FOR REQUIRED AREA

$$A = \frac{(0.20 \text{ AC-FT}) (4.0 \text{ FT})}{3600 (3.3 \times 10^{-5} \text{ FT/SEC}) (40 \text{ HOURS}) (1 + 4.0)} = 0.03 \text{ AC}$$

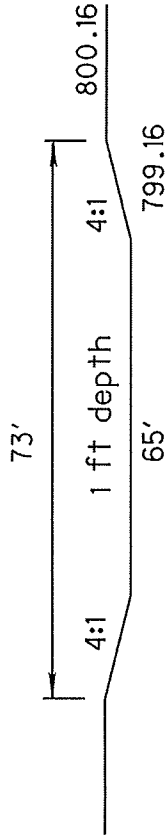
- ASSUME 20 FT. WIDTH. SOLVE FOR LENGTH

$$0.03 \text{ AC} = \frac{20 \text{ L}}{43560} \Rightarrow L = 65 \text{ FT}$$

- PROVIDE STORAGE FOR AT WQV PRIOR TO FILTRATION:

$$0.03 \text{ AC-FT} = 1,307 \text{ FT}^3$$

USE TRAPEZOIDAL SECTION @ 20 FT WIDTH X 65 FT
LONG X 12 INCHES DEPTH



VOLUME = 1,661 CF > 1,307 CF => O.K.
(Used Visual Urban software from FHWA)



City Of Beavercreek
Standard Construction Drawing
BIORETENTION CELL EXAMPLE

DETAIL
1 OF 3
SECTION
WQ-104A

- CHECK FOR Q_{10} BYPASS THROUGH BIORETENTION CELL

$Q_{10} = 23$ CFS FIGURE 1102-1 SHOW GRATE CAPACITY

OF No. 2-2B CATCH BASIN = 6.5 CFS @ 0.5 FT HEAD (ELEVATION 800.66)

2 BASINS $\Rightarrow$ $2 \times 6.5 = 13$ CFS < 23 CFS $\Rightarrow$ DESIGN WEIR FOR 23-13 CFS=10 CFS

TRAPEZOIDAL WEIR EQUATION (ASSUME 15' BASE WITH 4:1 SIDE SLOPES):

$Q = 3.367 \times B \times H^{3/2}$ $\Rightarrow$ $10 = 3.367 \times 15' \times H^{3/2}$, SOLVING FOR $H=0.34$ FT

$\Rightarrow$ TOP OF EMBANKMENT SHOULD BE AT LEAST $0.34' + 800.66=801.00$

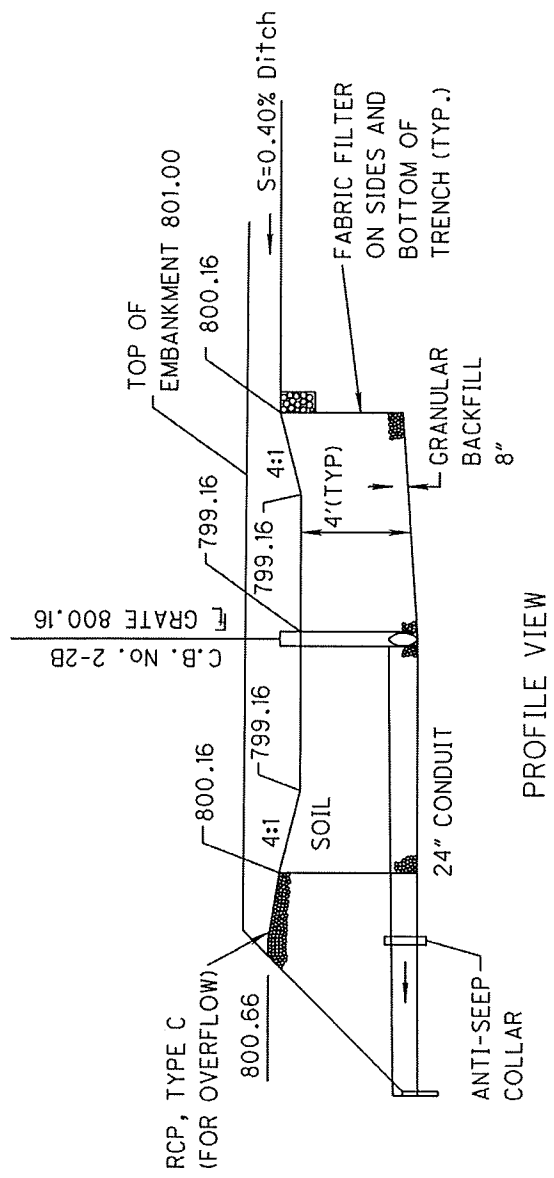
@ ELEVATION 801.00, TOTAL DISCHARGE IN CATCH BASINS = 20 CFS (FIGURE 1102-1 AT 0.84 FT HEAD,) 10 CFS EACH

- DESIGN STORM SEWER FOR Q_{10} FLOW ASSUME CB 1 & 2

TAKE 10 CFS EACH USING MANNINGS EQUATION:

1 TO 2 $\Rightarrow$ USE 21" CONDUIT @ 0.68%

2 TO 3 $\Rightarrow$ USE 24" CONDUIT @ 1.1%



City Of Beaver Creek
Standard Construction Drawing
BIORETENTION CELL EXAMPLE

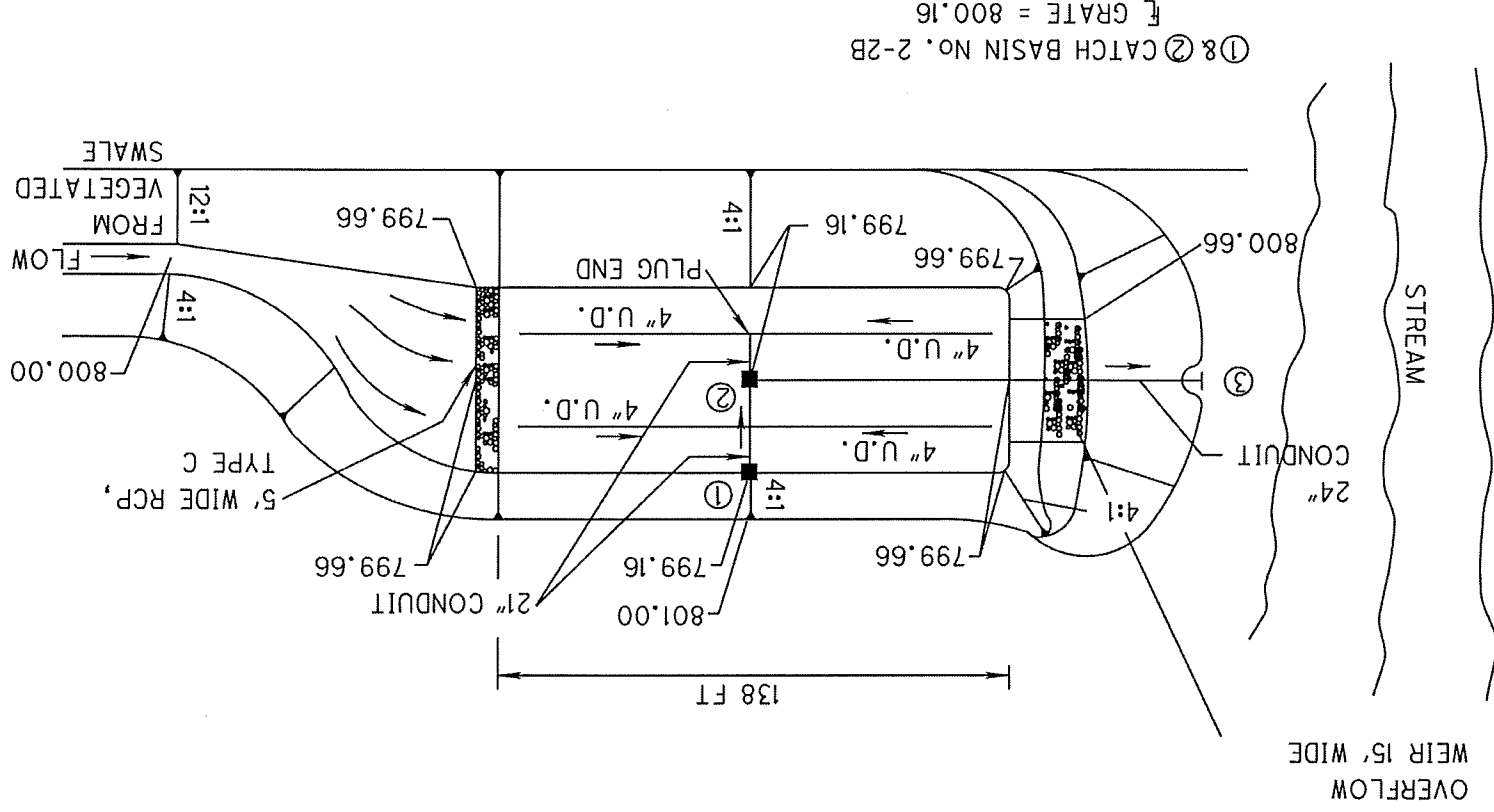
2 OF 3
SECTION
WQ-104B



City of Beavercreek
Standard Construction Drawing
BIORETENTION CELL EXAMPLE

3 OF 3
WQ-104C

N-35



① & ② CATCH BASIN NO. 2-2B
F GRATE = 800.16

NOTES:
4" U.D. BLIND TAPS INTO THE
21" COLLECTOR PIPE
0.5' WIDE RCP USED TO SPREAD
THE FLOW ACROSS THE CELL
AREA TO BE MULCHED AND PLANTED W/TREES,
SHRUBS, AND GRASSES NATIVE
TO THE AREA.

PLAN VIEW
NTS

GIVEN:

$$WQ_v = 0.16 \text{ Ac-ft}$$

Trench Backfill = uniform sized gravel ($p=0.40$)

Surrounding Soil Permeability (K) = 0.000065 ft/sec

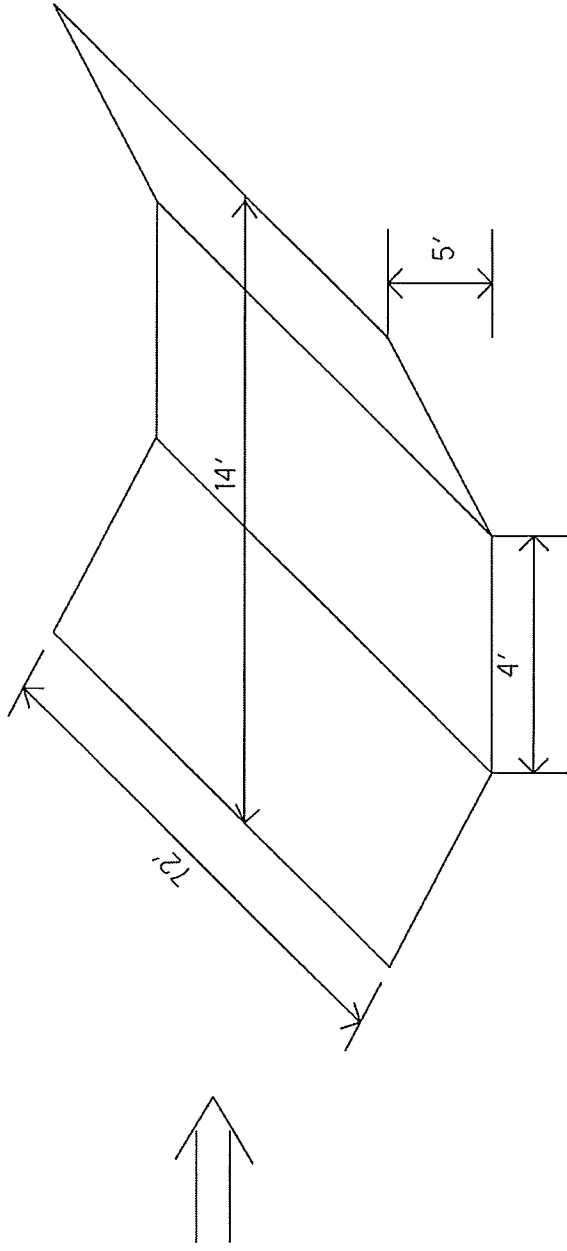
Drain time = 24 hours

- ☐ Assume depth = 5.0 feet
- ☐ Assume bottom width = 4.0 feet
- ☐ Calculate the required length:

$$L = \frac{43560 \times (0.16 \text{ Ac-ft})}{3600 \times (0.000065 \text{ ft/sec}) \times (24)(4+2(5)) + 0.40 \times (5 + (4)(5))}$$

$$L = 72 \text{ ft.}$$

$$\text{TOP WIDTH} = 4 + (2)(5) = 14 \text{ FEET}$$



City Of Beavercreek
Standard Construction Drawing
INFILTRATION TRENCH EXAMPLE

1 OF 1
SECTION
WQ-105

GIVEN:

Sandy Loam Soil (infiltration rate (k) = 1.0 in/hr)

WQv = 0.25 Ac-ft

Surrounding Soil Permeability (K) = 0.000065 ft/sec

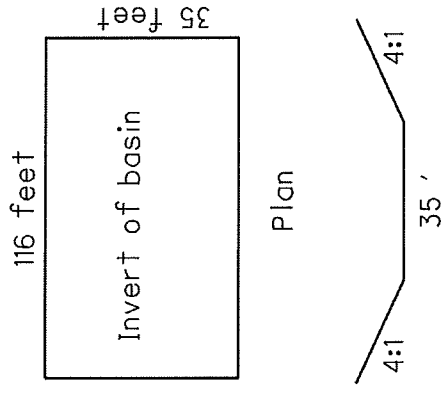
Drain time = 48 hours

- Calculate the required surface area of the basin invert:

$$A = \frac{0.25 \text{ Ac-ft} \times 1.5 \times 12}{1.0 \text{ in/hr} \times 48 \text{ hours}} = 0.093 \text{ Ac} = 4,084 \text{ sf}$$

- Will try a 35 foot wide basin:

$$\text{Length} = \frac{4,084 \text{ sf}}{35 \text{ ft}} = 116 \text{ feet}$$



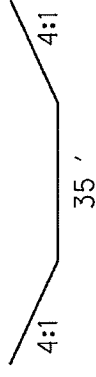
- Calculate the depth of the basin:

Will assume that only basin invert infiltrates storm water

Therefore, depth = WQv/Invert Area = 0.25 Ac-ft/0.093 Ac = 2.68 feet

Add one foot for freeboard requirement => Depth = 3.68 feet

Cross Section



- Therefore, dimensions of the basin are:

116 feet x 35 feet x 3.68 feet with 4:1 slopes



City Of Beavercreek
Standard Construction Drawing
INFILTRATION BASIN EXAMPLE

DETAIL	1	OF	1
SECTION	WQ-106		