# Clark County Subdivision Technical Specifications

Clark County
Engineer's Office

Bruce C. Smith, P.E., P.S.
Clark County Engineer

# CLARK COUNTY, OHIO

# ENGINEERING, MATERIALS,

# AND

# CONSTRUCTION SPECIFICATIONS

# FOR

# SUBDIVISION DEVELOPMENT

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# ARTICLE I

# ENGINEERING DRAWINGS

## PLAN PREPARATION

Subdividers of private property shall submit to the County Engineer for preliminary review, two (2) sets of prints of drawings showing engineering details of all existing and proposed facilities and utilities.

As prescribed by the Engineers and Surveyors Registration Law of Ohio, these drawings must be prepared by or under the supervison of a Registered Professional Engineer, registered in the State of Ohio, and bear his signature and stamp of the seal prescribed by the State Board of Registration for Professional Engineers and Surveyors. After the drawings have received final approval, three (3) copies shall be furnished to the County Engineer.

## PLAN SHEETS

Each set of plans shall include the following sheets or information:

1. A title page that identifies the plans, and includes a vicinity sketch; the owner, developer, surveyor, and engineer's names; a table of contents; a line legend; and signature blocks for approval by the county engineer, the county sanitary engineer, and the design engineer. Do not include any plan details on the Title Page. Include a statement that the specifications governinig construction of the improvemetns shall be the State of Ohio, Department of Transportation, Construction and Material Specifications, most recent edition.
2. A general summary listing estimated quantities.
3. A proposed typical section(s), and existing sections where required.
4. Plan and profile sheets for all proposed improvements.
5. Cross sections.
6. Intersection, cul-de-sac, structure, and miscellaneous details sheets.
7. When storm sewers, detention ponds, or culverts (excluding driveway pipe) are proposed, drainage areas must be delineated on a copy of the preliminary plat or other suitable drawing.

All Engineering drawings shall be prepared on sheets 24" x 36" out to out of the trimmed edges.

## DRAWING SCALES

The plans shall be drawn using the following scales:

| | HORIZONTAL | VERTICAL |
|---|---|---|
| Plan View | 1" = 50' | N/A |
| Profile | 1" = 50' | 1" = 5' |
| Cross Sections | 1" = 10' | 1" = 5' |
| Typical Sections | 1" = 4' | 1" = 4' |
| Intersections | 1" = 20' | N/A |
| Cul-de-Sacs | 1" = 20' | N/A |
| Structures | 1" = 10' | 1" = 10' |

## BENCH MARKS

All elevations shall be on U.S.G.S. Datum and a complete description, location, and elevation of the Bench Mark used shall be shown on the plans. Identify at least two temporary bench marks on-site as well as the permanent bench mark used.

## EXISTING OFF-SITE FACILITIES

Existing utilities, buildings, driveways, and other details of all existing streets and sewers that are to be extended to the subdivision shall be shown for a distance of at least 150 feet from the point of entry into the subdivision, on the plan and profile.

## AS-BUILT DRAWINGS

After the subdivision development has been completed one (1) set of "as built" drawings produced on "mylar" originals shall be furnished to the County Engineer. These plans shall show the following items in detail:

1. Gas, water, and sewer mains located in refernce to the curb line or other suitable reference.
2. Fire hydrants and water valve locations.
3. Water and gas service locations.
4. Plan and profile of all main sewers.

5. Sanitary sewer lateral house connections shall be located at the curb line by referencing to the nearest intersection street right-of-way line and measured along the curb line. When curb and gutter is not required, show distance measured from nearest downstream manhole.

6. Final curb or centerline elevations and stationing.

# ARTICLE II

# STREET DESIGN STANDARDS

All streets shall be designed and constructed in accordance with the State of Ohio Department of Transportation, Construction and Material Specifications, most recent edition. Additional standards, not necessarily repeated herein, may be found in the SUBDIVISION REGULATIONS FOR CLARK COUNTY, OHIO, Titles 4 and 5.

## DESIGN SPEED

A. The design speed for minor streets shall be 25 mph.

B. The design speed for collector streets shall be 35 mph.

## PLAN AND PROFILE

A. The plan view shall show all items proposed to be constructed, the stationing on the centerline of all streets at 100 foot intervals, the station and angle of all intersecting streets, the station of all PC's, PI's, and PT's, and any other stations necessary for a complete review of the plans. Partial lot lines shall be shown where they intersect the street right-of-way lines and shall be numbered consistent with the Record Plat.

B. The profile shall show the elevations of the existing ground, proposed top of curb grade when curb and gutter is required or proposed centerline grade when curb and gutter has been waived, and sewer grades, all at intervals not to exceed fifty feet. Elevations for vertical curves shall be shown at 25-foot intervals.

## TYPICAL SECTIONS

A. Typical sections shall be included in all sets of construction drawings without exception. Limiting stations shall be identified. Any areas or sections which vary from the typical shall be detailed with centerline and edge of pavement elevations drawn on a 20-scale detail format.

B. All minor streets shall be constructed to either meet or exceed the standard typical sections contained in Appendix B of these standards. Collector streets and major thoroughfares shall be given special study and designed to meet the specific requirements dictated by the location, present and future traffic, soil conditions, and ultimate use. The designer shall meet with the County Engineer or his representative to establish the specific requirements for collector streets and major thoroughfares prior to proceeding with detailed plan preparation.

C. All proposed streets within the subdivision shall be improved the full length and width of the street. A typical cross-section of all new streets shall be shown on the plan. Each typical section shall show the proposed width, pavement buildup, curb and gutter type or side ditch construction, side slopes, sidewalks, seeding and mulching limits, sodding limits, a minimum side ditch depth (not less than 18"), and any other pertinent details necessary for a complete plan review.

D. When the developer is required to upgrade existing streets within or bordering the subdivision, a typical cross section of the existing streets shall be included in the plans.

E. A complete set of cross sections generated at intervals of 50 feet shall be included as part of the detailed plans. Each section shall show, as a minimum, existing and proposed centerline grades, proposed side ditch grades (unless curb and gutter is proposed), excavation and embankment quantities, and seeding and mulching quantities. Designers using CADD may request a waiver of portions of these requirements if they can provide accurate control of ditch grades and quantities.

## GRADIENT

A. Where changes in street grade have an algebraic difference greater than 0.50% a vertical curve shall be introduced. The length shall be established by using a "K" value commensurate with the design speed and sufficient to provide good rideablity and adequate sight distance. Gradient and vertical curve design shall conform to the O.D.O.T. Location and Design Manual for crest and sag vertical curves.

   The P.C., P.V.I., and P.T. of all vertical curves shall be stationed and elevations shown at 25 foot stations along the curve.

B. All street grades shall be top of curb grade or centerline grade.

C. The minimum rate of grade on streets shall be 0.50% when curb and gutter is proposed, with no minimum centerline grade when drainage is provided by side ditches. The maximum grade shall be in accordance with section 5.1 of the Clark County Subdivision Regulations.

D. The grade of all existing and proposed manhole lids, water valve boxes, gas valve boxes, catch basin grates, or other structures located within the paved area, must be constructed flush with the final street surface.

## MISCELLANEOUS PROVISIONS

A. Concrete curb and gutter and sidewalk, where required, shall be constructed in accordance with standard drawings in Appendix B of these standards. Water and sewer lateral locations shall be stenciled into the back of curb by impressing an "S" or "W" in the fresh concrete.

B. The final 404 asphalt concrete wearing surface shown on the standard typical sections shall not be placed on any street until a minimum of nine months have elapsed after construction of the street base. Any deterioration or settlement that has developed during this period shall be removed and replaced before the final wearing surface is applied.

C. Pavement markings, when required, and signage requirements shall be shown on the detail construction drawings and quantities carried to the general summary. Pavement marking and signage shall be in conformance with the Ohio Manual of Uniform Traffic Control Devices.

## PAVEMENT SECTIONS

All streets and roadways shall have a section build-up that is in compliance with one of the applicable sections listed below. These sections are for minor and collector streets only. Primary and secondary thoroughfares shall be designed to engineering standards pertaining to location, present and future traffic, soil conditions, ultimate use, or other factors that may influence the design. The designer shall consult with the County Engineer to determine acceptable section details when modifications are required to be made to an existing County or Township Road. Additional details are shown on the Standard Typical Sections in the Appendices.

1. Minor Street - 50' R/W

| | | | |
|---|---|---|---|
| A. | 9" | 304 | Aggregate Base (2 Lifts @ 4.5" Each) |
| | | 408 | Bituminous Prime Coat applied at .50 Gal. per sq. yd. |
| | 2" | 402 | Asphalt Concrete |
| | 1" | 404 | Asphalt Concrete |

B. Alternate

| | | |
|---|---|---|
| 4" | 301 | Bituminous Aggregate Base |
| 1.5" | 402 | Asphalt Concrete |
| 1.5" | 404 | Asphalt Concrete |

2. Collector Street - 60' R/W

| | | | |
|---|---|---|---|
| A. | 10" | 304 | Aggregate Base |
| | | 408 | Bituminous Prime Coat applied at .50 Gal. per sq. yd. |
| | 2.50" | 402 | Asphalt Concrete |
| | 1.25" | 404 | Asphalt Concrete |

B. Alternate

| | | | |
|---|---|---|---|
| | 5.5" | 301 | Bituminous Aggregate Base |
| | 1.5" | 402 | Asphalt Concrete |
| | 1.5" | 404 | Asphalt Concrete |

3. Commercial/Industrial Street

| | | | |
|---|---|---|---|
| A. | 6" | 310 | Subbase |
| | 10" | 304 | Aggregate Base |
| | | 408 | Bituminous Prime Coat applied at .50 Gal. per sq. yd. |
| | | 409 | Seal Coat Bituminous Material |
| | 2" | 402 | Asphalt Concrete |
| | 1.25" | 404 | Asphalt Concrete |
| | 1.25" | 404 | Asphalt Concrete |
| B. | 9" | 452 | Plain Portland Cement Concrete |

Alternate

| | | | |
|---|---|---|---|
| C. | 7.5" | 301 | Bituminous Aggregate Base |
| | 1.5" | 402 | Asphalt Concrete |
| | 1.5" | 404 | Asphalt Concrete |

**DESIGN REFERENCES**

A. State of Ohio, Department of Transportation, Construction and Material Specifications, most recent edition.

B. O.D.O.T. Location and Design Manuals, Volumes I, II, and III.

C. O.D.O.T. Bureau of Location and Design, Standard Construction Drawings.

D. Ohio Manual of Uniform Traffic Control Devices.

E. Ohio Manual of Traffic Control for Construction and Maintenance Operations.

# ARTICLE III

# DRAINAGE DESIGN STANDARDS

## STORMWATER RUNOFF POLICY

This design manual is premised on the policy that land uses and developments which increase the runoff rate or volume shall be required to control the discharge rate of runoff prior to its release to off-site land. The purposes of this policy are to:

1. Permit development without increasing the flooding of other lands.

2. Reduce damage to receiving streams and impairment of their capacity which may be caused by increases in the quantity and rate of water discharged.

3. Establish a basis for design of a storm drainage system on lands below undeveloped areas which will preserve the rights of property owners and assure the long-term adequacy of storm drainage systems.

This runoff control policy applies to all land developments not specifically exempted below.

Exemptions are appropriate for certain land use activities which clearly do not generate significant increases in stormwater runoff. The following land uses and developments are within this exemption category:

1. Land preparation for agricultural crops, orchards, woodlots, sod farms, and nursery operations.

2. Land grading or leveling for erosion control under direction of the local soil conservation district.

3. Land subdivisions for residential purposes having a minimum lot size greater than five acres.

## GENERAL DRAINAGE CONCEPTS

The design principles set forth herein emphasize control of stormwater on-site, through the use of retention, detention, storage, and other measures. Application of control measures on the individual development level are expected to have beneficial downstream effects by increasing infiltration, and reducing both peak runoff and total short term runoff.

Accelerated channel erosion as well as increased flooding can be controlled if the natural predevelopment drainage patterns are maintained. However, it is usually not practical to retain the predevelopment rate of infiltration when a large part of the watershed is covered with impervious surfaces.

The developer shall give primary consideration to construction of storage facilities. Properly designed storage areas will reduce peak runoff rates, aid in the replenishment of the groundwater supply, reduce accelerated downstream channel erosion and flooding, reduce the sizes of storm sewers, and provide many other on-site benefits.

In these regulations, retention facilities refer to storage areas that maintain a planned permanent water level even after the storm runoff has ceased. These permanent ponds and lakes, if properly constructed, will provide multiple benefits including enhancement of wildlife habitat.

In contrast, detention basins refer to areas set aside to store water for a short period then release it at a controlled rate. Detention basins may remain dry when not in use, or may be used in combination with permanent retention pools. Typical designs utilize parking lots, swales, lawns, or general open spaces and are suitable for residential, commercial, or industrial development. Since they are frequently designed to remain dry when not in use, detention basins can serve as parking lots, recreation areas or blend inconspicuously into the overall landscape design when not performing stormwater duties.

## PRELIMINARY DRAINAGE DESIGN

The Engineer planning a subdivision must consider the following three factors to properly address the drainage both within, and adjacent to, the proposed subdivision: the internal collection system, major drainageways, and storage.

### 1. Collection System

The stormwater collection system consists of those elements that collect storm runoff at the points where initial flow originates. Included are curbs and gutters, storm sewers, manholes, roadside ditches, culverts, driveway pipes, and other open channels.

The preliminary lot layout and the drainage plan shall be developed concurrently, utilizing existing drainage patterns in conjunction with the planned collection system, such that the two systems function as a complete and effective method to intercept and transport storm runoff to existing waterways or streams.

The drainage design, including specific storm sewer or culvert placement, material specifications, and hydraulic design, must be presented to the County Engineer for review prior to finalization of the street layout.

2. Major Drainageways

Since it is not economically feasible to size the storm sewer system, culverts, and open channels to accommodate more than the design storm, the plat shall be designed to provide a route in which to convey the excess runoff from a larger storm. The street rights-of-way and side or rear lot lines are acceptable locations to route the excess runoff in a safe, non-destructive manner.

3. Storage Locations

When required, proposed storage locations shall be shown on the preliminary lot layout. Information shall be presented defining the area, storage capacity, temporary, and permanent uses, and ultimate ownership, including maintenance responsibility.

## TENTATIVE DRAINAGE PLANS

The tentative subdivision map shall include and shall have appended to it sufficient data for the County Engineer to completely review the drainage system as proposed by the subdivider. The following data shall be provided:

A. Hydrologic Calculations

(At all critical points within the subdivision):

1. Tributary drainage areas delineated on the map.
2. Times of concentration.
3. Intensity.
4. Runoff Coefficients.
5. Design Flow.

B. Hydraulic Calculations

1. Provide sufficient documentation to indicate the results of the investigation into the adequacy of the downstream drainage system to handle the runoff from the proposed development. This will determine the maximum allowable release rate for the proposed development and, in turn, the amount of storm water storage that will be required.

2. The plan and profile of all drainageways shall be provided, imposed upon which shall be the design energy and hydraulic grade lines.

3. 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. Plan Details

1. Sizes and types of drainage improvements, including special structures, typical sections, right-of-way widths and fencing.

2. Sufficient contours and grading details to indicate proposed street grades and elevations throughout the subdivision.

## DESIGN CRITERIA

A. Hydrologic Design

When the improvement or construction of a large open waterway is required, waterway improvements shall be designed in accordance with the following criteria:

1. Major Waterways: Major waterways are defined as those with a tributary area in excess of four (4) square miles. Major waterways shall be designed to carry runoff from a 100 year storm.

2. Secondary Waterways: Secondary waterways are defined as those with a tributary area of between one (1) and four (4) square miles. Secondary waterways shall be designed to carry runoff from a 50 year storm.

3. Minor waterways: Minor waterways are defined as those with a tributary area of one (1) square mile or less ( 640 Acres). Minor waterways shall be designed to carry runoff from a 25 year storm. See hydraulic design for closed conduit design.

4. Design flows shall be computed using one or a combination of the following methods:

   a. Rational Formula: For watersheds of 5 acres or less, the rational formula, $Q = C*I*A$, shall be used to compute design flows.

      Where $Q$ = Runoff, in cubic feet per second

      $C$ = Runoff coefficient

      $I$ = Rainfall intensity, in inches per hour

      $A$ = Watershed area, in acres

      Minimum values for "C" shall be:

      Single family residential - 0.40
      Multi-family residential - 0.60
      Commercial and industrial - 0.90

      Values for "I" can be obtained from the chart on page _. Values for $I_{10}$ are tabulated in Table 2.

   b. Regression Equations: For watershed areas in excess of 5 acres, this method may be used to compute design flows. See "Techniques For Estimating Flood-Peak Discharges of Rural, Unregulated Streams In Ohio", U. S. Geological Survey, Water-Resources Investigations Report 89-4126. This report supercedes Bulletins 43 and 45. Clark County is in Region A and has an average annual rainfall of 38 inches. Note that the watershed must have a clearly defined main channel.

   c. Technical Release No. 55: For watershed areas in excess of 5 acres or when the volume of runoff must be estimated, along with the peak rate of runoff, Technical Release No. 55 may also prove useful. Technical Release 55, is published by the United States Department of Agriculture, Soil Conservation Service.

B. Hydraulic Design

1. Closed conduits and side ditches shall be designed to carry a storm with a 10 year average recurrence interval. Facilities located within the subdivision shall be designed such that, after computing all losses for friction, changes in grade, changes in alignment, and inlet losses, the depth of flow in the streets shall not exceed the curb height. For streets with side ditches the depth of flow in the ditch shall not exceed the centerline grade minus one foot, or the top of the back slope, whichever is lower.

2. The depth of flow or ponding resulting from a storm with a 100-year recurrence interval, shall not exceed levels which would cause damage to any dwelling constructed within the subdivision.

3. Within a subdivision with curb and gutter, catch basins shall be spaced so that the width of flow will not exceed 6 feet for a 2-year recurrence interval, and will not exceed the top of curb for a 10-year recurrence interval. The maximum spacing shall not exceed 400 feet.

C. Structural Design

1. Waterways. The minimum centerline radius of constructed waterways shall be 5 times the top width of the waterway. The minimum bottom width of constructed waterways shall be 2'-0".

   Side slopes shall be 3:1 or flatter when required to accept proper bank stabilization. Drop structures or stream bed stabilization are required when waterway velocities exceed 10 feet per second.

   The top of bank shall be graded to direct surface flow to points where rock chutes or other erosion control measures are constructed.

2. Storm Sewers. Storm sewers, culverts, drains, manholes, catch basins, and headwalls shall be constructed in accordance with Items 603 and 604 of the O.D.O.T. Construction and Material Specifications, latest edition. Sewers under pavements shall be Type B Conduits, 706.02, 706.04, or 706.05, class II minimum, with class B bedding. Sewers which are constructed parallel to the proposed pavement and more than three (3) feet from the edge of pavement may be constructed of any materials permitted by Item 603.

   Manholes shall be type 3. Manholes shall be constructed at the junction of two (2) or more sewers, at the sewer termini, at all changes in size, alignment, and grade and at a distance not to exceed 400 feet. For storm sewers 42" in diameter and larger, spacing may be increased to 500 feet.

D. Stormwater Runoff Control Criteria
For Retention/Detention Basins

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 volume of site surface drainage water resulting from accelerated runoff caused by site development shall be controlled so that the post development peak rate of runoff does not exceed that of the predevelopment stage, 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 Serivce, Urban Hydrology for Small Watersheds, Technical Release No. 55, January 1975.

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

1. Determine the percent increase in runoff volume for a one year frequency, 24-hour storm occurring on the development area.

2. Determine the critical storm frequency for which additional control is needed by using the percent increase in runoff volume, derived in (1), in Table 1.

3. Control the post-development storms of a frequency between one year and the critical storm determined in (b), so that it is equal to or less than the pre-development peak runoff rate for a 24 hour, one year frequency storm.

Other procedures may be used to control accelerated runoff rates provided they are acceptable to the County Engineer.

**TABLE 1**

DETERMINING STORM FREQUENCY
FOR WHICH CONTROL IS NEEDED

| PERCENT INCREASE IN RUNOFF VOLUME FROM A ONE-YEAR FREQUENCY, 24-HOUR STORM | | |
|---|---|---|
| Equal to or Greater Than (Percent) | Not More Than | Storm Frequency (Years) |
| | | |
| --------- | 10 | 1 |
| 10 | 20 | 2 |
| 20 | 50 | 5 |
| 50 | 100 | 10 |
| 100 | 250 | 25 |
| 250 | 500 | 50 |

## CONSTRUCTION PLANS

The final construction plans for drainage within the subdivision shall conform to the above provisions and to any special conditions required by the County Engineer in approving the tentative map. Such construction plans for drainage shall be approved by the County Engineer prior to construction of any drainage facilities within the subdivision. A grading plan shall be submitted along with the construction plans showing the proposed lot grading and in-tract drainage planned for the subdivision.

The assigning of runoff coefficients to areas tributary to the drainage area shall be based on the present use of the land, or, the present zoning of the land, whichever is the higher figure.

The designer shall 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 on-site retention or ponding basins to limit the flow to an amount which the downstream system can accept.

**TABLE 2**

CLARK COUNTY
INTENSITY - DURATION TABLE

FOR A 10-YEAR STORM
BASED ON USWB RECORDS - EXHIBIT A

| TIME MIN. | I In/Hr | TIME MIN. | I In/Hr | TIME MIN. | I In/Hr |
|---|---|---|---|---|---|
| | | | | | |
| 10.0 | 5.5 | 20.0 | 4.0 | 30.0 | 3.2 |
| 10.5 | 5.4 | 20.5 | 3.9 | 30.5 | 3.1 |
| 11.0 | 5.3 | 21.0 | 3.9 | 31.0 | 3.1 |
| 11.5 | 5.2 | 21.5 | 3.8 | 31.5 | 3.1 |
| 12.0 | 5.1 | 22.0 | 3.8 | 32.0 | 3.0 |
| 12.5 | 5.0 | 22.5 | 3.7 | 32.5 | 3.0 |
| 13.0 | 5.0 | 23.0 | 3.7 | 33.0 | 3.0 |
| 13.5 | 4.9 | 23.5 | 3.6 | 33.5 | 2.9 |
| 14.0 | 4.8 | 24.0 | 3.6 | 34.0 | 2.9 |
| 14.5 | 4.7 | 24.5 | 3.5 | 34.5 | 2.9 |
| 15.0 | 4.6 | 25.0 | 3.5 | 35.0 | 2.8 |
| 15.5 | 4.5 | 25.5 | 3.5 | 35.5 | 2.8 |
| 16.0 | 4.5 | 26.0 | 3.4 | 36.0 | 2.8 |
| 16.5 | 4.4 | 26.5 | 3.4 | 36.5 | 2.8 |
| 17.0 | 4.3 | 27.0 | 3.4 | 37.0 | 2.7 |
| 17.5 | 4.2 | 27.5 | 3.3 | 37.5 | 2.7 |
| 18.0 | 4.2 | 28.0 | 3.3 | 38.0 | 2.7 |
| 18.5 | 4.1 | 28.5 | 3.3 | 38.5 | 2.7 |
| 19.0 | 4.1 | 29.0 | 3.2 | 39.0 | 2.7 |
| 19.5 | 4.0 | 29.5 | 3.2 | 39.5 | 2.7 |

## TABLE 3

MINIMUM AND MAXIMUM COVER
OVER STORM SEWERS

CLARK COUNTY

| ASTM | C-14 | C-14 | C-76 | C-76 | C-76 | C-76 | C-76 |
|---|---|---|---|---|---|---|---|
| SPEC NO. | TABLE 1 | TABLE 2 | CL. 1 | CL. 2 | CL. 3 | CL. 4 | CL. 5 |
| | | | | | | | |
| DIA. | | | | | | | |
| (INCHES) | | | | | | | |
| 8 | | | | | | | |
| 10 | 7-8 | 3-16 | | | | | |
| 12 | 6-7 | 3-14 | | 4.0-8 | 3.0-14 | 2.0-30 | 2.0-40 |
| 15 | 6-7 | 3-13 | | 3.5-8 | 3.0-14 | 2.0-30 | 2.0-40 |
| 18 | 6-7 | 3-13 | | 3.5-8 | 3.0-13 | 2.0-30 | 2.0-40 |
| 21 | 6-7 | 3-13 | | 3.5-9 | 2.5-15 | 2.0-30 | 2.0-40 |
| 24 | 6-7 | 3-13 | | 3.0-10 | 2.5-16 | 2.0-30 | 1.5-40 |
| 27 | | | | 3.0-10 | 2.5-17 | 2.0-30 | 1.5-40 |
| 30 | | | | 3.0-11 | 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 |

## MISCELLANEOUS DESIGN CRITERIA

1. STANDARD COUNTY CATCH BASINS

| | CURB GRADE |
|---|---|
| Type A | 0% to 2.75% |
| Type B | 2.76% to 6.25% |
| Type C | 6.26% and up |
| Type D | Low spot |

2. Time of concentration (Tc) - Use Overland Flow Chart, Exhibit C

3. The 24 hour storm - SCS Method:

The 24 hour total rainfall for Clark County is:

| RECURRENCE INTERVAL YEARS | 24 HOUR RAINFALL TOTAL - INCHES |
|---|---|
| 1 | 2.4 |
| 2 | 2.7 |
| 5 | 3.4 |
| 10 | 3.9 |
| 25 | 4.5 |
| 50 | 4.9 |
| 100 | 5.2 |

# ARTICLE IV

# SANITARY SEWERS

## GENERAL

All sanitary sewers constructed within the Clark County General Sewer District shall be constructed in full compliance with the "Clark County, Ohio General Sewer District, Sewer Use Regulations" adopted May 1994 and any subsequent amendments. The following standards and guidelines are not intended to supercede the sewer use regulations but are supplemental thereto. Portions of the sewer use regulations are re-stated herein for ease of use. If a conflict exists, the sewer use regulations shall take precedence.

Effective November 1, 1995 plans for the construction of sanitary sewers must be submitted to and APPROVED BY OHIO EPA prior to the start of construction.

## SEWER MAINS

1. Sanitary sewers shall be designed to flow half full at the maximum expected rate of flow. This quantity of sewage flow shall be determined by the use of 100 gallons per capita per day and four persons per house for the entire area which may drain through the area being developed. All sanitary sewers shall be designed to have a minimum velocity of flow at least 2.0 feet per second, based on Manning's formula using an "n" value of 0.013. The minimum slope for an eight (8) inch diameter sewer shall be 0.40 feet per 100 feet.

2. The minimum size of main sewer shall be eight (8) inch diameter and shall be constructed of EPA-approved materials, e.g. (a) extra-strength vitrified clay, bell and spigot pipe or an approved equal, with premium joints, "O-ring" type or an approved equal, and conforming to ASTM C-425 Joint Specification or (b) PVC, ASTM D 3034, SDR 26, joint specification ASTM D 3212.

3. No combined sewers will be allowed and the connection of roof drains, foundation drains, other subsoil drains, and any other clean water source to the sanitary sewer system is strictly prohibited.

## SERVICE CONNECTIONS

1. The minimum size of house connection shall be four (4) inches in diameter and shall be of the same material and joint construction as the main sewer.

2. All service laterals shall be connected to the main sewer by the use of "wye" or "tee" fittings on 8, 10, and 12 inch sewers and by stubs on sewers larger than 12 inches in diameter.

3. All service laterals shall be laid at a minimum grade of two (2) percent unless a flatter grade of not less than one (1) percent has been approved by the Authority. and shall have an invert depth of not less than six (6) feet at the curb except where lots along streets are on an embankment. Where slab type housing is constructed, the house lateral shall have a minimum cover of four (4) feet below the finished curb grade.

**MANHOLES**

1. Standard manholes shall be constructed at ends of all main sewers, at intersections of two or more sewers, at all changes in pipe size, grade, alignment, and at intervals not to exceed 400 feet.

2. Manholes may be either poured-in-place or precast concrete with construction conforming to ASTM C-478 and joints between sections conforming to ASTM C-443.

3. Manholes shall be a minimum of 48 inches in diameter. Steps shall be provided and kept in line during assembly of precast sections.

4. The flow channel through each manhole shall be made to conform in shape, slope, and smoothness to that of the sewer.

5. Where a drop in grade of more than two (2) feet is necessary, it shall be made by construction of a standard drop manhole.

**MANHOLE CASTINGS**

1. Standard manhole frames and covers shall be cast iron with a 24 inch opening, similar to Neenah R-1657, heavy duty with pickhole and solid lid. Total weight shall be approximately 350 pounds.

2. In streets and other paved areas, all manhole covers shall be adjusted flush with the final wearing surface. In other areas, the manhole casting should be adjusted so that the top is slightly above finished grade to prevent the entrance of surface water.

**TESTING**

1. Upon completion of construction the contractor shall test for water tightness each section of sewer including manholes, to insure compliance with the allowable infiltration limitation into sanitary sewers not to exceed 200 gallons per inch of tributary pipe diameter per mile of length, per 24 hours.

   Such tests are to be performed according to the instructions given in Appendix A and are to be witnessed and certified by the County Sanitary Engineer or his representative.

2. All air pressure testing shall be done in accordance with established EPA standards.

3. Upon completion of construction the contractor shall conduct a deflection test for each section of sewer constructed of PVC pipe, to insure compliance with the allowable deflection limitation established by Ohio EPA.

All material and construction on sanitary sewers and appurtenances shall be done in accordance with the latest standard drawings and specifications on file in the County Sanitary Engineer's Office and standards of the Ohio EPA. In case of conflict the stricter regulation or standard shall apply.

# ARTICLE V

# WATER MAINS

## GENERAL

The standards set forth herein are supplemental to the Clark County Utilities Department Rules and Regulations adopted February 3, 1958, all subsequent amendments thereto, and the Cross Connection Control Resolution No. 210-A adopted March 10, 1992. When the source of supply is the City of Springfield the standards of the City shall apply.

All streets in subdivisions where water line construction is proposed or required shall be provided with water mains, valves, valve boxes, fire hydrants, and service lines for each lot to a point back of curb where a curb stop and curb box shall be installed and the location of same marked on the curb. Where curbing is not required the service line shall be installed to the right-of-way line.

Effective November 1, 1995 plans for the construction of water lines must be submitted to and APPROVED BY OHIO EPA prior to the start of construction.

## WATER MAIN MATERIALS

1. Water main lines shall be ductile iron pipe, Class 3 or Schedule 53, bell and spigot pipe or an approved equal. Joints may be either "Push-On" type or mechanical joints.

2. Pipe fittings shall be ductile iron with mechanical joint ends. All pipe and fittings shall have a cement lining coated with a bituminous seal coat.

3. No water main less than six (6) inches in diameter will be permitted in the distribution system.

## WATER MAIN INSTALLATION

1. All water mains shall have a minimum depth of cover from finished grade to top of pipe of 48 inches. Pipe shall be laid with bell ends facing the direction of laying. In assembling push-on joints, only a tested and approved water pipe lubricant shall be used.

2. All new water mains, extensions to existing systems, and all repaired sections shall be disinfected in accordance with Ohio EPA standards for disinfection under the direction of and approved by the Sanitary Engineer before being placed in service.

3. Long runs of water main which dead-end should be avoided. Looping of lines and interconnection is desirable to form a pipe network.

## VALVES AND VALVE BOXES

1. Gate valves for control of the water system shall be installed at locations approved by the Sanitary Engineer. Gate valves located at street intersections shall be placed in line with street right-of-way lines.

2. Gate valves shall be Mueller, Clow, M. & H., Kennedy or and approved equal and shall conform to AWWA C-500. All gate valves shall be iron body, bronze-mounted double disc gate valves with two inch square wrench nut, non-rising stem, with O-ring type stem seals. Direction of opening shall be to the LEFT (counterclockwise) and shall be indicated by an arrow and the word "OPEN" cast on the flanged base of the operating nut and the nut, respectively.

3. All buried valves shall be provided with valve boxes. All valve boxes shall be cast iron, Buffalo type, with 5-1/4 inch shaft, screw type adjustable 36 to 48 inches, three piece consisting of base, middle section, top section, and lid. The lid shall have the word "WATER" cast in. All boxes shall be coated inside and out with tar base enamel.

4. Valves and valve boxes shall be set plumb. The valve box shall be centered directly over the wrench nut of the valve but shall not rest on nor make contact with the valve. The top of the valve box and cover shall be adjusted level with the finished grade.

## FIRE HYDRANTS

Fire hydrants shall be installed at street corners, at ends of all cul-de-sacs, and at locations designated by the Sanitary Engineer. The interval between fire hydrants shall not exceed 500 feet.

## FIRE HYDRANT TYPE

1. Fire hydrants shall be compression-type main valve hydrants similar to Mueller, Clow, M. & H., Kennedy or an approved equal, and shall conform to AWWA Specification C-502. All hydrants shall be of the "Traffic Model" type with safety break-flange construction that, if subjected to severe impact, will break off at the ground line without damage to hydrant barrel or unseating the main valve.

2. Direction of opening shall be to the LEFT (counterclockwise). The stem operating nut and nozzle cap nuts shall be National Standard, pentagonal in shape and measuring 1-1/2 inches from point to opposite flat. Seals on upper stem shall be O-ring type. All hydrants shall be equipped with drain valves which operate in conjunction with the main valve.

3. Fire hydrants shall have a minimum main valve opening of 4 inches with two 2-1/2 inch hose connections. In industrial, commercial, and multi-family dwelling areas, hydrants shall have a minimum main valve opening of 5 inches with two 2-1/2 inch hose connections and a 4-1/2 inch pumper connection. The type of hose thread and color of paint on hydrants shall be as directed by the Sanitary Engineer.

**FIRE HYDRANT INSTALLATION**

1. Each hydrant shall be minimum four (4) foot bury and shall be set plumb and to the established grade with the hose nozzles at least 12 inches above the finished curb grade and the "Ground Line" ring on the hydrant barrel set within ± 3 inches of the proper finished grade.

2. Hydrants shall be installed with hose connections facing the street or curb and set so that no portion of the hose nozzle cap is closer than 12 inches from the gutter face of the curb. Any pole or guard post shall be set at least 30 inches from the hydrant in order to allow operating the hydrant with necessary hydrant wrenches.

3. Hydrants shall be braced with reaction backing and backfilled initially with washed #2 stone to a minimum depth of two feet.

4. Each hydrant shall have a 6 inch mechanical joint inlet connection and shall be supplied by a 6 inch branch and controlled by an independent 6 inch gate valve of the type previously specified.

**SERVICE LINES**

1. Each water service branch shall be provided with a water meter installed in an outside frostproof meter pit of a design and location approved by the Sanitary Engineer. All water meters shall conform to AWWA Specification C-700 and shall be of the type designated by the Sanitary Engineer.

2. Each service line shall be connected to the water main, drilled and tapped for insertion of a corporation stop which shall be of cast bronze or cast brass construction with ground key stops, a tapered AWWA Mueller thread inlet and a flared copper outlet connection and shall be Mueller H-15000 or equal.

3. House service lines from corporation stop to meter yoke shall be 3/4 inch seamless copper tubing, type "K" with flared ends at all fitting connections.

4. Each service line shall be provided with a curb stop and curb box at the property line or a point back of curb, and in the line ahead of the meter pit. Such curb stop shall be of cast bronze or cast brass construction, inverted key type, round way, without drain, having flared copper connections on inlet and outlet and shall be Mueller No. H-15200 or equal.

5. Curb boxes shall be cast iron, Buffalo type, with 3 inch shaft, screw type adjustable from 3'-3" to 4'-10", and consisting of base section, top section, and lid. The lid shall have the word "WATER" cast in and be secured with a brass bolt having standard pentagonal head, and inlaid level with the lid surface. All curb boxes shall be coated inside and out with tar base enamel.

6. Curb boxes shall be set plumb and centered directly over the key of the curb stop. The top of the curb box shall be adjusted level with the proper finished grade.

7. All service lines shall have a minimum depth of cover from finished grade to top of the pipe of 48 inches.

8. No water service line shall at any time be laid in the same trench with a sanitary sewer connection. Where possible, a horizontal separation of at least ten (10) feet will be maintained.

## CONSTRUCTION

All materials and construction methods used to install water mains and service lines shall be done in accordance with the latest standard drawings and specifications on file in the County Sanitary Engineer's Office.

# ARTICLE VI

## STANDARD GENERAL NOTES

## FOR SUBDIVISIONS

The following general notes are required on all final subdivision construction plans submitted to the County Engineer for approval.

1. All road work shall be performed in accordance with the State of Ohio, Department of Transportation "Construction and Material Specifications," most recent edition.

2. All storm drainage construction shall be performed in accordance with Clark County standards.

3. All trench excavation within the existing and proposed street rights-of-way shall be backfilled with granular material in accordance with Clark County specifications and compacted before subgrade approval.

4. If a soft subgrade is encountered in a cut area it shall be undercut a minimum of 12 inches over the entire area. Material to replace the unsuitable soil may be obtained from other acceptable excavated materials on-site. In lieu of a full undercut, the contractor may undercut the area to a depth of three (3) inches and lay a geotextile fabric over the area, full width. Fabric must be a woven material with a Mullen burst strength of 600 psi and a GrabTensile Strength of 300 pounds.

5. All underground utility service laterals are to be installed from the main line to the right-of-way line before asphalt concrete or portland cement concrete is placed.

6. The final 1-inch layer of asphalt concrete wearing surface shown on the standard typical sections shall not be placed until a minimum of eight (8) months have elapsed after construction of the street base.

7. All catch basins shall be type "A," unless otherwise specified.

8. All catch basin laterals shall be reinforced concrete A.S.T.M. Specification Number C-76, Class 4, unless otherwise noted.

9. All manholes shall be Type "A", unless otherwise noted.

10. The Contractor shall form a concrete channel in the bottoms of all manholes.

11. The radius of the back of curb at intersections shall be 15 feet for minor streets and 25 feet for collector streets.

12. All field tile encountered shall be replaced or connected to the storm sewer system.

13. Forty-Eight (48) hours before digging is to commence, the contractor shall notify the following agencies as may be appropriate: The Ohio Utilities Protection Service (OUPS) at 1-800-362-2764; the Ohio Edison Company at 513-322-4911; the Clark County Sanitary Department at 513-328-2493, and all other agencies which might have underground utilities involving this project and are non-members of OUPS.

14. The minimum separation between sanitary sewers and water lines shall be in accordance with Ohio EPA standards.

15. No construction of sanitary sewers or waterlines shall be undertaken without an approved set of plans stamped by the Ohio EPA.

# ARTICLE VII

## INSPECTION

**NOTIFICATION**

1. The County Engineer, the County Sanitary Engineer, or other persons having jurisdiction shall be notified at least 24 hours in advance of the start of construction, and no work shall be started without permission.

2. Improvements may be installed prior to Final Plat approval, but only after submission and approval of construction drawings, and after inspection fees have been paid.

3. Construction layout stakes relative to the item scheduled for inspection shall be complete and in place prior to requesting an inspection by the County.

4. The developer or his contractor shall notify the County Engineer prior to starting construction on each of the following items:

    A. Excavation and subgrade compaction;

    B. Storm sewers, manholes, catch basins, and open ditches;

    C. Curbs and gutters;

    D. Sidewalks;

    E. Street base, each course;

    F. Street pavement, each course;

    G. Final grading for berms and side ditches and prior to starting seeding and mulching.

If the required inspection procedure is not followed the County Engineer may require that the streets be cored, at the expense of the developer, to verify adherence to the plans.

5. The developer or his contractor shall notify the County Sanitary Engineer prior to starting construction on each of the following items:

    A. Sanitary sewers and manholes;

    B. Water mains and valves;

    C. Fire hydrants;

    D. Water and sewer service connections;

All sanitary sewers, manholes, water mains, valves, fire hydrants and other appurtenances shall be installed in accordance with the approved construction plans and specifications. Where changes from the approved plans become necessary the changes must be approved by the County Sanitary Engineer prior to the change being made.

## TESTING METHODS

Clark County reserves the right to use any commonly used standard method of testing to determine the suitability of materials proposed for incorporation into the work or to determine acceptance of construction methods or finished construction. The contractor shall complete sections of roadway full-width prior to calling for inspection. Incomplete construction will not be given a final inspection.

With respect to subgrade compaction, the contractor will be required to compact the subgrade and furnish a loaded (12 ton minimum) tandem axle dump truck for proof rolling prior to acceptance. Subgrade will be deemed acceptable when the wheel track does not exceed one inch in depth. No base material shall be placed until the subgrade has been approved.

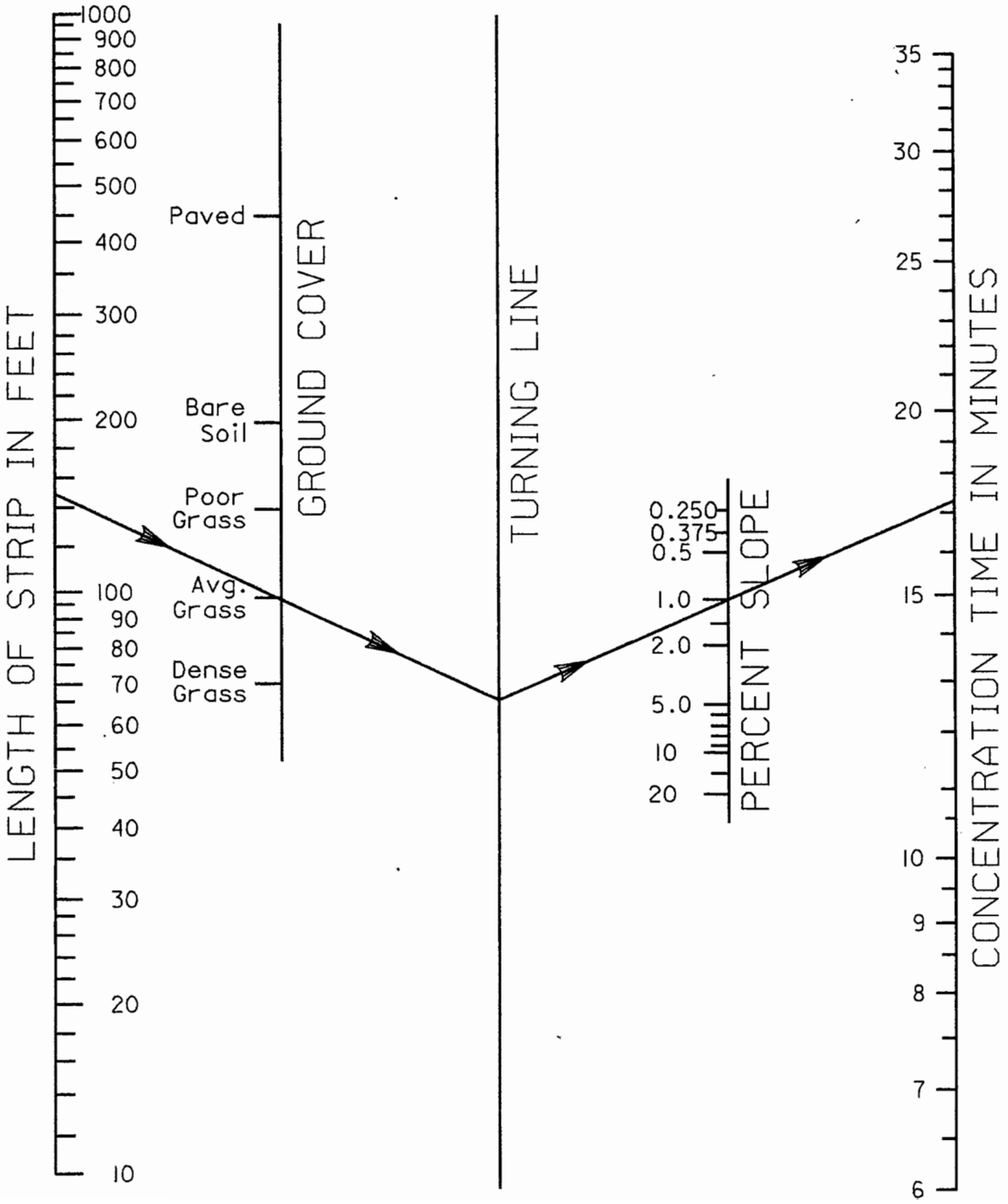
# A P P E N D I X  A

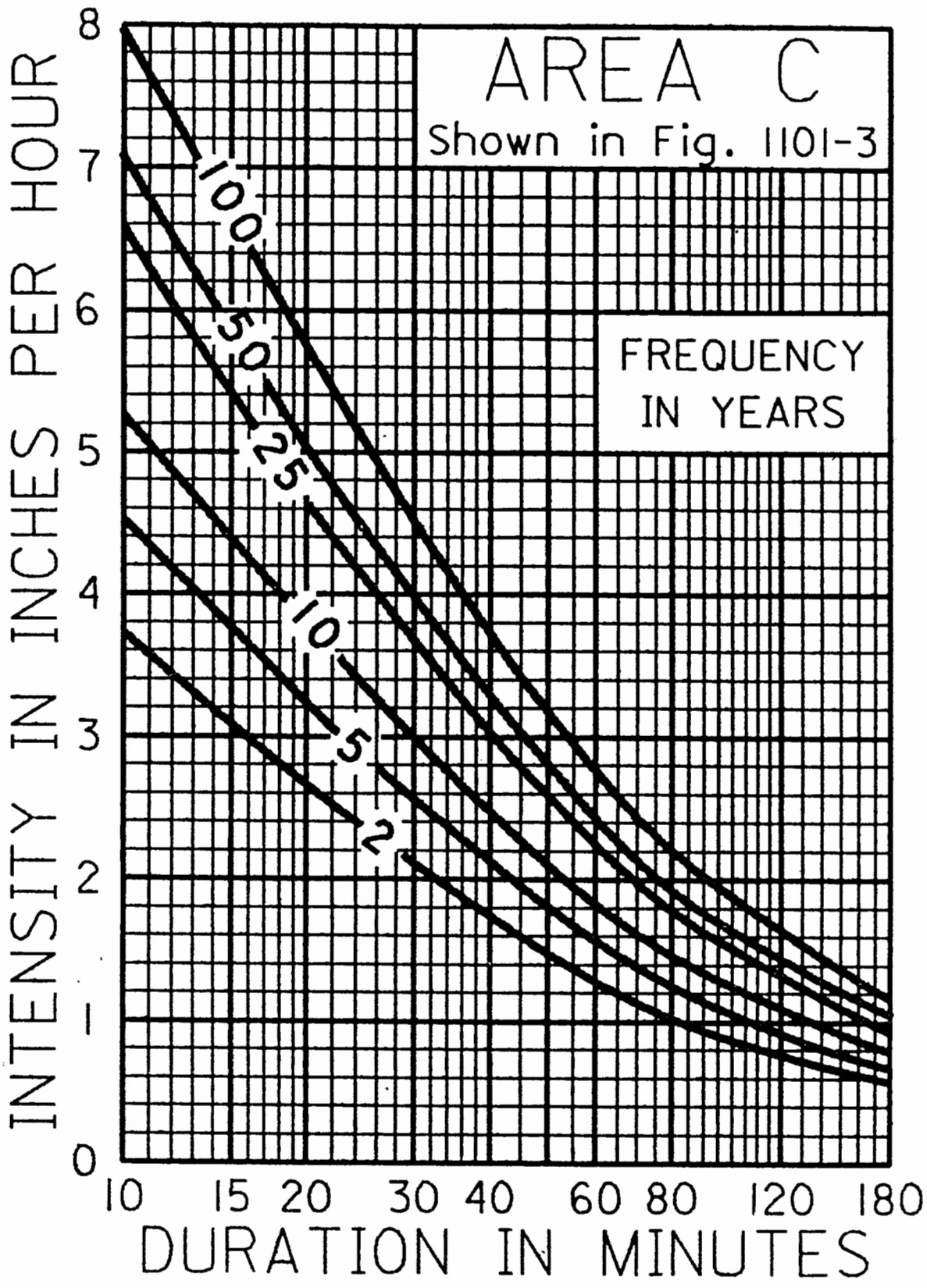
# D E S I G N
# A I D S

# OVERLAND FLOW CHART

1101-1

**REFERENCE SECTION**
1101.22

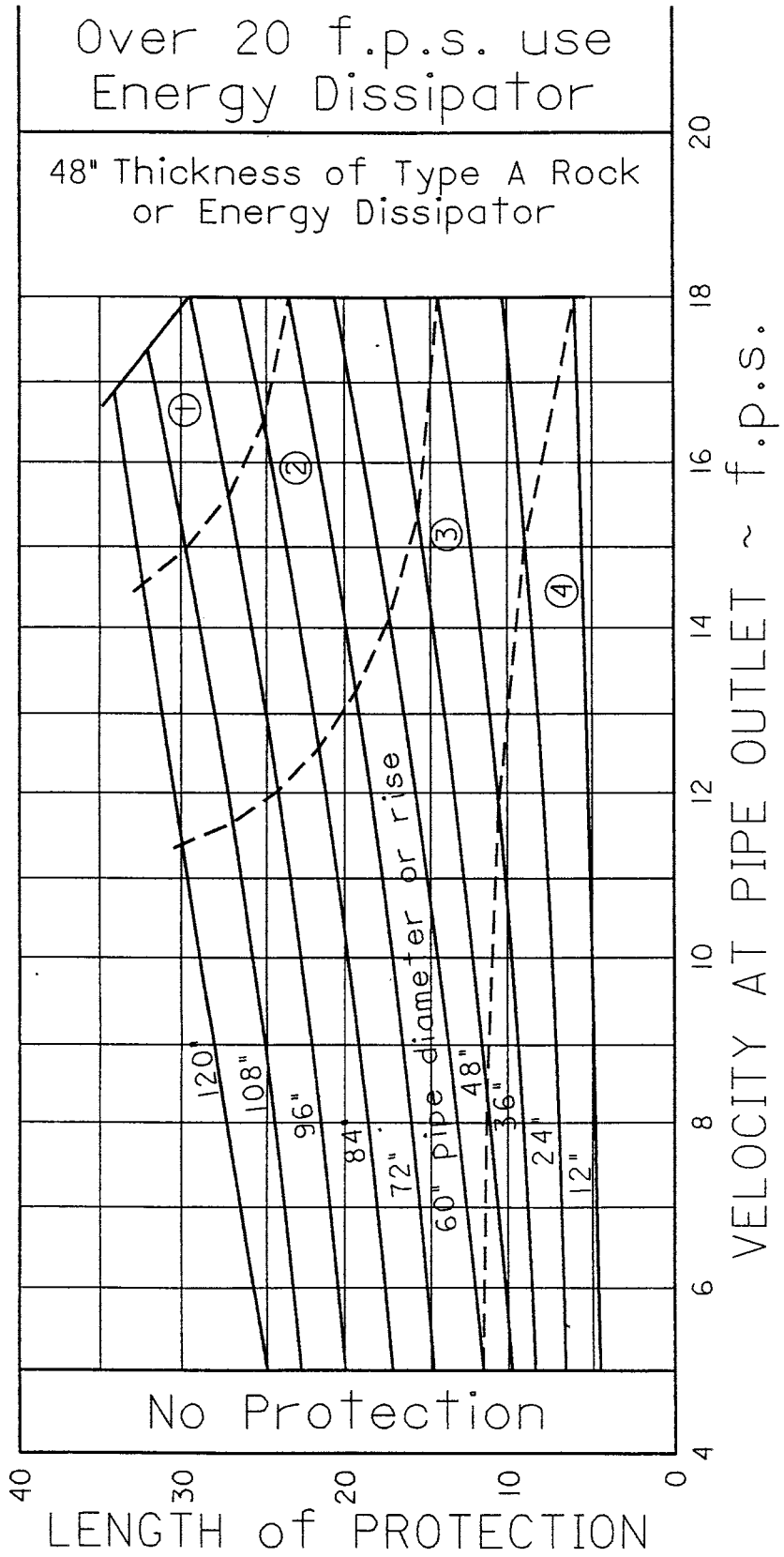



AREA C
Shown in Fig. 1101-3
FREQUENCY IN YEARS
100
50
25
10
5
2
INTENSITY IN INCHES PER HOUR
0
1
2
3
4
5
6
7
8
10
15
20
30
40
60
80
120
180
DURATION IN MINUTES

# ROCK CHANNEL PROTECTION AT CULVERT AND STORM SEWER OUTLETS

1107-1

**REFERENCE SECTION**
1107.2




ROCK TYPE
A
A
B
C

LEGEND
①48" of 18" rock
②36" of 18" rock
③30" of 12" rock
④18" of 6" rock

NOTES

Rock size (6", 12", 18") indicates the square opening on which 85% of the material, by weight, will be retained.

The width of protection shall be the width of the headwall, with 4' being the minimum.

(Where a stream bed will withstand the calculated velocity without erosion, no rock channel protection will be required.)

# MAXIMUM CHANGE IN VERTICAL ALIGNMENT WITHOUT VERTICAL CURVE

**203-2**

REFERENCE SECTION
**203.2**

| DESIGN SPEED | MAX. GRADE CHANGE* |
|---|---|
| 25 | 1.85% |
| 30 | 1.30% |
| 35 | 0.95% |
| 40 | 0.75% |
| 45 | 0.55% |
| 50 | 0.45% |
| 55 | 0.40% |
| 60 | 0.30% |
| 65 | 0.30% |
| 70 | 0.25% |

*ROUNDED TO NEAREST 0.05%

Based on the following formula:

$$A = 46.5\ L / V^2 = 1162.5 / V^2$$

Where: A = Maximum Grade Change
L = Length of Vertical Curve (assume 25')
V = Design Speed

Note: The recommended <u>minimum</u> distance between consecutive deflections is:

100' where design speed > 40 mph
50' where design speed ≤ 40 mph

# CREST VERTICAL CURVES

**203-3**

**REFERENCE SECTION 203.32**

HEIGHT OF EYE 3.50' - HEIGHT OF OBJECT 0.50'

| DESIGN SPEED | SSD | | K | |
|---|---|---|---|---|
| | MIN | PREF | MIN | PREF |
| 20 | 125 | 125 | 12 | 12 |
| 21 | 130 | 130 | 13 | 13 |
| 22 | 135 | 135 | 14 | 14 |
| 23 | 140 | 140 | 15 | 15 |
| 24 | 145 | 145 | 16 | 16 |
| 25 | 150 | 150 | 17 | 17 |
| 26 | 160 | 160 | 19 | 19 |
| 27 | 170 | 170 | 22 | 22 |
| 28 | 180 | 180 | 24 | 24 |
| 29 | 190 | 190 | 27 | 27 |
| 30 | 200 | 200 | 30 | 30 |
| 31 | 205 | 210 | 32 | 33 |
| 32 | 210 | 220 | 33 | 36 |
| 33 | 215 | 230 | 35 | 40 |
| 34 | 220 | 240 | 36 | 43 |
| 35 | 225 | 250 | 38 | 47 |
| 36 | 235 | 265 | 42 | 53 |
| 37 | 245 | 280 | 45 | 59 |
| 38 | 255 | 295 | 49 | 65 |
| 39 | 265 | 310 | 53 | 72 |
| 40 | 275 | 325 | 57 | 79 |
| 41 | 285 | 340 | 61 | 87 |
| 42 | 295 | 355 | 65 | 95 |
| 43 | 305 | 370 | 70 | 103 |
| 44 | 315 | 385 | 75 | 112 |
| 45 | 325 | 400 | 79 | 120 |

| DESIGN SPEED | SSD | | K | |
|---|---|---|---|---|
| | MIN | PREF | MIN | PREF |
| 45 | 325 | 400 | 79 | 120 |
| 46 | 340 | 415 | 87 | 130 |
| 47 | 355 | 430 | 95 | 139 |
| 48 | 370 | 445 | 103 | 149 |
| 49 | 385 | 460 | 112 | 159 |
| 50 | 400 | 475 | 120 | 170 |
| 51 | 410 | 490 | 126 | 181 |
| 52 | 420 | 505 | 133 | 192 |
| 53 | 430 | 520 | 139 | 203 |
| 54 | 440 | 535 | 146 | 215 |
| 55 | 450 | 550 | 152 | 228 |
| 56 | 465 | 570 | 163 | 244 |
| 57 | 480 | 590 | 173 | 262 |
| 58 | 495 | 610 | 184 | 280 |
| 59 | 510 | 630 | 196 | 299 |
| 60 | 525 | 650 | 207 | 318 |
| 61 | 530 | 665 | 211 | 333 |
| 62 | 535 | 680 | 215 | 348 |
| 63 | 540 | 695 | 219 | 363 |
| 64 | 545 | 710 | 223 | 379 |
| 65 | 550 | 725 | 228 | 396 |
| 66 | 565 | 750 | 240 | 423 |
| 67 | 580 | 775 | 253 | 452 |
| 68 | 595 | 800 | 266 | 482 |
| 69 | 610 | 825 | 280 | 512 |
| 70 | 625 | 850 | 294 | 544 |

Using: S = Decision Sight Distance
L = Length of Crest Vertical Curve
A = Algebraic Difference in Grades (%)
K = Rate of Vertical Curvature

- For a given design speed and an "A" value, the calculated length "L" = K x A
- To determine "S" with a given "L" and "A", use the following:

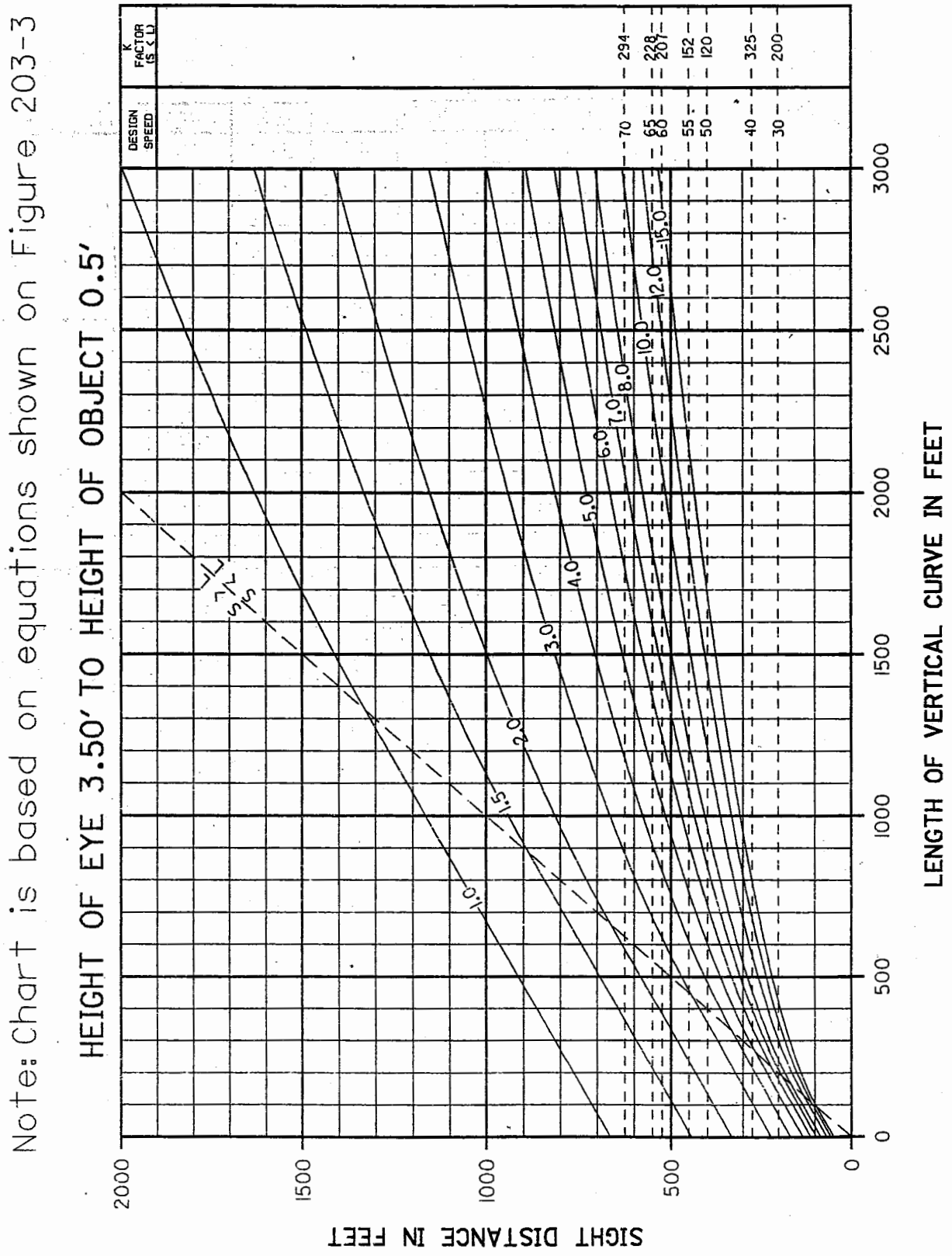
For S<L: $S = 36.45\sqrt{K}$, where $K = L/A$

For S>L: $S = 664.58/A + L/2$

# STOPPING SIGHT DISTANCE CREST VERTICAL CURVES

**203-4**

REFERENCE SECTION
**203.32**



# SAG VERTICAL CURVES

**203-6**

**REFERENCE SECTION 203.33**

HEIGHT OF HEADLIGHT = 2.00'

UPWARD LIGHT BEAM DIVERGENCE = 1° 00'

| DESIGN SPEED | SSD | | K | |
|---|---|---|---|---|
| | MIN | PREF | MIN | PREF |
| 20 | 125 | 125 | 19 | 19 |
| 21 | 130 | 130 | 20 | 20 |
| 22 | 135 | 135 | 21 | 21 |
| 23 | 140 | 140 | 22 | 22 |
| 24 | 145 | 145 | 23 | 23 |
| 25 | 150 | 150 | 24 | 24 |
| 26 | 160 | 160 | 27 | 27 |
| 27 | 170 | 170 | 29 | 29 |
| 28 | 180 | 180 | 31 | 31 |
| 29 | 190 | 190 | 34 | 34 |
| 30 | 200 | 200 | 36 | 36 |
| 31 | 205 | 210 | 38 | 39 |
| 32 | 210 | 220 | 39 | 41 |
| 33 | 215 | 230 | 40 | 44 |
| 34 | 220 | 240 | 41 | 46 |
| 35 | 225 | 250 | 43 | 49 |
| 36 | 235 | 265 | 45 | 53 |
| 37 | 245 | 280 | 48 | 57 |
| 38 | 255 | 295 | 50 | 61 |
| 39 | 265 | 310 | 53 | 65 |
| 40 | 275 | 325 | 56 | 69 |
| 41 | 285 | 340 | 58 | 71 |
| 42 | 295 | 355 | 61 | 77 |
| 43 | 305 | 370 | 63 | 81 |
| 44 | 315 | 385 | 66 | 85 |
| 45 | 325 | 400 | 69 | 89 |

| DESIGN SPEED | SSD | | K | |
|---|---|---|---|---|
| | MIN | PREF | MIN | PREF |
| 45 | 325 | 400 | 69 | 89 |
| 46 | 340 | 415 | 71 | 93 |
| 47 | 355 | 430 | 77 | 97 |
| 48 | 370 | 445 | 81 | 101 |
| 49 | 385 | 460 | 85 | 105 |
| 50 | 400 | 475 | 89 | 109 |
| 51 | 410 | 490 | 92 | 114 |
| 52 | 420 | 505 | 94 | 118 |
| 53 | 430 | 520 | 97 | 122 |
| 54 | 440 | 535 | 100 | 126 |
| 55 | 450 | 550 | 103 | 130 |
| 56 | 465 | 570 | 107 | 136 |
| 57 | 480 | 590 | 111 | 141 |
| 58 | 495 | 610 | 115 | 147 |
| 59 | 510 | 630 | 119 | 152 |
| 60 | 525 | 650 | 123 | 158 |
| 61 | 530 | 665 | 125 | 162 |
| 62 | 535 | 680 | 126 | 166 |
| 63 | 540 | 695 | 127 | 171 |
| 64 | 545 | 710 | 129 | 175 |
| 65 | 550 | 725 | 130 | 179 |
| 66 | 565 | 750 | 134 | 186 |
| 67 | 580 | 775 | 138 | 193 |
| 68 | 595 | 800 | 143 | 200 |
| 69 | 610 | 825 | 147 | 207 |
| 70 | 625 | 850 | 151 | 214 |

Using: S = Stopping Sight Distance

L = Length of Sag Vertical Curve

A = Algebraic Difference in Grades (%)

K = Rate of Vertical Curvature

- For a given design speed and an "A" value, the calculated length "L" = K x A
- To determine "S" with a given "L" and "A", use the following:

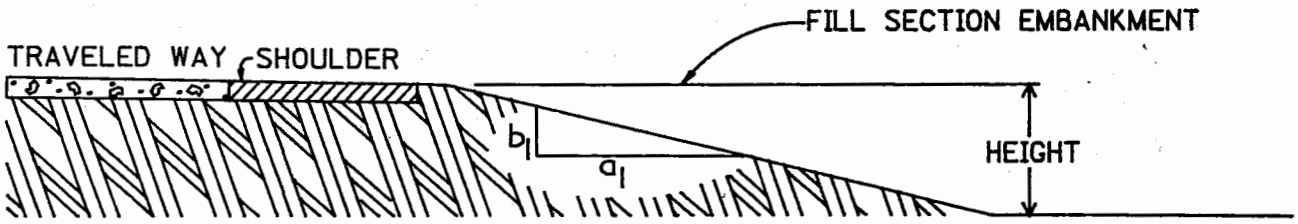
For S<L: $S = \dfrac{3.5L + \sqrt{12.25L^2 + 1600AL}}{2A}$

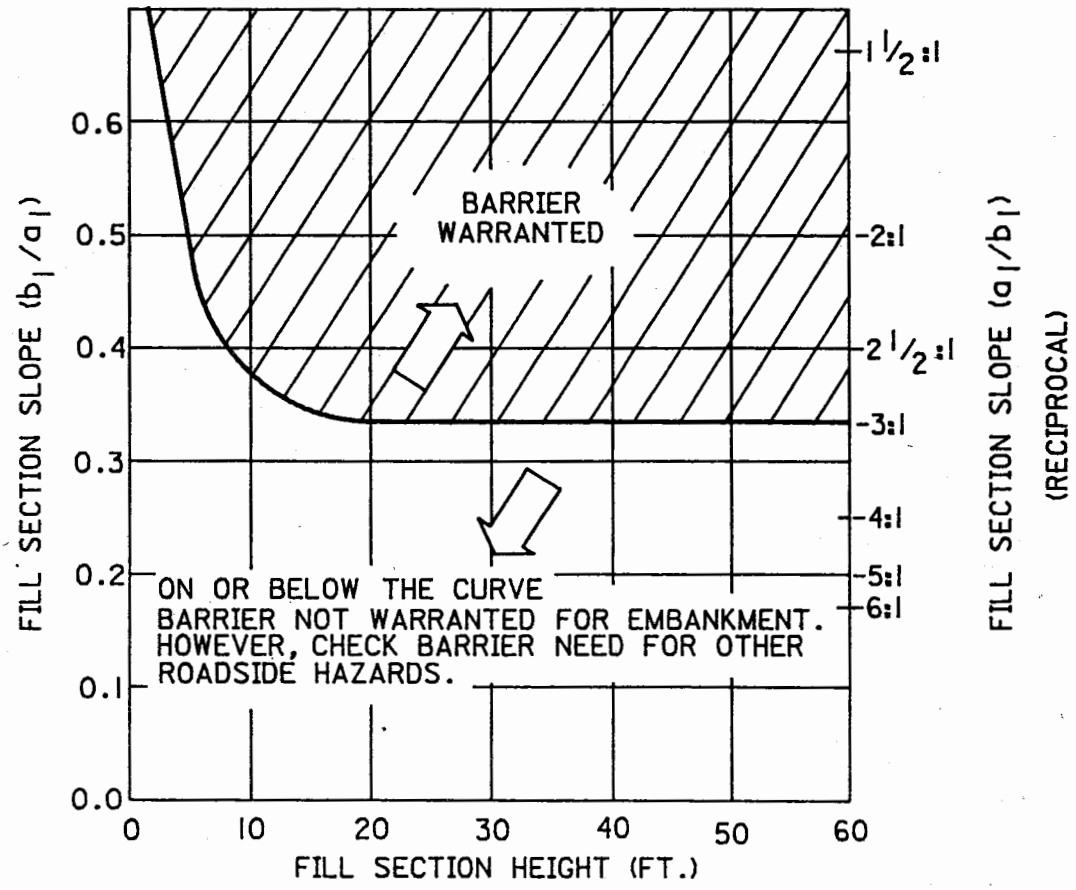
For S>L: $S = (AL + 400)/(2A - 3.5)$

# BARRIER WARRANTS FOR EMBANKMENTS

601-3

REFERENCE SECTION 601.2



# A P P E N D I X  B

# S T A N D A R D
# C O N S T R U C T I O N
# D R A W I N G S

**O.D.O.T. STANDARD DRAWINGS**
**CLARK COUNTY STANDARD DRAWINGS**

Following is a list of standard 11" x 17" drawings developed by the Ohio Department of Transportation and the Clark County Engineer. These drawings shall be included, where pertinent, with the detailed construction plans for any proposed development. Copies of these drawings may be obtained from O.D.O.T. or from the Clark County Engineer's Office for a nominal fee.

BP – 3.1
BP – 4.1
F – 1
F – 6
GR – 1.1
GR – 1.2
GR – 1.3
GR – 2.1
GR – 4.2

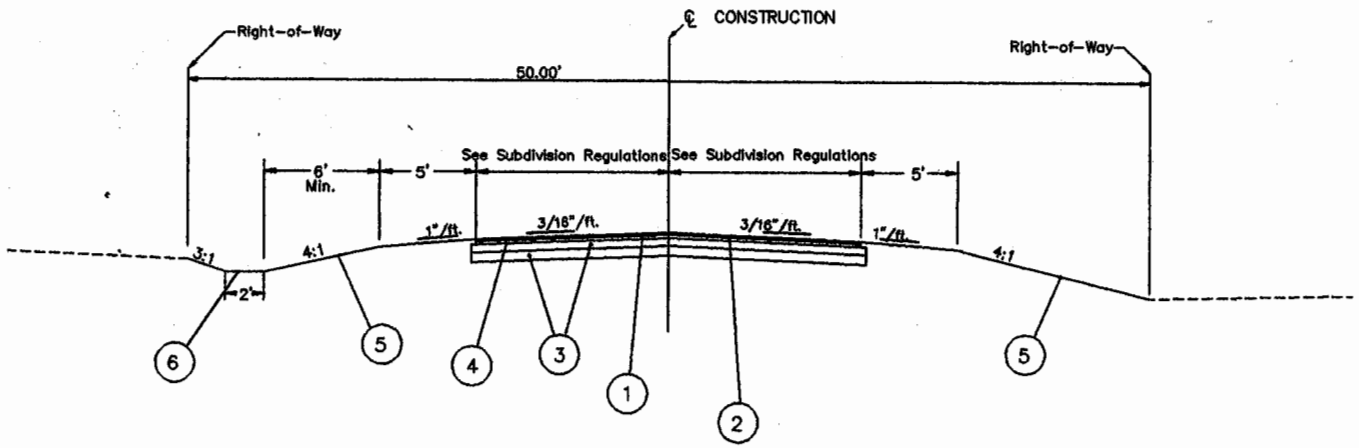
MC – 1
CB – 2-2-A & B
HW – 4B
MC – 4
MC – 8
MC – 11
MH – 3

WATER LINE DETAILS
WATERLINE NOTES
SANITARY SEWER NOTES

Clark County reserves the right to require inclusion of other standard drawings that may be pertinent to a particular improvement.

TYPICAL CROSS SECTION

50' STREET




## Full Depth Normal Section

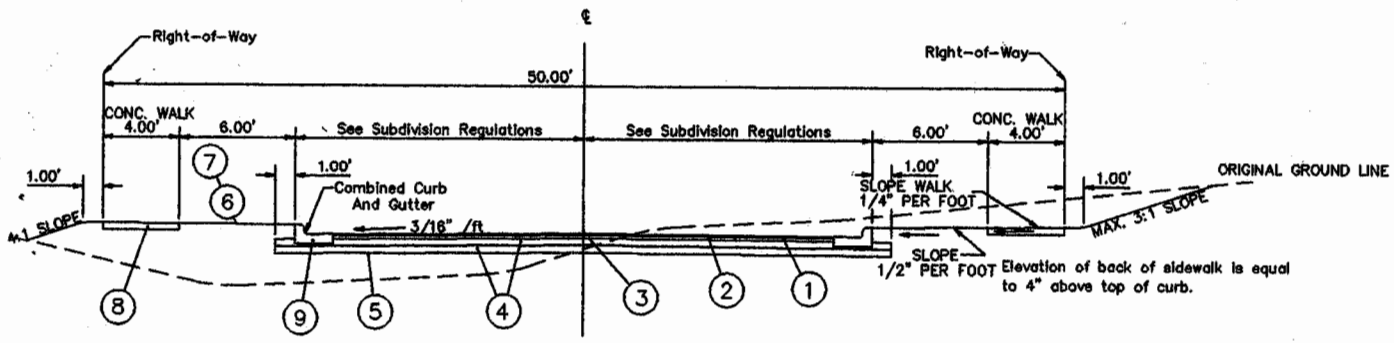
1. Item 404 – 1" Asphalt Concrete, AC–20
2. Item 402 – 2" Asphalt Concrete, AC–20
3. Item 304 – 9" Aggregate Base – 2 Lifts
4. Item 408 – Prime Coat @ 0.50 Gal./Sq. Yd.
5. Item 659 – Seeding and Mulching
6. Item 660 – Sodding – 4' Wide

NOTES:

1. Item 404 Asphalt Concrete shall not be applied until Item 402 Asphalt Concrete has been in place at least 9 months. Any Item 402 deterioration or settlement that has developed during this period shall be removed and replaced before the Item 404 course is applied, under the supervision and inspection by the Clark County Engineer.
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.

TYPICAL CROSS SECTION

50' CURBED STREET




(1) Item 404 – 1" Asphalt Concrete AC–20 to be applied 9 months after 402 course is applied.

(2) Item 402 – 2" Asphalt Concrete AC–20 at end of 24 hours after 408.

(3) Item 408 – Prime Coat MC–30 or RT 2 at 0.50 Gal. per sq. yd. to be applied immediately after 304.

(4) Item 304 – Aggregate Base – 2 – 4 1/2" Lifts

(5) Item 203 – Subgrade Compaction

(6) Item 659 – Seeding and Mulching

(7) Item 659 – Commercial Fertilizer

(8) Item 608 – Concrete Walk 4"

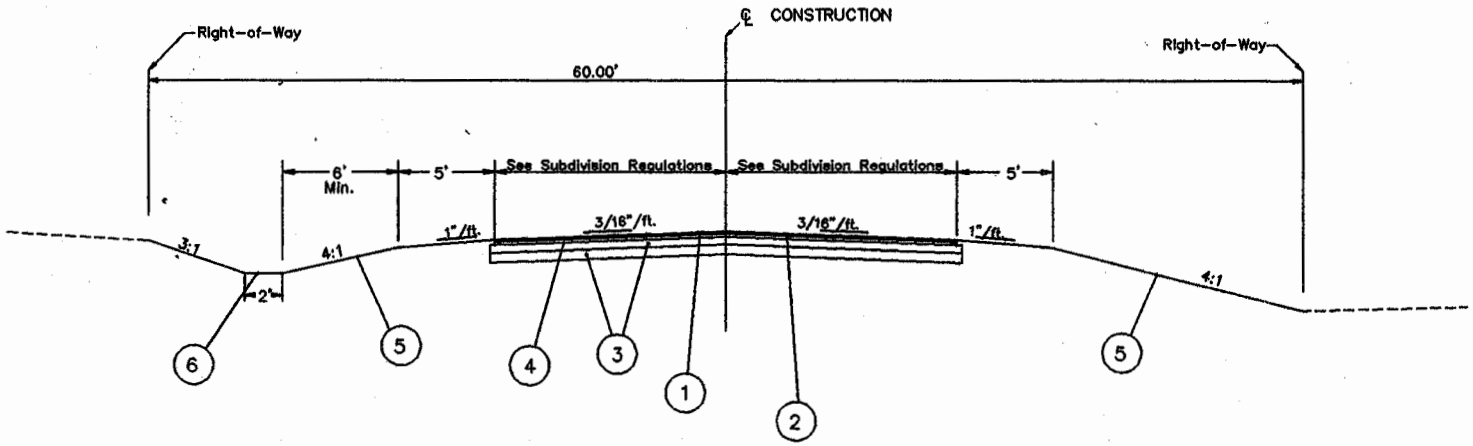
(9) Item 609 – Concrete Curb and Gutter – Type 3

NOTES:

1. Item 404 Asphalt Concrete shall not be applied until Item 402 Asphalt Concrete has been in place at least 9 months. Any Item 402 deterioration or settlement that has developed during this period shall be removed and replaced before the Item 404 course is applied, under the supervision and inspection by the Clark County Engineer.
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.

TYPICAL CROSS SECTION

60' STREET




## Full Depth Normal Section

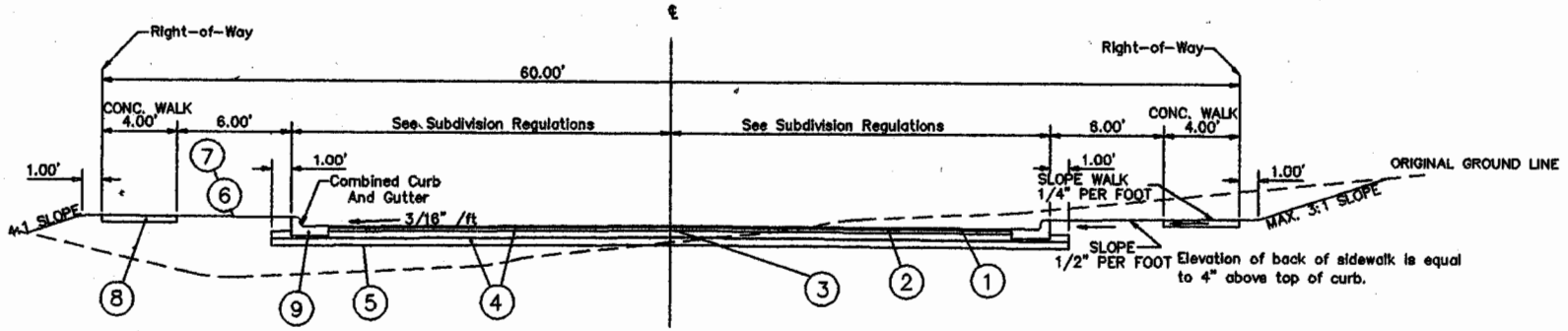
(1) Item 404 – 1 1/4" Asphalt Concrete,AC–20
(2) Item 402 – 2 1/2" Asphalt Concrete,AC–20
(3) Item 304 – 10" Aggregate Base – 2 Lifts
(4) Item 408 – Prime Coat @ 0.50 Gal./Sq. Yd.
(5) Item 659 – Seeding and Mulching
(6) Item 660 – Sodding – 4' Wide

NOTES:

1. Item 404 Asphalt Concrete shall not be applied until Item 402 Asphalt Concrete has been in place at least 9 months. Any Item 402 deterioration or settlement that has developed during this period shall be removed and replaced before the Item 404 course is applied, under the supervision and inspection by the Clark County Engineer.
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.

TYPICAL CROSS SECTION

60' CURBED STREET




(1) Item 404 – 1-1/4" Asphalt Concrete AC-20 to be applied 9 months after 402 course is applied.

(2) Item 402 – 2-1/2" Asphalt Concrete AC-20 at end of 24 hours after 408.

(3) Item 408 – Prime Coat MC-30 or RT 2 at 0.50 Gal. per sq. yd. to be applied immediately after 304.

(4) Item 304 – Aggregate Base – 2 – 5" Lifts

(5) Item 203 – Subgrade Compaction

(6) Item 659 – Seeding and Mulching

(7) Item 659 – Commercial Fertilizer

(8) Item 608 – Concrete Walk 4"

(9) Item 609 – Concrete Curb and Gutter – Type 3

NOTES:

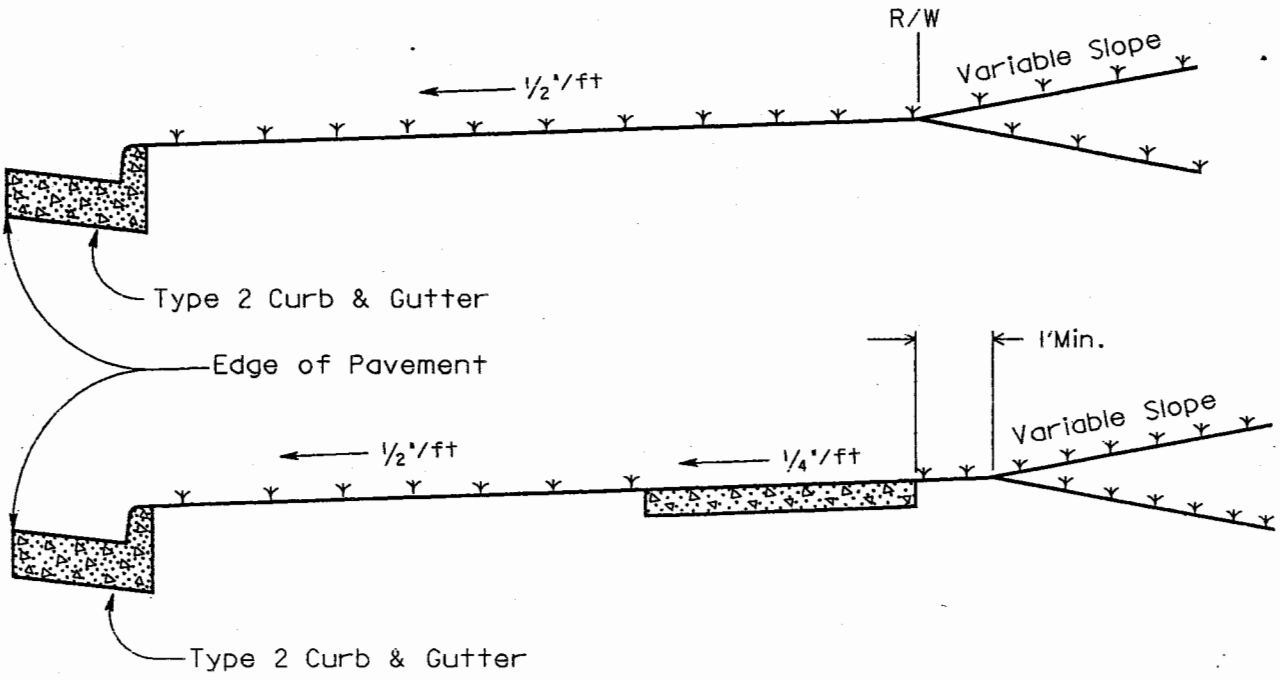
1. Item 404 Asphalt Concrete shall not be applied until Item 402 Asphalt Concrete has been in place at least 9 months. Any Item 402 deterioration or settlement that has developed during this period shall be removed and replaced before the Item 404 course is applied, under the supervision and inspection by the Clark County Engineer.
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.

October 1992

# SLOPE TREATMENT ADJACENT TO CURBED STREETS

**307-6**

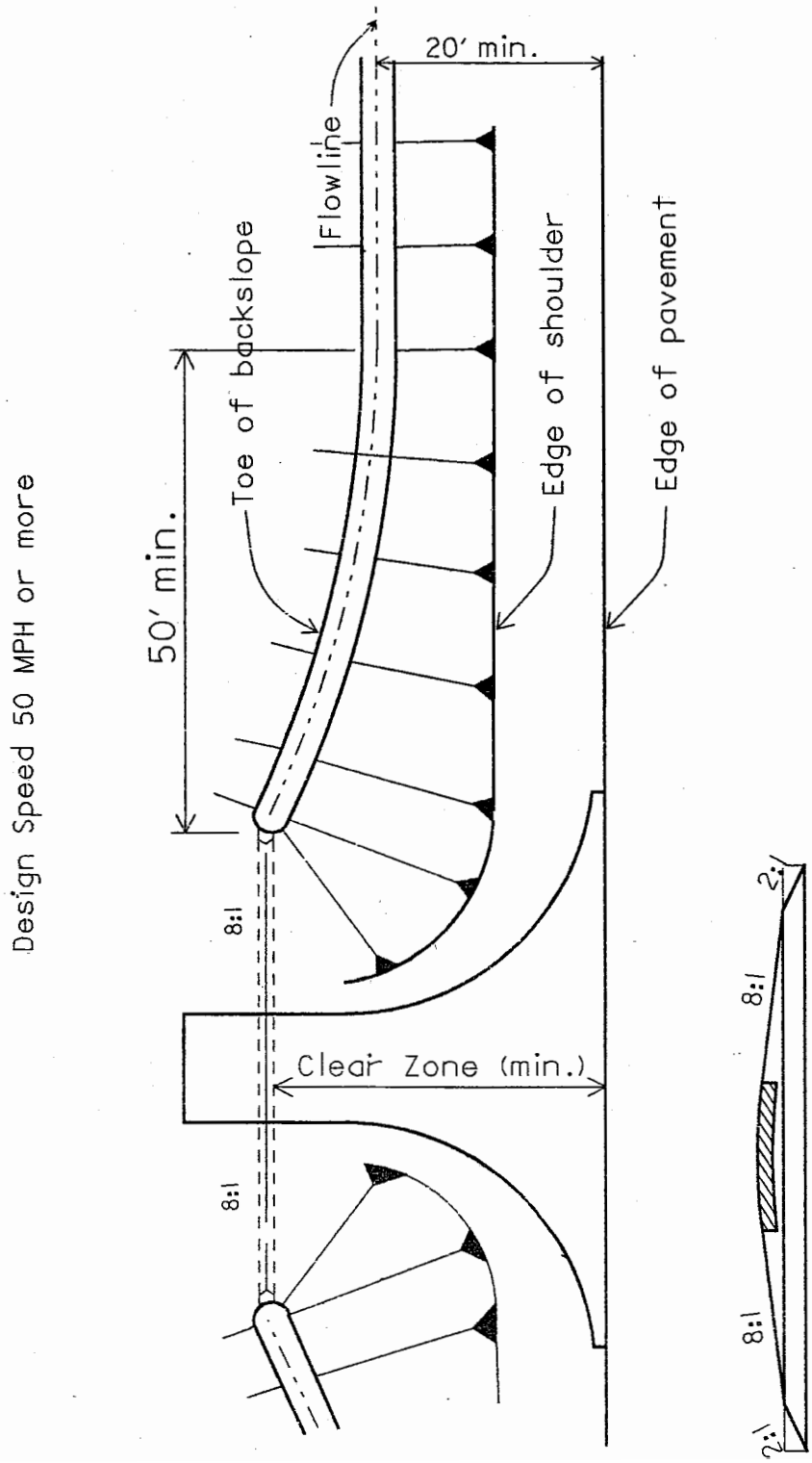
REFERENCE SECTION
**307.26**



# SLOPES AND DITCHES AT DRIVEWAYS AND CROSSROADS IN CUT OR LOW FILL

**307-7**

REFERENCE SECTION
307.27

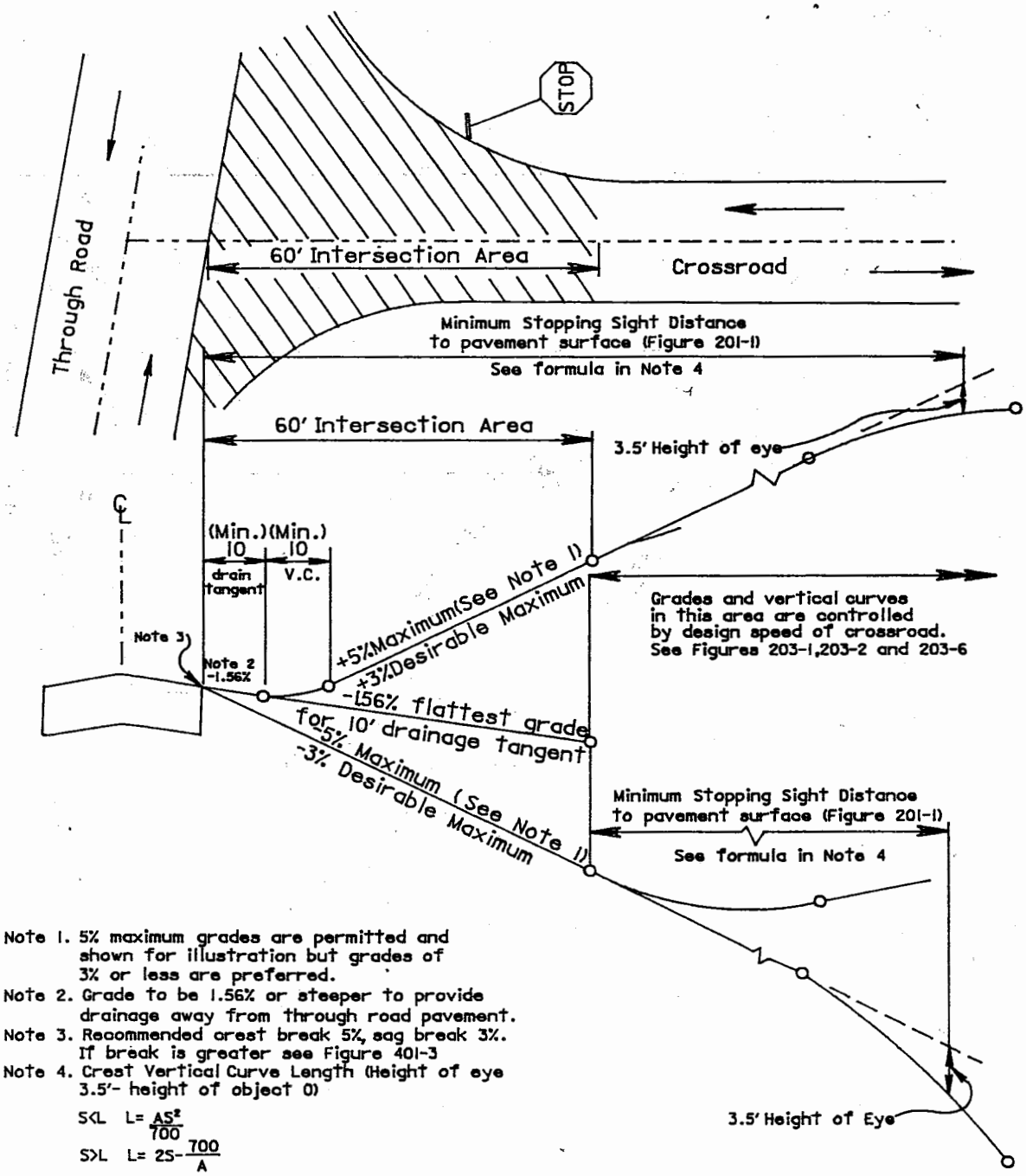



To be used on clear zone grading projects where the roadside ditch flowline is located within the clear zone distance

# CROSSROAD PROFILE -STOP CONDITION- THROUGH ROAD NORMAL CROWN

401-2

REFERENCE SECTION 401.41-.44




Note 1. 5% maximum grades are permitted and shown for illustration but grades of 3% or less are preferred.

Note 2. Grade to be 1.56% or steeper to provide drainage away from through road pavement.

Note 3. Recommended crest break 5%, sag break 3%. If break is greater see Figure 401-3

Note 4. Crest Vertical Curve Length (Height of eye 3.5'- height of object 0)

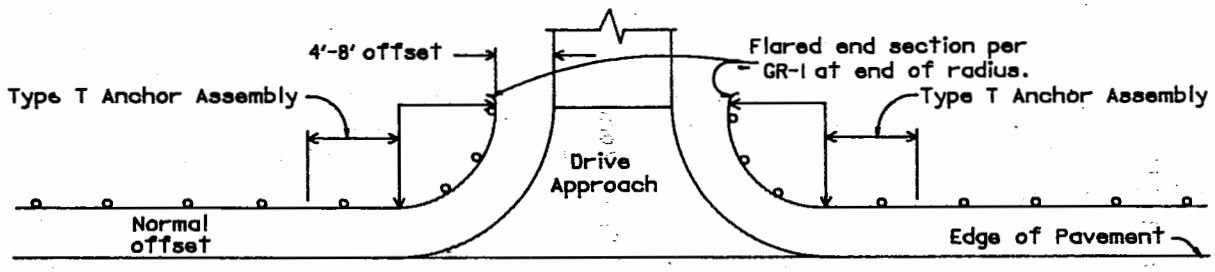
$S<L \quad L = \frac{AS^2}{700}$

$S>L \quad L = 2S - \frac{700}{A}$

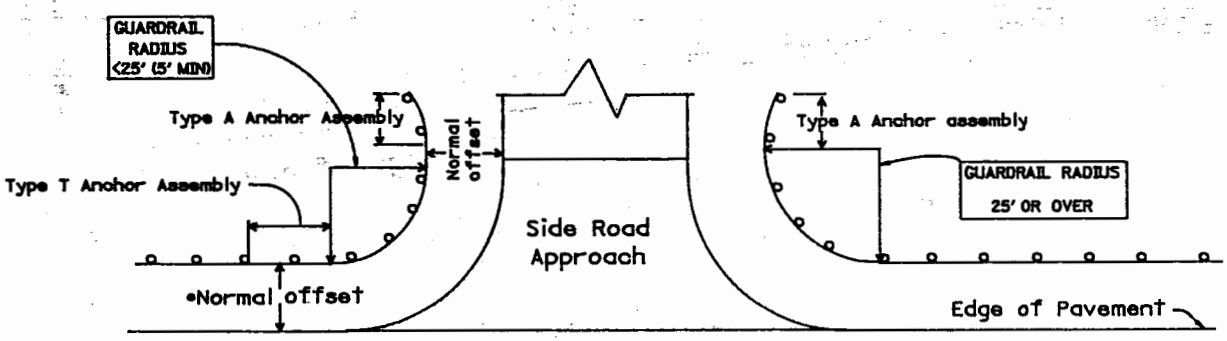
# DRIVE AND SIDE ROAD GUARDRAIL OPENINGS

601-9

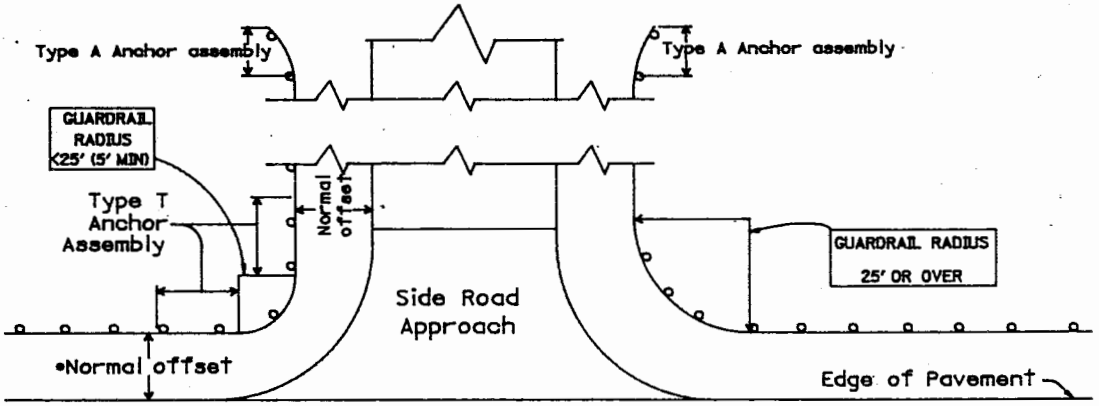
REFERENCE SECTION 601.7




## DRIVE GUARDRAIL OPENING




## SIDE ROAD GUARDRAIL OPENING

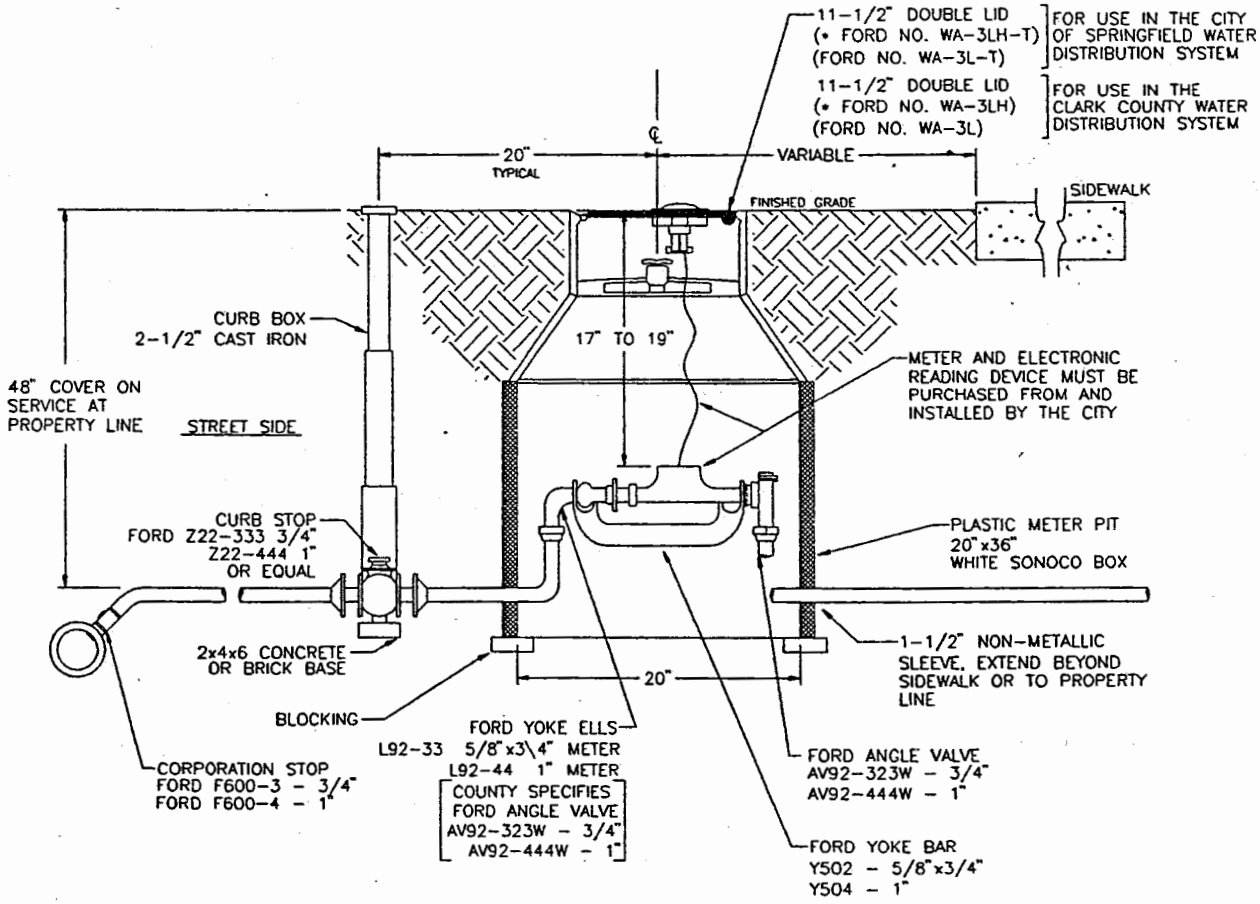



## SIDE ROAD GUARDRAIL OPENING WHERE GUARDRAIL EXTENDS ALONG SIDE ROAD

• See Figure 201-4 for Side Road guardrail offset treatment.

# CLARK COUNTY
AND
# THE CITY OF SPRINGFIELD
# INSTALLATION DETAIL
FOR
# RESIDENTIAL WATER METERS & BOXES

JAN. 23, 1995




1. CURB STOP, CURB BOX AND METER PIT TO BE LOCATED BETWEEN CURB AND SIDEWALK.
2. WATER METER SERVICE FEE MUST BE PAID BEFORE METER WILL BE INSTALLED.
3. WATER METER SETTING MUST BE PROBERLY INSTALLED AND FINAL PLUMBING INSPECTION COMPLETED BEFORE METER WILL BE INSTALLED AND SERVICE TURNED ON.
4. PLANS FOR LARGER THAN 1" SERVICES MUST BE SUBMITTED FOR APPROVAL.
   OR USE FORD COPPER SETTER 1-1/2" AND 2" 70 SERIES
   1.5" - VBH - 76 - 24B - 11 - 66 - HB OR LB
   2.0" - VBH - 77 - 24B - 11 - 77 - HB OR LB
   METER BOX 30x30
   FORD MONITOR COVERLID # MC - 30 - T

(*). FOR USE IN AREAS OF TRAFFIC, DETERMINED BY THE WATER DEPT.