

PUBLIC IMPROVEMENT SPECIFICATIONS

**PREPARED FOR:
TOWN OF BROOKLYN, CT**

PUBLIC IMPROVEMENT SPECIFICATIONS

2007 Edition

This report provides standards and requirements for roadways, sidewalks, storm drainage systems, etc. It provides standards for materials used in road construction. It serves as a guide for municipalities and their public works departments. This publication was originally conceived and prepared by Terence P. Chambers, P.E. and was funded with a grant from the Federal Highway Administration to the Northeastern Connecticut Regional Planning Agency.

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PUBLIC IMPROVEMENT SPECIFICATIONS

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PUBLIC IMPROVEMENT SPECIFICATIONS

1.0 GENERAL REQUIREMENTS

1.1. PURPOSE

These Public Improvements Specifications are established in order to regulate and require the construction of public improvements within as required by the Subdivision Regulations.

All public improvements shall be constructed as set forth herein.

Section 1.3 of these specifications details requirements for new subdivision construction and public works which are included in any development approved by the Commission.

Section 1.4 of these specifications details requirements for public works improvements on existing Town roads, including subdivision or development of any tract, lot or parcel abutting an existing street.

1.2 REFERENCE TO RELATED CODES, MANUALS, REGULATIONS, ORDINANCES

These specifications require that certain and specific works shall be constructed, installed or otherwise implemented or provided as public works, and such certain and specific works shall be in accordance with the type of construction and specifications set forth in any code, manual regulation or ordinance which is referred to for any particular construction, installation, implementation or provision set forth in these specifications.

In all cases, materials, methods of construction and workmanship shall be in strict accordance with "State of Connecticut, Department of Transportation Standard Specifications for Roads, Bridges and Incidental Construction" Form 816, 2004 or latest edition.

All design of roadways shall be in strict accordance with American Association of Street Highway and Transportation Officials "A Policy on Geometric Design of Streets and Highways", 1990 or latest edition.

1.3 REQUIREMENTS FOR NEW SUBDIVISION CONSTRUCTION

All construction shall be required by these specifications.

1.3.1 CLASSIFICATION

Proposed roads shall be classified by the Commission as to Local or Collector status. Right of way are given for each in Figure No. 1.

1.3.2 ROADWAY

All roads shall be constructed of bituminous concrete, processed aggregate base and gravel subbase. Requirements are detailed in paragraph 2.0. and Figure Number 1.

1.3.3 STREET CURBS

All street curbing shall be constructed of bituminous concrete (cape cod berm) or, where deemed necessary by the Commission because of anticipated traffic type or volume, granite or Portland cement concrete.

1.3.4 SIDEWALKS

Sidewalks shall be constructed along one side of proposed roadways and shall be constructed of Portland cement concrete.

1.3.5 STORM DRAINAGE

Storm drainage shall be constructed in all new roadways. Drainage pipe shall be reinforced concrete or corrugated polyethylene with a smooth interior, minimum diameter 15". When ground water or wet conditions are encountered, underdrains shall be utilized. Test borings shall be made to determine subsurface conditions at the discretion of the Commission or its designated agent. If ground water conditions appear after construction commences, an underdrain shall be required in accordance with the requirements of the Commission or its designated agent.

1.3.6 SEDIMENT BASIN

Before construction commences, sediment basins shall be constructed to protect against the silting of downstream water courses. During construction, other erosion control measures such as baled hay shall be installed and maintained to prevent soil loss. All designs for sediment basins and specifications for other erosion control measures shall be based on the Connecticut Council on Soil and Water Conservation's "2002 Connecticut Guidelines for Soil Erosion and Sediment Control", and as

amended. All sediment basin design shall be as approved by the Commission or its designated agent.

1.3.7 DETENTION BASINS

In the event a detention basin is required as part of the storm water drainage system, the design of the detention basin shall be based upon a detailed hydrologic investigation utilizing the Soil Conservation Services TR-20 methodology. Detention basins with drainage areas in excess of 5 acres shall be sized to accommodate a 100-year design storm. Those with drainage areas of less than 5 acres shall be sized for a 50-year storm event.

1.4 PUBLIC IMPROVEMENTS REQUIRED ON EXISTING STREETS

Where development takes place on any tract, lot or parcel abutting an existing street, the owner of such tract, lot or parcel shall make improvements to the street as set forth in this section.

1.4.1 ROADWAY IMPROVEMENTS

The roadway along the tract, lot or parcel frontage containing the development shall be widened and constructed to minimum street widths and standards as shown on Figure Number 7.

1.4.2 STREET CURBS

All streets shall have curbing, except where it is deemed unnecessary by the Commission or its designated agent.

- a. All street curbing shall be constructed of bituminous concrete (cape cod berm) or, at the discretion of the Commission, granite or Portland cement concrete.
- b. All curbs on temporary cul-de-sac turnabout circles shall be constructed of bituminous concrete.
- c. Where curb exists on an existing street but is not up Town Standards due to material, material deficiencies, alignment, curb reveal, or other conditions which do not conform with Standard Details, the existing curb shall be removed and curb shall be furnished and placed to conform with these Standard Details.

1.4.3 SIDEWALKS

Sidewalks shall be provided on one side of the roadway in areas of substantial residential concentration, areas of any retail commercial development, and any area within fifteen hundred (1500) feet of a school, library or other public building.

- a. All sidewalks shall be constructed of Portland cement concrete along the entire frontage of the tract, lot or parcel on that side of the road deemed by the Commission as having the higher density of residential or commercial development or concentration of public facilities.
- b. Where a sidewalk exists on an existing street but does not meet Town Standards due to material, material deficiencies, alignment, grade, or other conditions which do not conform with these Standard Details, the existing sidewalk shall be removed and reconstructed to conform with these Standard Details.

1.4.4. STORM DRAINAGE

Storm drainage shall be installed along the frontage of the tract, lot or parcel when required by the Board or its agent. Drainage pipe shall be reinforced concrete or corrugated polyethylene with a smooth interior. When ground water or wet conditions are encountered, perforated pipe shall be utilized. Test borings shall be made to determine subsurface conditions at the discretion of the Commission or its designated agent. If ground water conditions appear after construction commences, an underdrain shall be installed in accordance with the requirements of the Commission or its designated agent.

1.4.5 SEDIMENT BASINS

Before construction commences sediment basins shall be constructed to protect against the silting of downstream watercourses. During construction, other erosion control measures such as baled hay shall be installed and maintained to prevent soil loss. All designs for sediment basins and specifications for other erosion control measures shall be based on the Connecticut Council on Soil and Water Conservation's "2002 Connecticut Guidelines for Soil Erosion and Sediment Control", and as amended.

All sediment basin design shall be approved by the Commission or its designated agent.

1.4.6 DETENTION BASINS

The construction of detention basins or seepage basins or wells may be required by the Commission or its designated agent as part of the storm drainage system if hydraulic calculations indicate that downstream drainage systems do not have the capacity for increased volume and/or velocity.

The design of all detention basins shall be as approved by the Commission or its designated agent.

1.5 PUBLIC IMPROVEMENTS REQUIRED ON UNIMPROVED TOWN ROADS

Whenever a subdivision in excess of four lots is proposed for any tract, lot or parcel abutting or accessible only by an existing unimproved road the owner of such tract, lot or parcel shall make improvements to the road surface and storm drainage as deemed necessary by the Commission or its designated agent.

2.0 ROADWAY DESIGN AND CONSTRUCTION REQUIREMENTS

2.1 INSPECTIONS

Inspections shall be performed by the Board or the Board's designated agent to ascertain conformance to these specifications.

2.1.1 ROUTINE INSPECTIONS

All site improvements to be dedicated to the Town shall be inspected by the Board or the Board's designated agent to insure satisfactory completion.

In no case shall the Applicant perform any paving work without permission from the First Selectman's Office or the Board's designated agent. The Applicant shall notify the First Selectman or the Board's designated agent at least forty-eight (48) hours before the Applicant is to undertake construction of gravel base course or premixed bituminous base so that a representative of the Town may be present at the time the work is to be done. The construction of streets and storm drainage shall conform to the Specifications and Standard Details set forth in these Regulations. Failure to notify the First Selectman's Office or the Board's designated agent forty-eight (48) hours in advance of performing work will result in the Town not approving work performed.

2.1.2 FINAL INSPECTION

A final inspection of all improvements and utilities shall be made to determine whether the work is satisfactory and in substantial agreement with the approved final engineering drawings and these specifications. The Applicant shall file with the Town certified plans and profiles entitled “As-Built-Drawings” that show the actual location of the installation of all improvements. Upon a satisfactory final inspection report, action shall be taken to release the performance bond covering such improvements and utilities.

2.2 STANDARDS AND SPECIFICATIONS FOR ROAD CONSTRUCTION

The Applicant shall construct the road in conformity with the Road Cross Section, Figure Number 1, other Detail Sheets and Design Criteria. All materials and construction methods shall conform to “State of Connecticut Department of Transportation Standard Specifications for Roads, Bridges and Incidental Construction, Form 816”, 2004 or latest revision.

2.2.1 CONSTRUCTION OF SUBGRADE AND SURFACING COURSES

When constructing the subgrade, all loam, trees, roots, boulders, and ledges shall be removed from the street site. The street site shall be excavated below profile grade to a depth determined by the particular roadway section to be used, but, in no case shall this depth be less than eighteen (18) inches below the finished grade of the pavement for the full width of the street. All soft spots shall be replaced with gravel subbase and the entire subgrade shall be compacted before placing gravel base courses. The subgrade shall be surfaced with rolled gravel subbase and processed aggregate base using the compacted depths shown on the Road Cross Section, Figure Number 1. Base and subbase materials shall meet the requirements of ConnDOT Form 816 Section M.02.06 grading “C” and M.05.01. Each course shall be compacted with a vibratory roller weighing at least ten (10) tons, or an equivalent mean of compaction to achieve at least a 95 percent maximum dry density.

2.2.2 BITUMINOUS CONCRETE BINDER COURSE

All house services, including gas, sanitary sewer, water, electric and telephone shall be constructed previous to the installation of the bituminous concrete base course. In all instances the bituminous concrete binder course shall be a minimum of one and one-half (1 ½) inches in depth after compaction. See Road Cross Section, Figure Number 1.

2.2.3 BITUMINOUS CONCRETE SURFACE COURSE

The top surface course shall consist of bituminous concrete, applied with a paving machine and rolled to a one and one-half (1 ½) inch compacted depth in compliance with Figure Number 1.

2.2.4 SIDEWALKS, CURBS AND DRIVEWAY ENTRANCE

Driveways, concrete sidewalks, bituminous concrete Cape Cod berm, granite curb and concrete curb shall be installed in accordance with the Standards and Specifications as set forth in the these Regulations. See Figures Number 2 and 3 for Sidewalk and Curb Details and Figures Number 4 and 5 for Driveway and Driveway Opening Details, respectively.

2.2.5 LOAMING – SEEDING – FERTILIZING

The Applicant shall place four (4) inches of loam on the grass strip and side slopes and spread limestone, fertilizer, grass seed and mulch in accordance with Standards and Specifications for such, as contained in the Connecticut Council on Soil and Water Conservation's "2002 Connecticut Guidelines for Soil Erosion and Sediment Control", as amended. The establishment of permanent grass cover shall be the responsibility of the Applicant.

2.2.6 MONUMENTATION

Concrete monuments or merestones shall be installed by the Applicant in accordance with the plans as approved. These monuments shall be set to the finished grade of the streets on the property line, right angles to and opposite the point of curve and point of tangency of all curves, street intersections and other points designated by the Town. Iron pins as called for in the Subdivision Regulations shall be set at the property corners of proposed lots. Concrete monuments, merestones and pins shall conform to the Standard Detail Sheet, Figure Number 3. The location of all monuments shall be indicated on the as-built plan to the satisfaction of the Town. Bound stones shall be furnished by the Developer; they must be installed and their accuracy certified by a Land Surveyor registered in the State of Connecticut.

2.3 TYPICAL CROSS SECTION AND STANDARD DETAILS

The following Typical Cross Section and Standard Detail Sheets are a part of these regulations:

<u>Figure Number</u>	<u>Description</u>
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1	Road Cross Section
2	Sidewalk and Curb Details
3	Curb and Monumentation Details
4	Residential Driveway Details
5	Residential Driveway Details
6	Typical Intersection Details
7	Improvements to Existing Town Roads
8	Typical Cul-de-sac
9	Details for Sight Distance and Grade Intersections
10	Crest Vertical Curves
11	Sag Vertical Curves
12	Superelevation Chart and Transition Detail

2.3.1 SPECIFICATIONS FOR STREET IMPROVEMENTS

All construction details shown on the Typical Cross Sections, Standard Details are made a part of these Regulations and shall conform to “State of Connecticut Department of Transportation Standard Specifications for Roads, Bridges and Incidental Construction, Form 816”, 2004 as amended.

2.3.2 HORIZONTAL DESIGN CRITERIA

The following standards shall be used:

Minimum pavement radii for intersections:

Local road intersecting local road – 20-foot radius

Local road intersecting collector road – 25-foot radius

All arterial intersections – 30 foot radius

See Typical Intersection Details, Figure Number 6.

When the intersection angle is greater than 90 degrees and/or the turning speed greater than twenty (20) miles per hour, the length of the turning radius shall be increased.

In designing horizontal curves, the Engineer shall use flat curves; this is particularly true of highway intersections where sight distance along both highways is important. Reverse horizontal curves are to be avoided; curves shall be connected with a minimum tangent of one hundred (100) feet between curves. Horizontal alignment of roadways shall be designed in accordance with AASHTO’s “A Policy on Geometric Design of Highways and Streets” 1990, or latest edition.

2.3.3 INTERSECTION DESIGN

- a. Except where impracticable because of topography or other conditions, all streets shall join each other so that for a distance of at least one hundred (100) feet, the street is at a 90 degree angle to the street it joins.
- b. No more than two streets shall intersect or meet at any one point.
- c. No street shall intersect or meet at an angle of less than 60 degrees.
- d. The centerline of all crossroads shall pass through a single point.
- e. Except for crossroads designed in accordance with Section 2.3.3.d. no point of intersection of any local road shall be closer than one hundred fifty (150) feet from an intersection on the opposite side of the road.

2.3.4 STREET PROFILES AND GRADIENTS

The roadway design shall blend harmoniously with the existing terrain. Profile gradients of over twelve (12) percent are not desirable and will not be approved. No road shall be constructed having gradient of less than one (1) percent except at low points. Under certain conditions, a lesser gradient may be employed with the approval of the Commission. A smooth profile with gradual changes shall be striven for in preference to a line with numerous breaks and short lengths or grades. The gradient through street intersections shall not exceed three (3) percent for a distance of one hundred fifty (150) feet from the centerline intersection.

2.3.5 VERTICAL DESIGN CRITERIA

At all changes in gradients, in a vertical curve shall be provided. The minimum length of vertical curve shall be one hundred (100) feet. As speed increases from thirty (30) to fifty-five (55) miles per hour, the minimum stopping sight distance varies from two hundred (200) to five hundred (500) feet, on summit vertical curve. See Figure Number 10 for Crest Vertical Curves and Figure Number 11 for Sag Vertical Curves. Select vertical curves for next larger fifty (50) or one hundred (100) foot station.

2.3.6 SUPERELEVATION

See Figure Number 12 for superelevation rate and method of application.

2.3.7 DESIGN OF IMPROVEMENTS

All plans for new roads and improvements to existing roads shall be prepared and sealed by a Professional Engineer registered in the State of Connecticut.

2.3.8 DRIVEWAYS

All driveway construction shall conform to the Standard Details (See figures 4 and 5). Driveways shall be paved with a minimum thickness of two (2) inches of bituminous concrete for at least twenty (20) feet from the road or as required by the Board or its designated agent. All driveways that contain slopes of 10 percent or greater shall be paved for that length. No driveway shall have a slope greater than 12 percent.

Driveway approaches shall be constructed so that they match the grade at the gutter line of the road. A landing area equal to one car length (20 feet) and no greater than 3 percent slope shall be constructed adjacent to the Town road.

The following criteria will be evaluated for applicability to each individual driveway by the Town road foreman.

- a. Clearing of existing trees and or brush along the existing town road may be required to achieve a desirable sightline of 250 feet in both directions.
- b. Cutting back of the embankment in front of the lot which the driveway will serve may be required to achieve the desirable sightline.
- c. A cross culvert (15" minimum diameter) may be required under the proposed driveway apron if there is an existing or planned swale adjacent to the town road.

Prior to commencement of any driveway construction a Driveway Permit application shall be completed by the applicant and issued by the Board's designated agent. A bond in an amount determined by the Board's agent shall be posted by the applicant prior to construction. The applicant shall provide at least two working days notice to the Board prior to construction.

In some instances an as-built plan may be required to ensure compliance with this regulation. Upon satisfactory completion of construction by the applicant in accordance with the conditions contained in the approved Driveway Permit, the bond shall be returned to the applicant.

2.3.9 CUL-DE-SACS

The geometric design of cul-de-sacs shall be in accordance with Figure No. 8 and shall contain provisions for a disposal area for snow.

3.0 STORM DRAINAGE DESIGN AND CONSTRUCTION REQUIREMENTS

3.1 STANDARDS DETAILS

All storm drainage facilities constructed under these Regulations shall conform to the following Standard Detail Sheets.

<u>PLATE NUMBER</u>	<u>DESCRIPTION</u>
13	Intensity, Duration & Frequency of Rainfall
14	Seelye Nomograph for Determining Time of Concentration
15	Kirpich Chart – Time of Concentration
16	Gutter Flow Characteristic Curves
17	Nomograph for Computing Required Size of Circular Drain Flowing Full
18	Headwater Depth for Concrete Pipe Culverts with Inlet Control
19	Gutter Flow Analysis Work Sheet
20	Storm Sewer System Design Work Sheet
21	Standard Details for Top of “C” Catch Basin
22	Standard Details for Top of “C-L” Catch Basin
23	Standard Details for Double Grate Catch Basin Type I
24	Standard Details for Double Grate Catch Basin Type II
25	Standard Details for Storm Manhole Type A
26	Standard Details for Cast Iron Catch Basin Frame and Grate
27	Typical Riprap Swale Cross Section
28	Typical Underdrain Detail

3.2 SPECIFICATIONS FOR STORM DRAINAGE IMPROVEMENTS

All storm drainage construction shall conform to the requirements of the “State of Connecticut Department of Transportation Standard Specifications for Roads, Bridges and Incidental Construction, Form 816”, 2004, as amended.

3.3 HYDRAULIC DESIGN REQUIREMENTS

The protection of the lives and property of area residents, the traveling public, and the Town shall be of paramount importance and the facilities shall be located and planned so as to minimize danger to such life and property. Storm drainage shall be designed by a registered Professional Engineer in accordance with the following criteria:

3.3.9 RUNOFF

The following methods shall be used in determining peak discharge:

- a. Less than 200 ac. – Rational Method
- b. 200 ac. to 5 sq. mi. – judgement between various methods
 - 1. S.C.S. (Soil Conservation Service)
 - 2. NEHL (New England Hill & Lowlands)
 - 3. Comparable gaged streams
 - 4. Rational method as limiting flow only
 - 5. Other acceptable methods when developed
- c. Over 5 sq. mi. – Bigwood-Thomas Flood Flow Formula

3.3.9 DESIGN STORM

The following design storms shall be used:

- a. Drainage systems – 15 year
- b. Discharge pipes at low points including cross culverts without roadway pickups – 25 year
- c. Minor streams (200-1000 ac.) – 50 year
- d. Major streams (more than 1000 ac.) – 100 year
- e. Detention basins (more than 5 ac. drainage) – 100 year
- f. Detention basins (less than 5 ac. drainage) – 50 year

3.3.9 RAINFALL INTENSITY

Rainfall intensity shall be determined from the Rainfall Intensity Chart, Figure Number 13. The time of concentration used in this chart shall be determined as follows:

Overland Flow less than 1,000 ft. – Seelye chart (Figure Number 14)

Overland Flow more than 1,000 ft. – Kirpich Chart (Figure Number 15)

Flow in Pipes – Computed for design flow

3.3.9 COEFFICIENT OF IMPERVIOUSNESS

The following coefficients shall be used in the Rational Method:

a.	Pavement, roofs or other impervious areas	0.90
b.	Commercial Areas	0.80
c.	Apartments	0.70
d.	Residential areas	0.50
e.	Parks, cemeteries, recreation areas	0.25

The runoff coefficient may also be computed by the weighted average of the various types of surface making up an area. It is recommended that the following coefficients be used for a weighted average:

Impervious areas	0.90
Grass areas	0.40
Heavily wooded areas	0.30

3.3.9 PIPE

All pipe for storm drains shall be reinforced concrete pipe, Class IV or corrugated polyethylene with a smooth interior. The minimum size of pipe shall be fifteen (15) inches. In special cases, aluminum may be used if approved by the Commission and the Board.

3.3.9 SLOPE

The minimum slope used for storm drains shall be 0.5 percent.

3.3.9 HYDRAULIC DESIGN

The hydraulic design of pipes shall be based on the Manning Formula. The roughness coefficient (n) used shall be 0.013 for concrete pipe and 0.010 for polyethylene pipe. (See Figure Number 17.)

All pipes shall be checked for inlet control. The maximum headwater (HW) in catch basins shall be 1.0 feet below the top of grate. At endwalls, when headwater divided by diameter of pipe (HW/D) exceeds 1.2, the limits of flooding shall be shown on the plan. (See Figure Number 18.)

3.3.9 GUTTER FLOW ANALYSIS

The Engineer shall complete gutter flow analysis to determine catch basin spacing and need for double basins in roadway sags. (See Figure Number 16.)

3.3.9 DETENTION BASINS

Detention basins shall be constructed when required by the Commission for the purpose of limiting peak discharge from a developed area to the peak discharges occurring before development.

Detention basins shall be designed for a storm frequency consistent with Section 3.3.2. An emergency spillway shall be provided in addition to the primary outlet.

The procedure for computing the outflow from detention basins shall include the development of storm hydrographs and the routing of these hydrographs through the detention basin. The method developed by the Soil Conservation Service, United States Department of Agriculture, for developing synthetic hydrographs and routing these hydrographs through reservoirs is a satisfactory method.

Detention basins may be any of the following typed:

- a. Dry basin that may be multi-purpose with recreational or other uses during dry periods. Low frequency storms shall result in little or no flooding. The basin shall be designed to empty within twelve (12) hours after a storm.
- b. Small permanent pond with the major portion of the detention area a dry basin with flat slopes as above. The permanent pond shall be designed as a silting basin for use both during and after construction.
- c. Permanent pond with detention capacity provided above the normal water level. The pond shall be designed as silting basin for use both during and after construction.

The submission for the design of a detention basin shall include the following:

- a. Plan with a scale of not less than 1" = 40' showing proposed contour with a 2 foot interval
- b. Detail of the outlet
- c. Inflow hydrograph with discharge hydrograph superimposed
- d. Inflow mass curve

- e. Elevation – storage curve
- f. Elevation – discharge curve
- g. Flood routing calculations

The designed may find Figure Number 20, “Storm Sewer System Design Work Sheet”, helpful in developing this information.

3.4 EROSION AND SEDIMENT CONTROL

The Connecticut Council on Soil and Water Conservation’s “2002 Connecticut Guidelines for Soil Erosion and Sediment Control,” and as amended shall be followed.

The Commission may require water quality sampling before, during and after construction to assure protection of existing water courses. The laboratory fees shall be borne by the applicant.

3.5 STREAMBELT DELINEATION

The U.S. Department of Agriculture, Soil Conservation Service Publication, “A Guide for Streambelts – A System of Natural Environmental Corridors in Connecticut”, shall be used to delineate streambelts.

3.6 FIRE POND PROVISION

Where practical, access to storm detention basins and natural impoundments shall be provided for fire fighting equipment.

3.7 COVER

The minimum cover over all pipe shall be two (2) feet.

3.8 INTERSECTIONS

Catch basins shall be installed to properly drain all intersections of new streets and intersections of new streets with existing Town streets.

3.9 EASEMENTS

Easements at least thirty (30) feet in width, centered on the storm drain, shall be provided for all storm water and sanitary sewer pipes which will not be installed in streets to be dedicated to the Town. Easements for outlet pipes shall extend to

a suitable existing storm drain or an adequate natural course. Easements shall be provided for ditches, channels or natural streams and shall be of sufficient minimum width to include a ten (10) foot access strip in addition to the width of the ditch, channel or natural stream from top of bank to top of bank. In addition, a minimum easement width of twenty (20) feet shall be dedicated, if required, on the rear line of each lot for the use of public utilities, poles, pipes and conduits, except where the Commission deems such easements impracticable or undesirable. Permanent, all-weather access to storm drainage facilities to be dedicated to the Town shall be provided.

3.10 CHANNEL LINES

Channel and building lines shall be provided along any major stream or river for the purpose of preventing encroachment upon and constriction of the natural water channel by buildings, filling operations or other facilities and construction. The width of the channel shall be based on sound engineering calculations, anticipating long range storms and flow potentials, and recognizing proper alignment and gradients of the channel. A note shall be placed on the final map explaining the channel and building lines and stating the restrictions against encroachment upon the channel in a manner approved by the Town Attorney.

3.11 CATCH BASINS AND MANHOLES

The first inlet in a storm drain system shall be located within three hundred fifty (350) feet of the roadway high point. Other than the first inlet, all inlets will be spaced a maximum of three hundred (300) feet apart. Drainage structures (catch basins or manholes) shall be placed at each grade change along a storm drain, at each change in horizontal direction and at each junction point of two or more storm drains.

Double grate inlets shall be used at sags where, due to off-street runoff, a design flow in excess of 3.0 cubic feet per second will be entering the inlet.

3.12 DISCHARGE

The discharge of all storm water shall be into suitable streams or rivers, or into Town drains with adequate capacity to carry the additional water. Where the discharge shall be into private property adjoining the proposed subdivision, proper easements and discharge rights shall be secured by the Applicant for the Town before approval of the final map and acceptance of the drainage plan. No storm drain shall outlet into a natural water course, whether continually flowing or intermittent, or an existing drainage system, so as to exceed the capacity of the water course or drainage system, without provisions being made to satisfactorily increase the capacity of the water course or downstream structure. The applicant shall obtain an Inland Wetlands Permit as needed.

3.13 UNDERDRAIN

Underdrains shall be installed in all areas where wet conditions prevail or where directed by the Commission or its agent. Underdrain outlets shall be connected to drainage structures wherever practical. When impractical, they shall be terminated with an approved endwall.

3.14 OUTLETS

All storm drain system outlets shall be terminated with an approved headwall or flared end section. Whenever practical, storm drains shall terminate at a natural water course. In no event shall they terminate closer than one hundred fifty (150) feet from a street line unless they discharge directly into a natural water course. Cross culverts without roadway pickup shall terminate in approved headwalls located at the right-of-way (R.O.W) lines.

3.15 SWALES

The use of swales to carry storm water to natural water courses shall not be allowed except in special cases, and then only with prior approval of the Commission or its designated agent. Where ditches are permitted, they shall be properly designed with respect to size, slope and embankment protection.

3.16 SPECIAL STRUCTURES

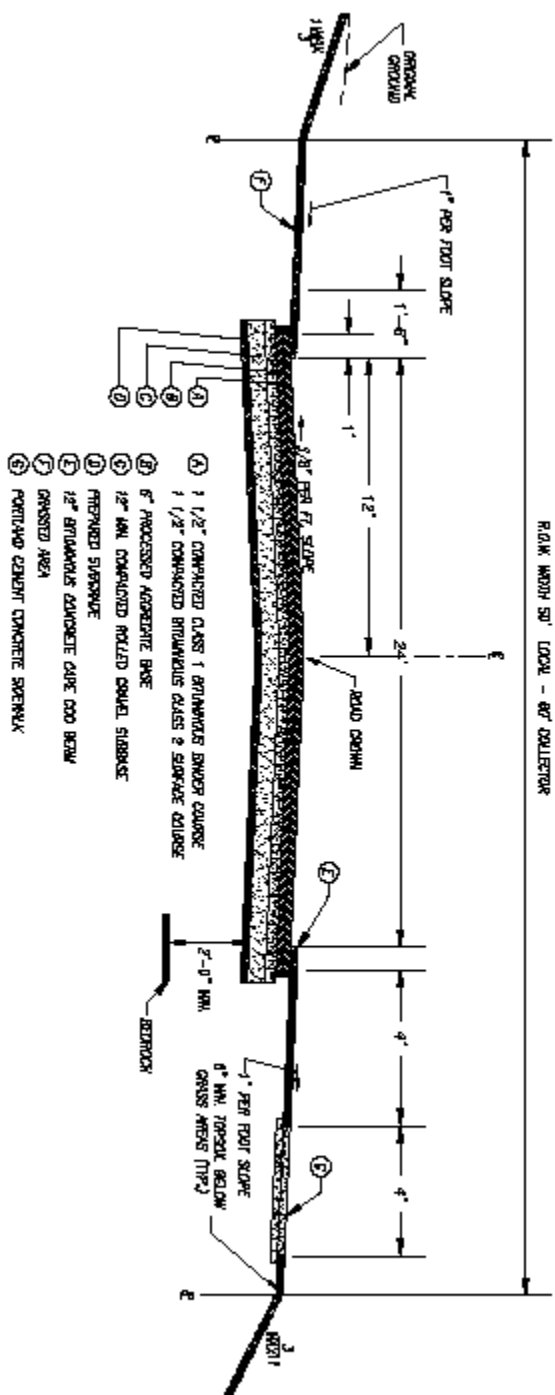
Bridges, box culverts, deep manholes, non-standard endwalls and other special structures shall be designed in accordance with good engineering practice and shall be subject to the approval of the Commission or its agent. Bridges and box culverts shall be designed to carry at least the full width of the required street pavement and at least a four (4) foot sidewalk on one side. The design of all special structures shall be in strict accordance with applicable standards including, for bridges and box culverts, the State of Connecticut Department of Transportation Bridge Design Manual.

3.17 PRIVATE DRAINS

The size and location of all private storm drains that connect to the Town storm drain system shall be approved by the Town prior to the installation; however, the Town shall not be responsible for the storm drainage system in the event of any failure. Rear yard drains, cellar or foundation drains that are connected to the storm drainage system must be shown on the final as-built plan of the drainage system.

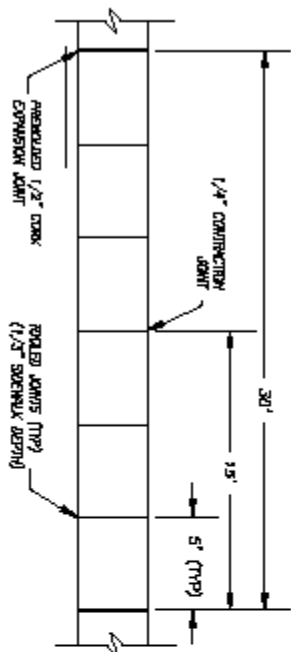
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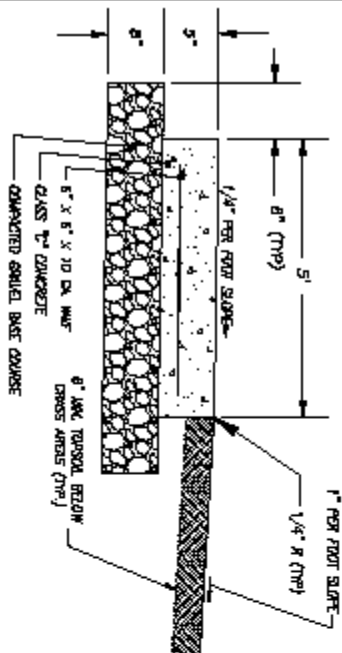
TYPICAL CROSS - SECTION OF ROADWAY
NOT TO SCALE

FIGURE NO. 1



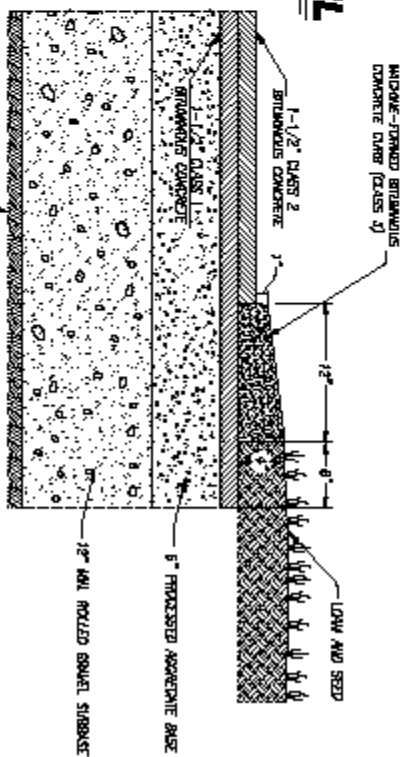
CONCRETE WALK **EXPANSION JOINT DETAIL**

NOT TO SCALE

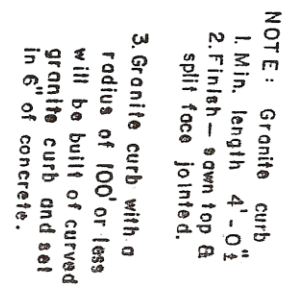


CONCRETE SIDEWALK

NOT TO SCALE

**CAPE COD BERM**

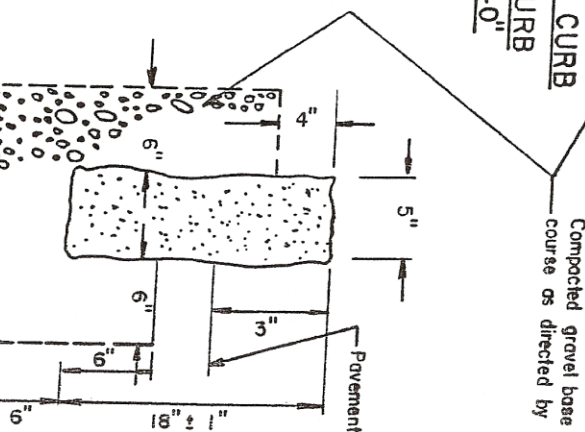
NOT TO SCALE



CURVED STONE CURB
GRANITE CURB
Scale: 1" = 1'-0"

Scale: 1" = 1'-0"

Scale: 1" = 1'-0"



GRANITE CURB

CURB AND MONUMENTATION DETAILS

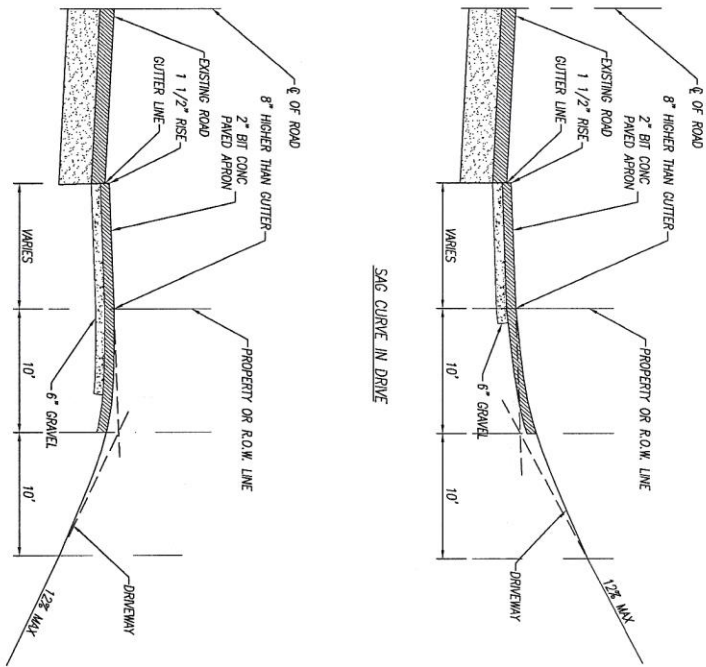


FIGURE No. 4

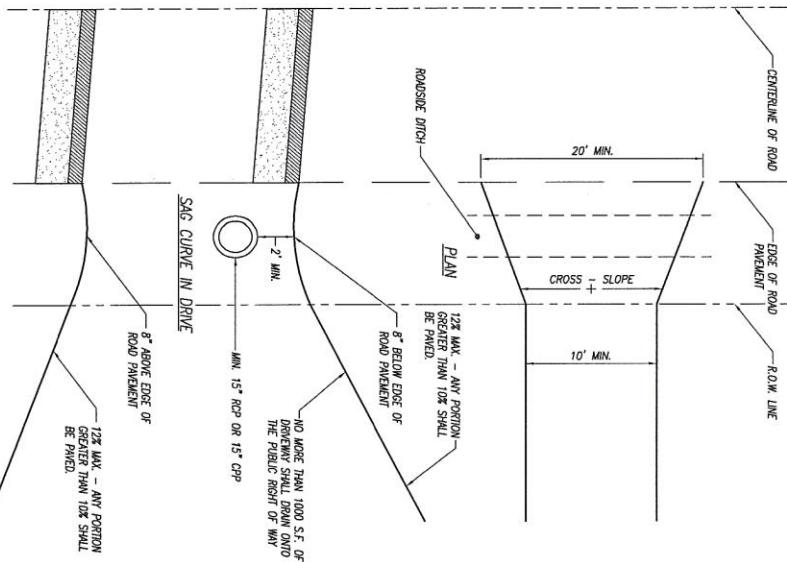


FIGURE No. 5

RESIDENTIAL DRIVEWAY SECTION DETAIL

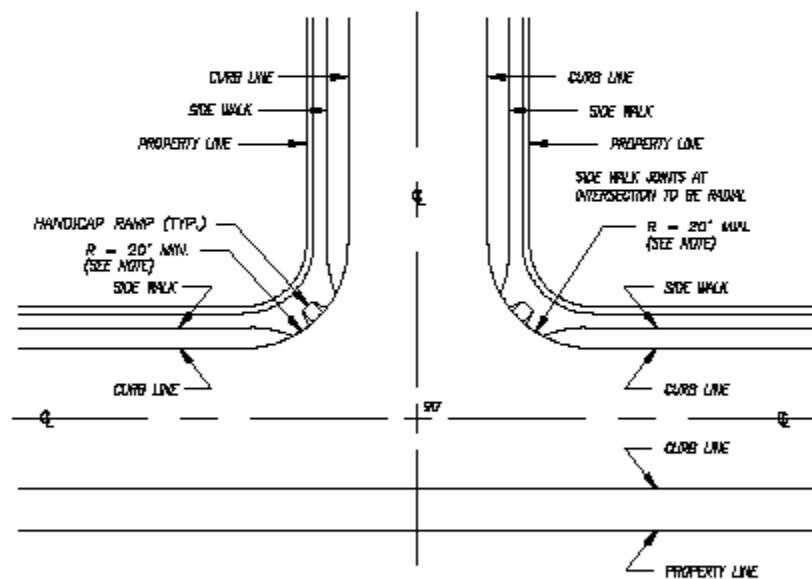
NOT TO SCALE

RESIDENTIAL DRIVEWAY SECTION DETAIL

NOT TO SCALE

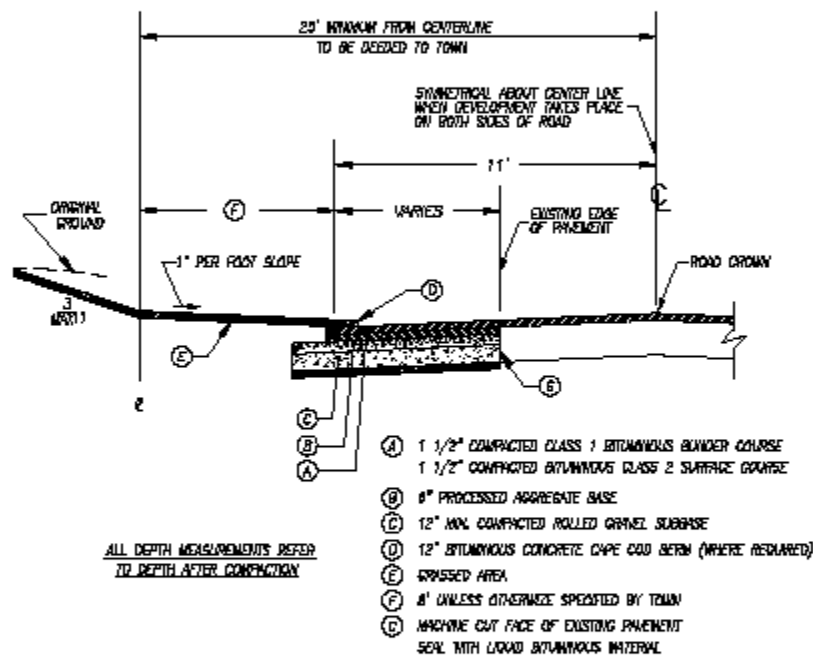
FIGURE No. 6

NOTE:
 MINIMUM PAVEMENT RADIUS FOR INTERSECTIONS
 LOCAL INTERSECTING LOCAL ROAD - 20'
 LOCAL INTERSECTING COLLECTOR ROAD - 25'
 ALL ARTERIAL INTERSECTIONS - 30'



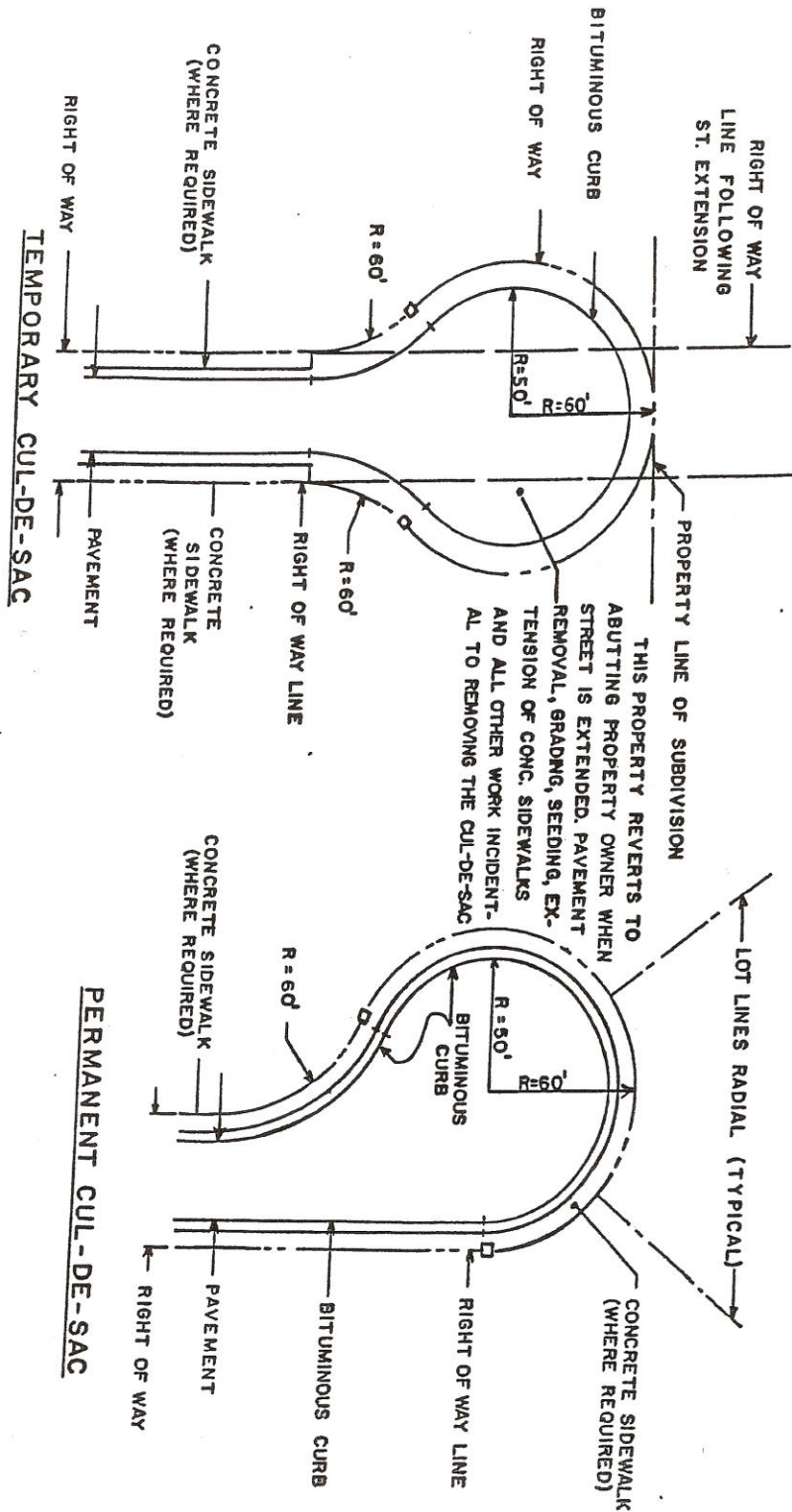
TYPICAL INTERSECTION DETAILS

NOT TO SCALE



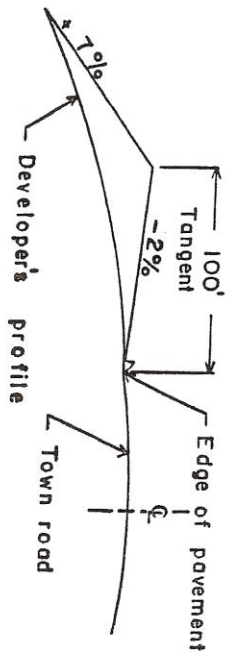
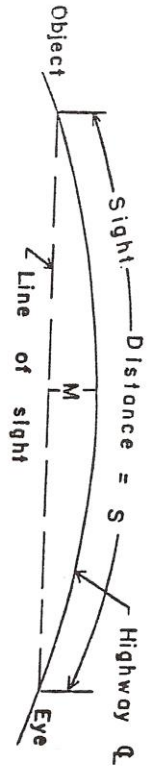
IMPROVEMENT TO EXISTING TOWN ROADS

NOT TO SCALE



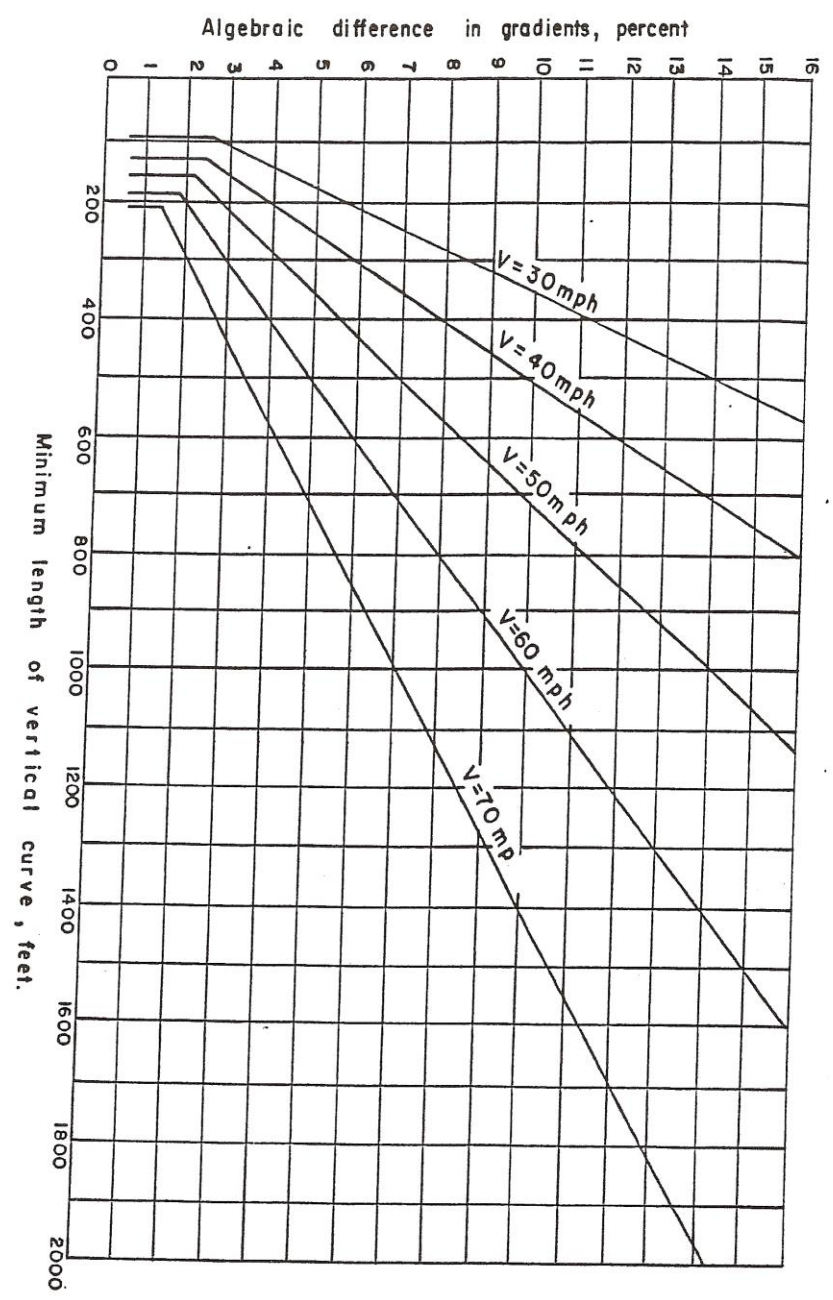
TYPICAL CUL-DE-SAC

NOT TO SCALE

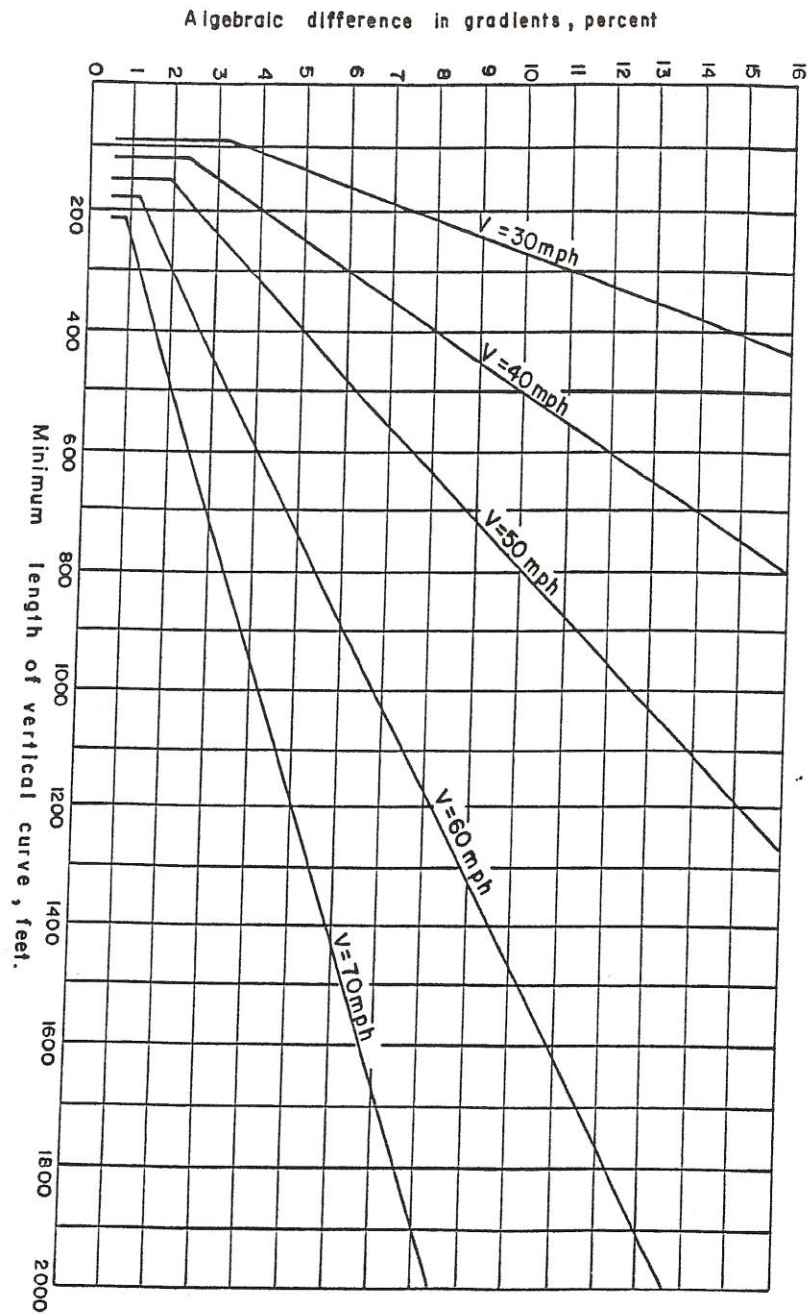


Design Speed	HORIZONTAL SIGHT DISTANCE M , IN FEET		Degree of Curve absolute maximum	Minimum safe radius, ft.
	Distance from Q to obstruction	Passing — Two lane highway		
30	22	134	25	232
40	23	245	14	412
50	24	380	9	644

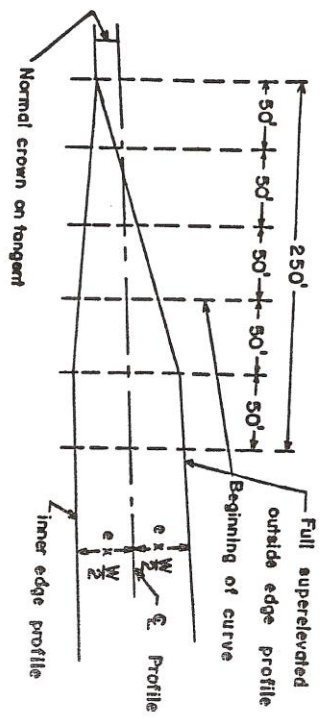
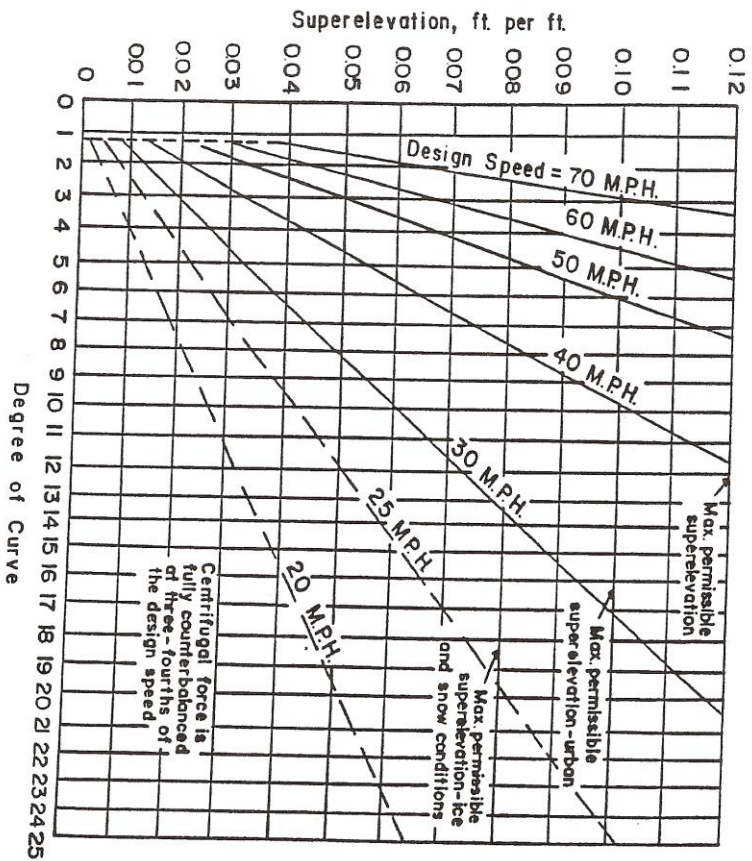
DETAILS FOR SIGHT DISTANCE AND GRADE INTERSECTIONS



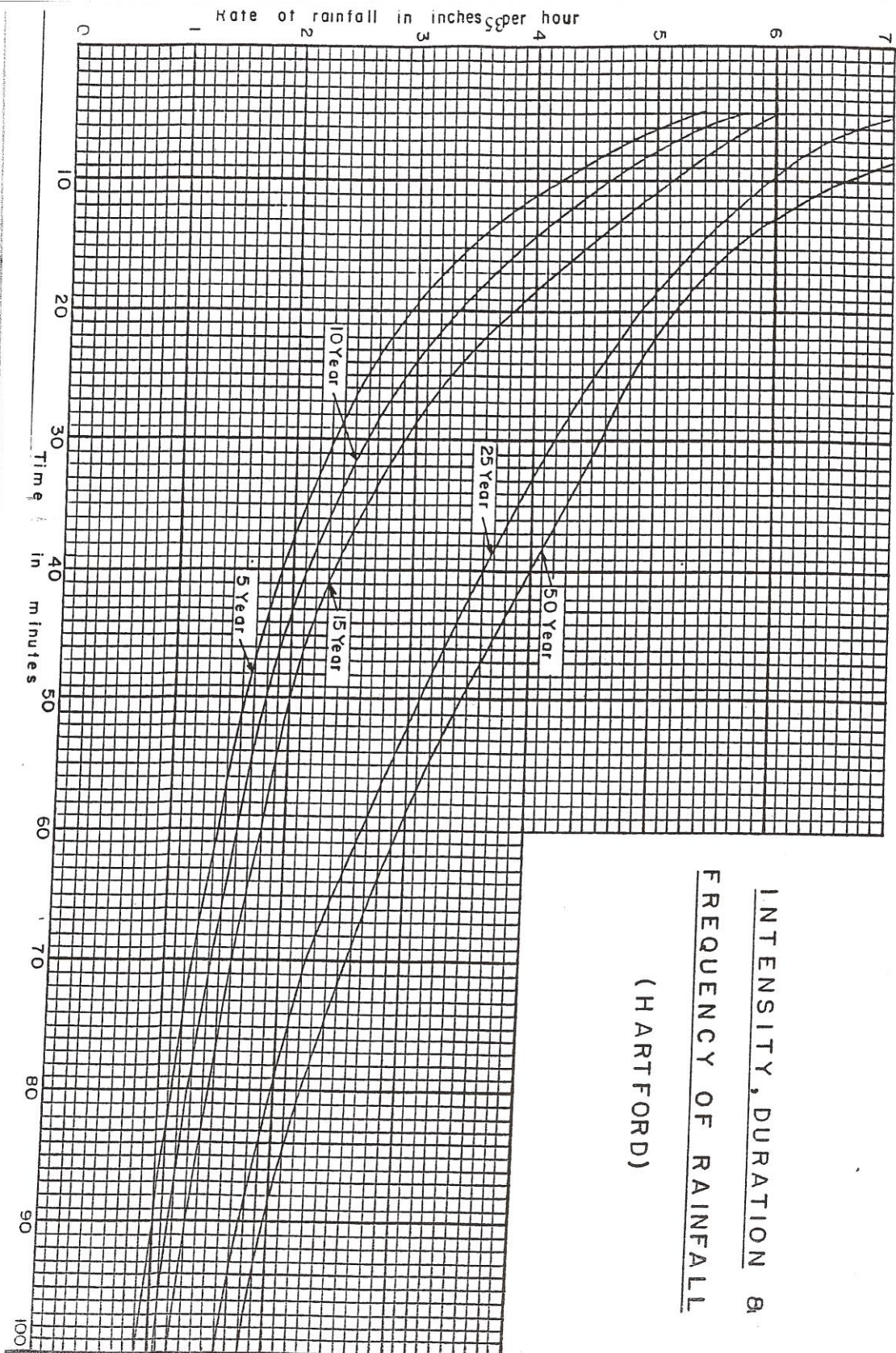
CREST VERTICAL CURVES



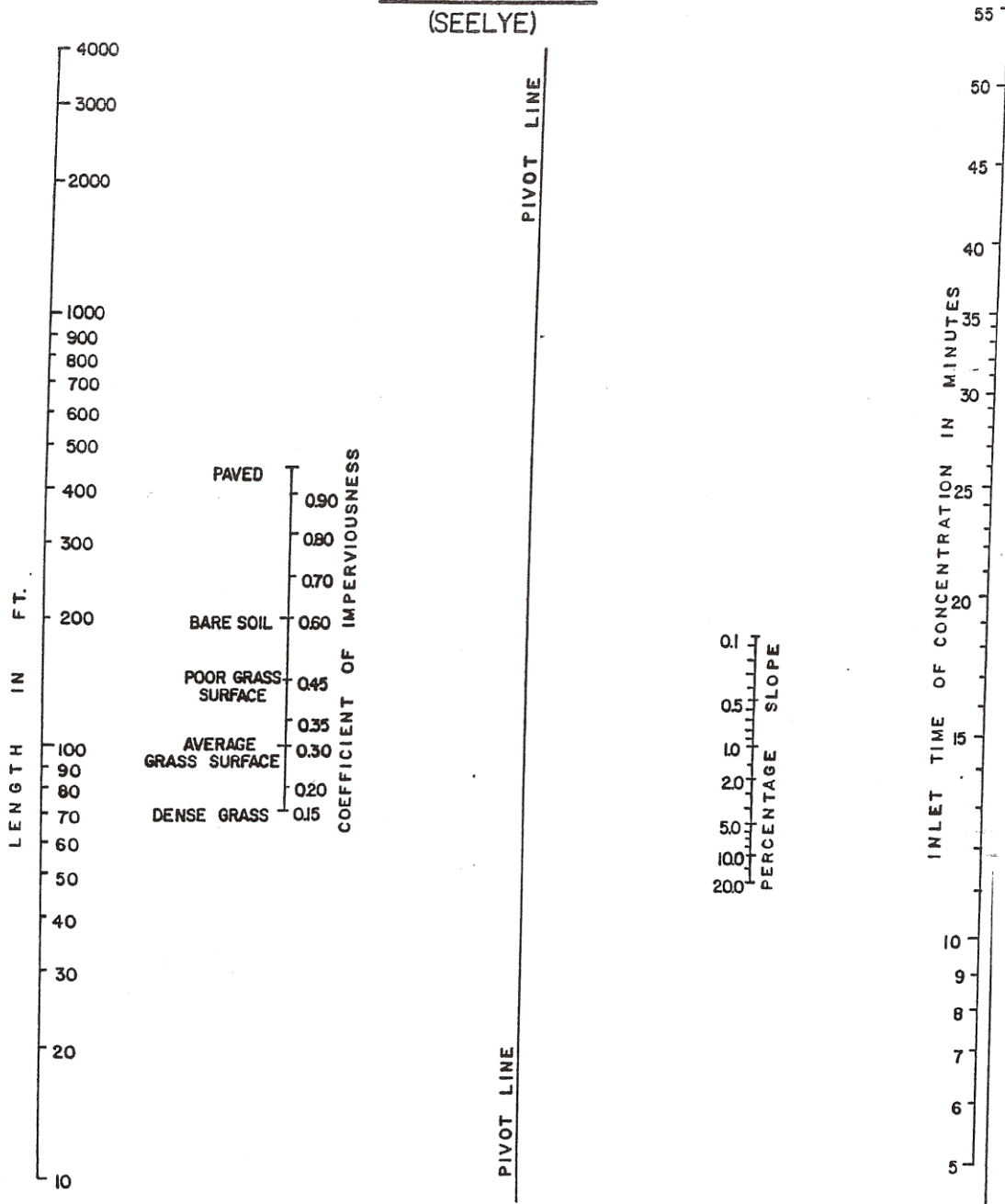
SAG VERTICAL CURVES



SUPERELEVATION CHART & TRANSITION DETAIL

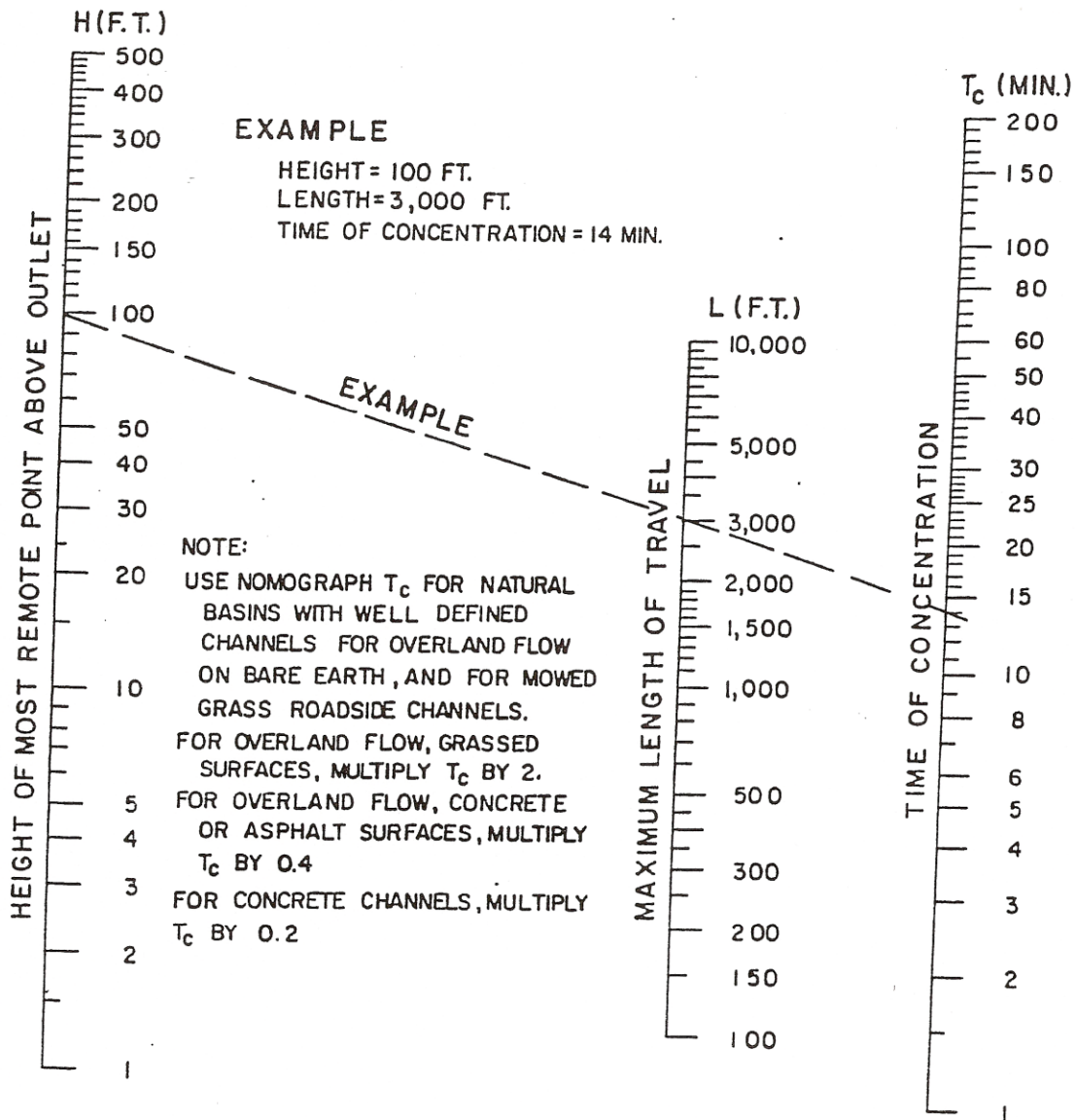


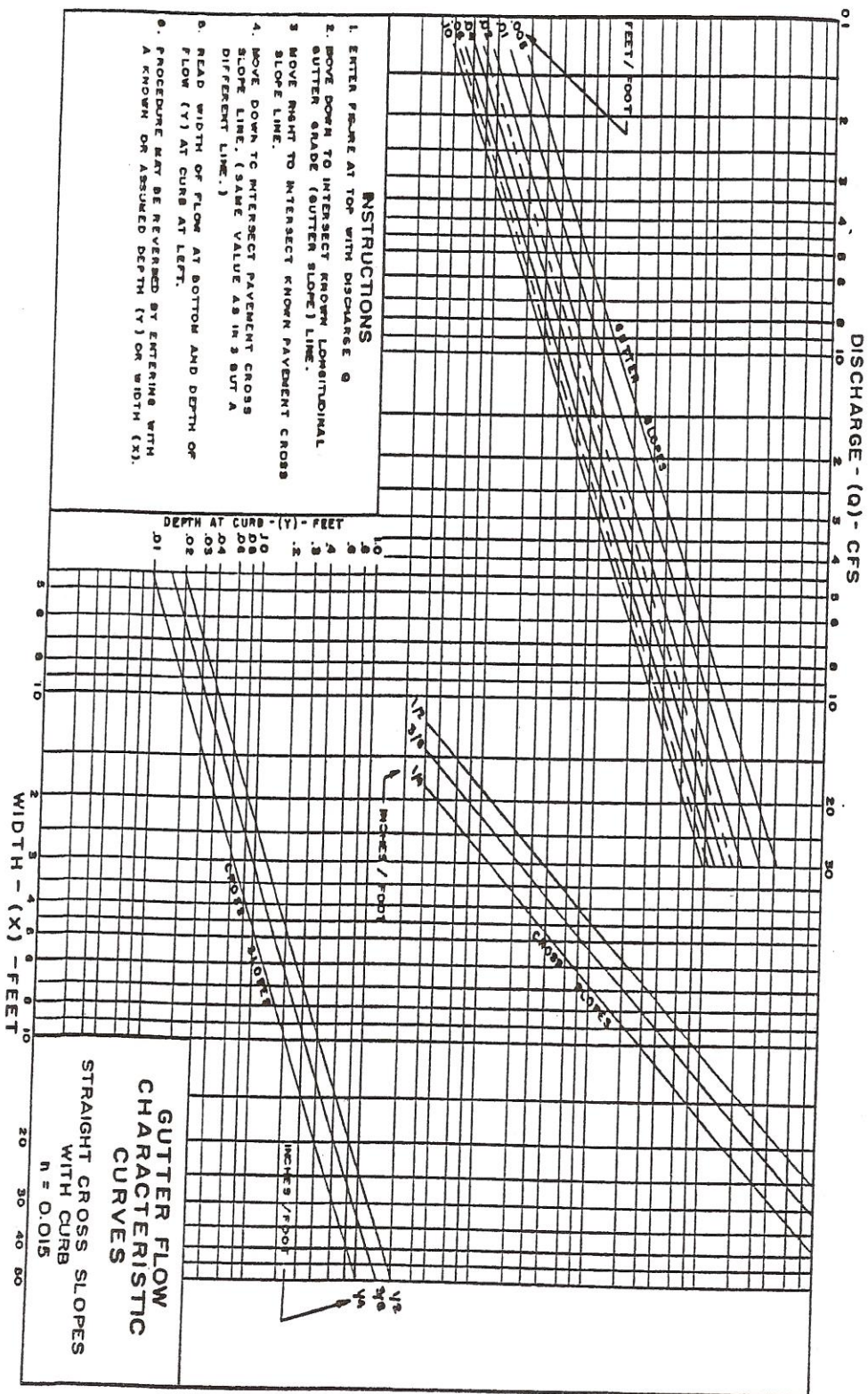
NOMOGRAPH FOR DETERMINING TIME OF CONCENTRATION (SEELYE)

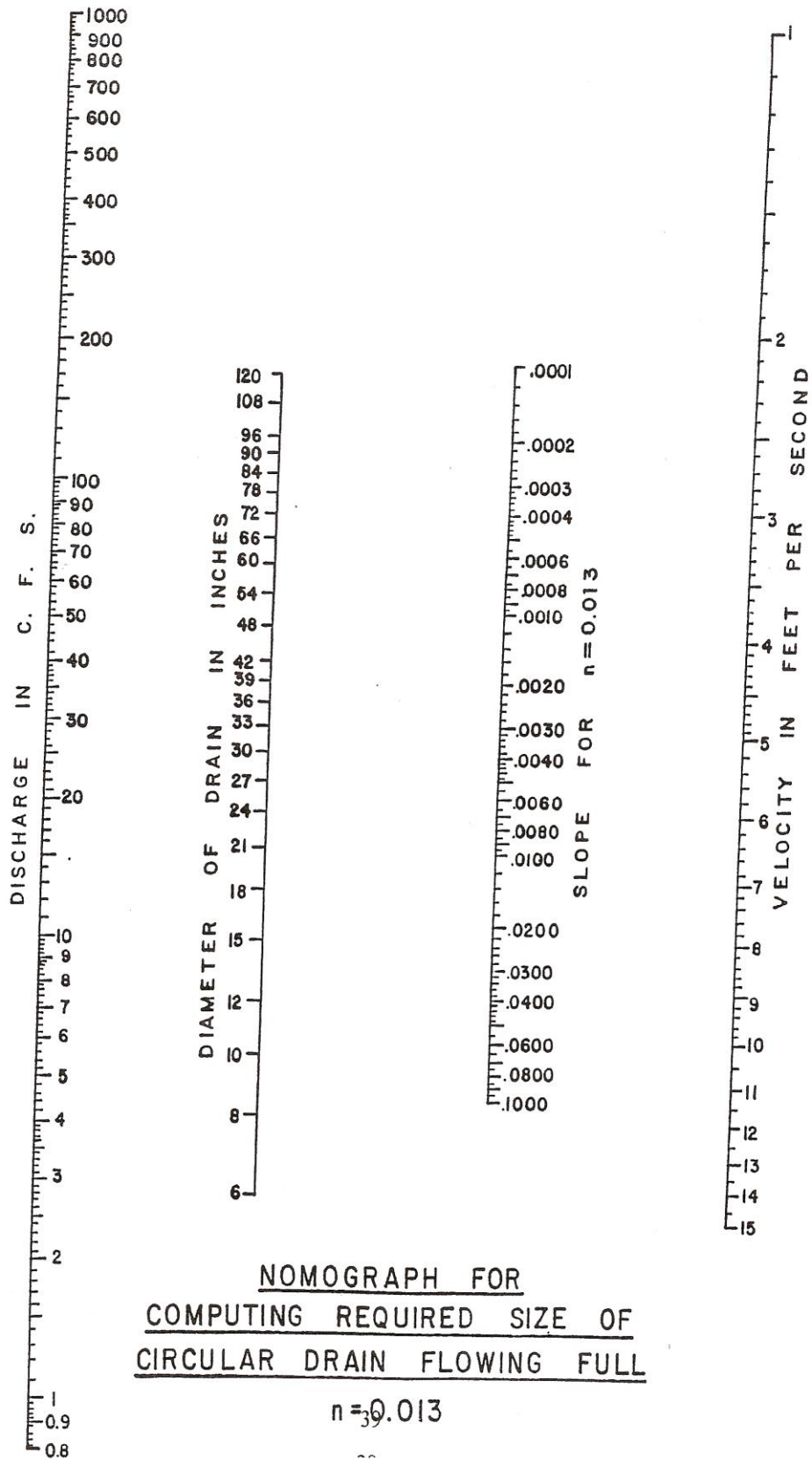


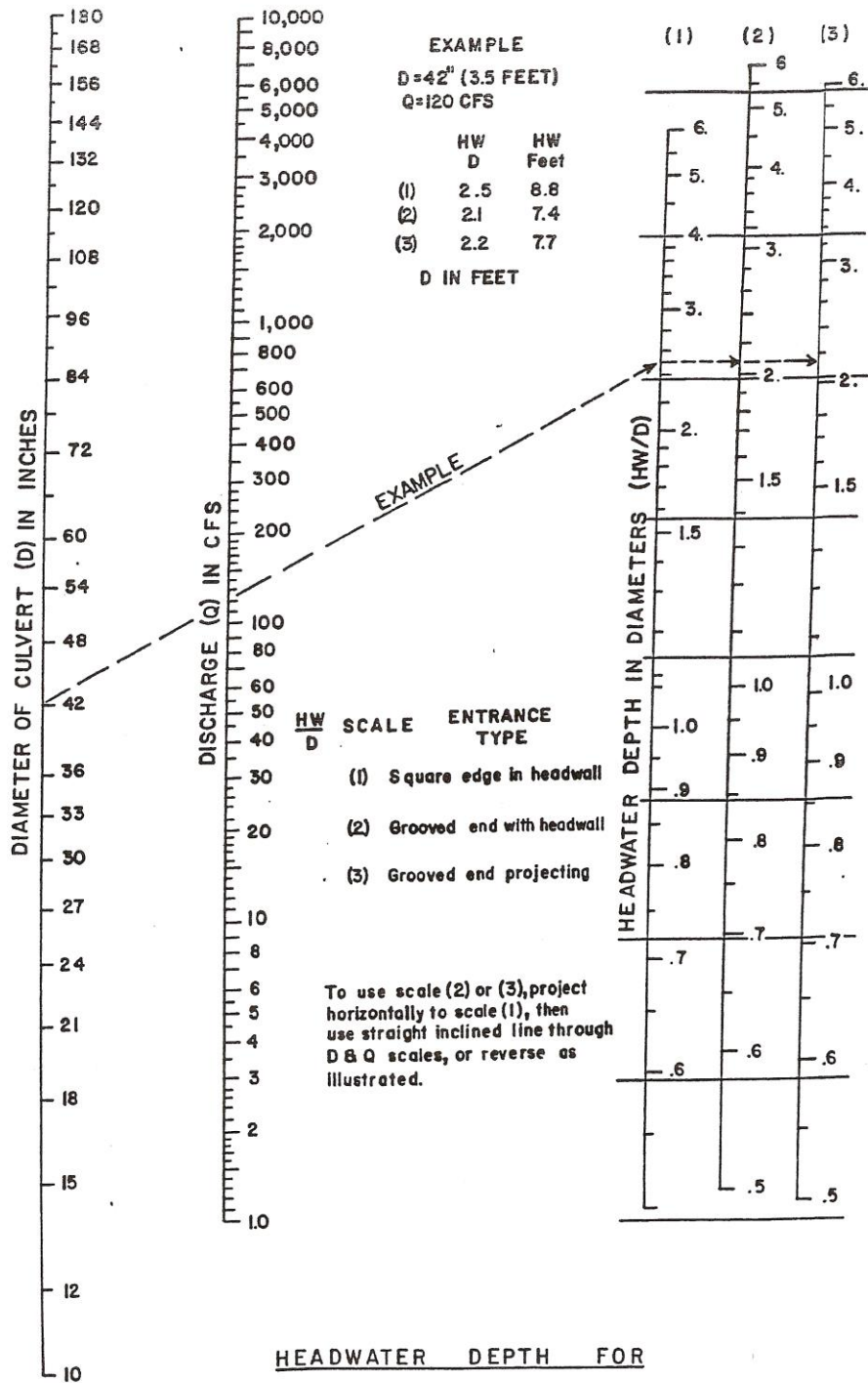
KIRPICH CHART

TIME OF CONCENTRATION





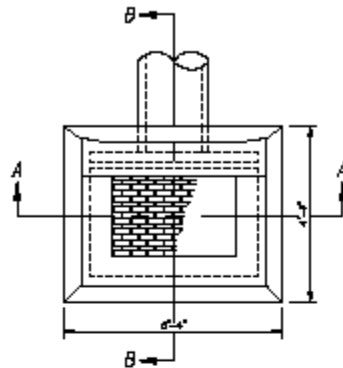




HEADWATER DEPTH FOR
 CONCRETE PIPE CULVERTS WITH
 INLET CONTROL

41

42

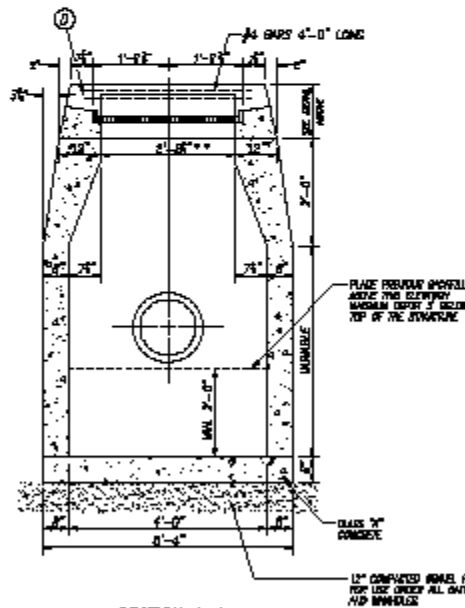


PLAN TYPE "C"

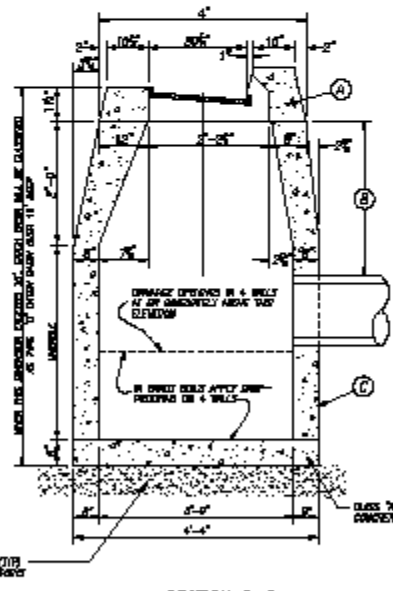
NOTES:

1. WHEN CATCH BASIN IS SET IN CONCRETE PAVEMENT THE 1/2" SLOPE ON THE TOP SURFACE SHALL BE CHANGED TO MATCH ADJACENT PAVEMENT.
2. CATCH BASIN TOPS SHALL CONFORM TO THE PROFILE OF THE TYPE OF CLOSURE USED.
3. CATCH BASIN TOP SHALL BE SKINNED TO MATCH THE GRADE OF THE OUTLET (LONGITUDINAL & TRANSVERSE)

- (A) CLASS "A" CONCRETE POURED IN PLACE OR PRECAST CONCRETE UNIT
- (B) MINIMUM DEPTH UNLESS SPECIFICALLY OTHERWISE OTHERWISE UNDER TYPICALLY 1'-0" UNLESS OTHERWISE NOTED 2'-0"
- (C) PRECAST CONCRETE UNITS SHALL CLASS "A" CONCRETE MINIMUM CONCRETE UNITS SHALL BE 1'-0" UNLESS OTHERWISE NOTED 2'-0" UNLESS OTHERWISE NOTED 2'-0"
- (D) ALTERNATE CONSTRUCTION WITH ALL CURBS BACK TO BE USED AT LOCATIONS ADJACENT TO CURBS OR PROPOSED CURBS



SECTION A-A



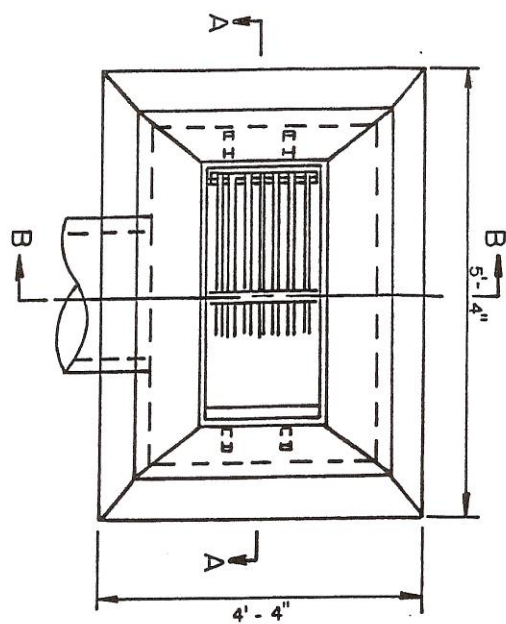
SECTION B-B

TYPE 'C' CATCH BASIN DETAIL

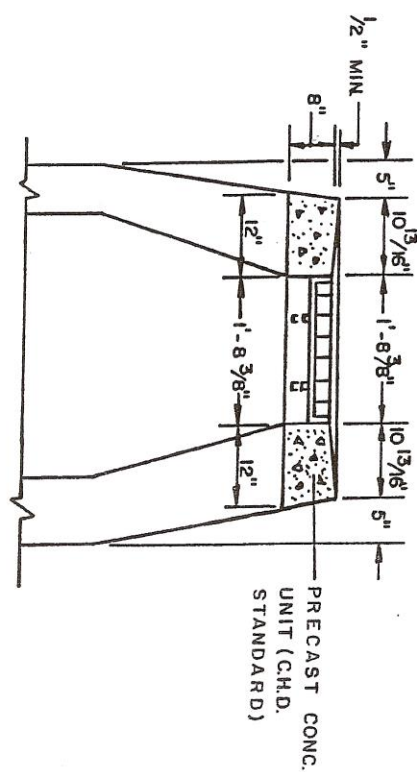
NOT TO SCALE

44

PLAN



SECTION B-B



NOTE:
FOR DETAILS & DIMENSIONS OF LOWER
SECTION, SEE "TYPE C CATCH BASIN"
FIGURE NO. 21

TOP OF TYPE "C-L"
CATCH BASIN
NOT TO SCALE

SECTION A-A

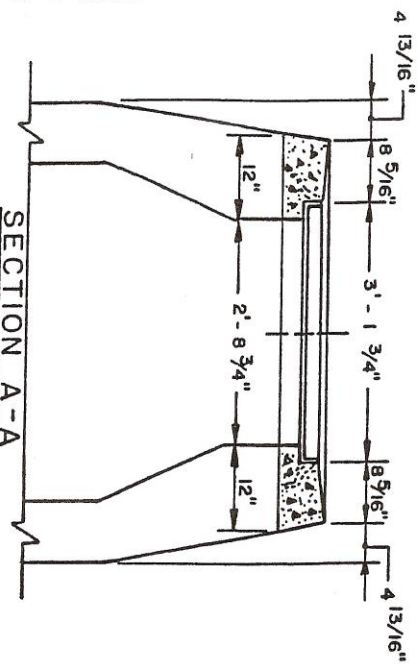
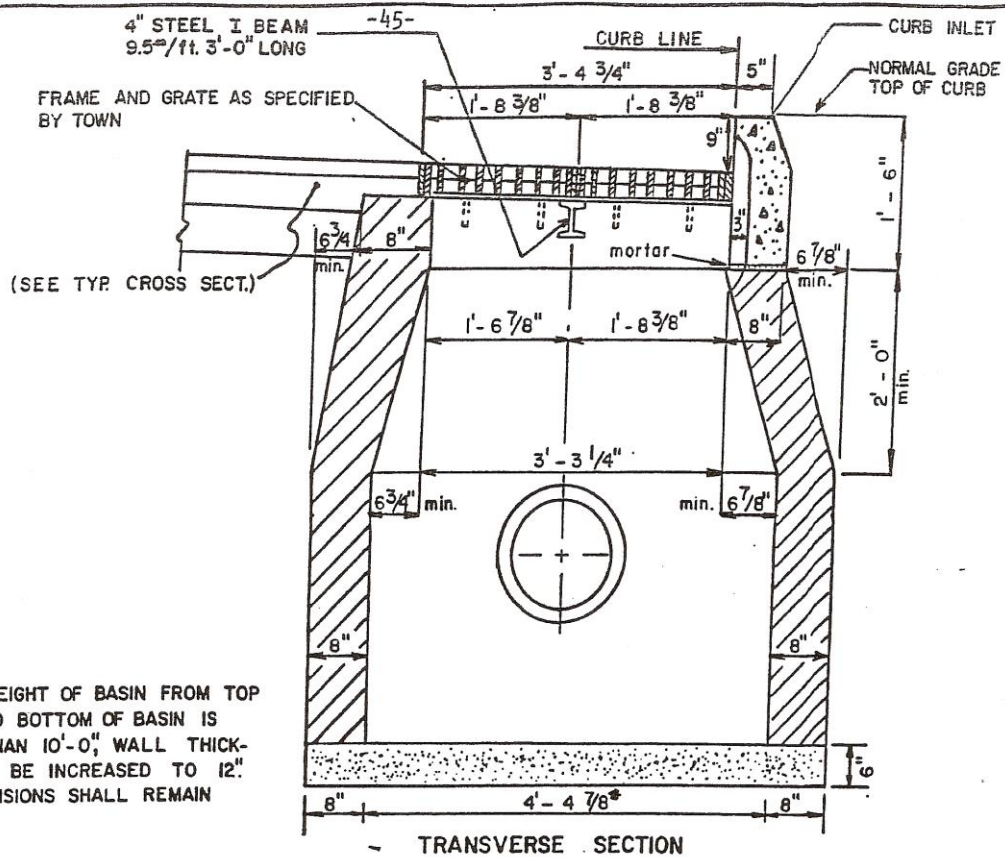
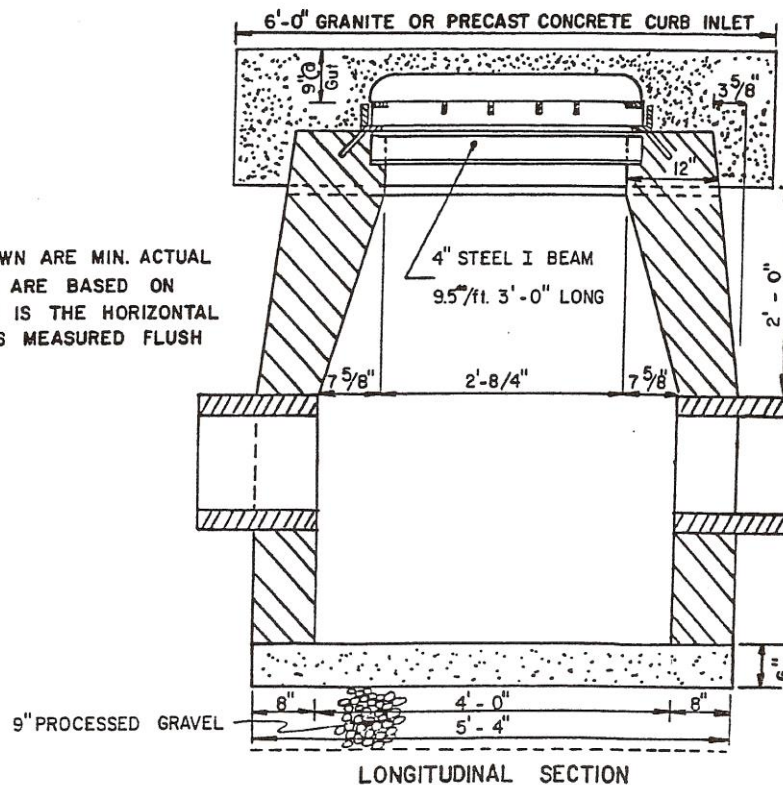


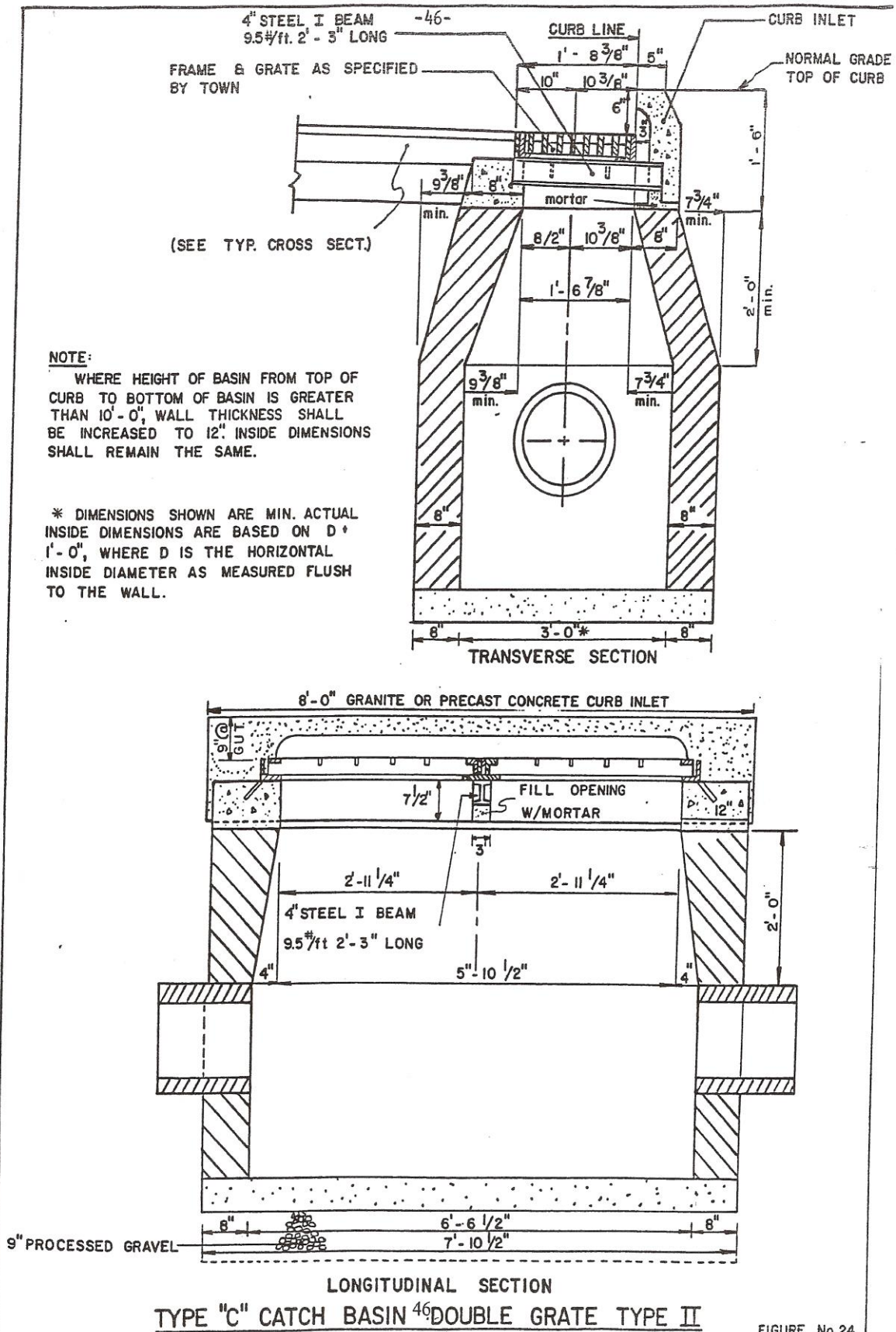
FIGURE No. 22

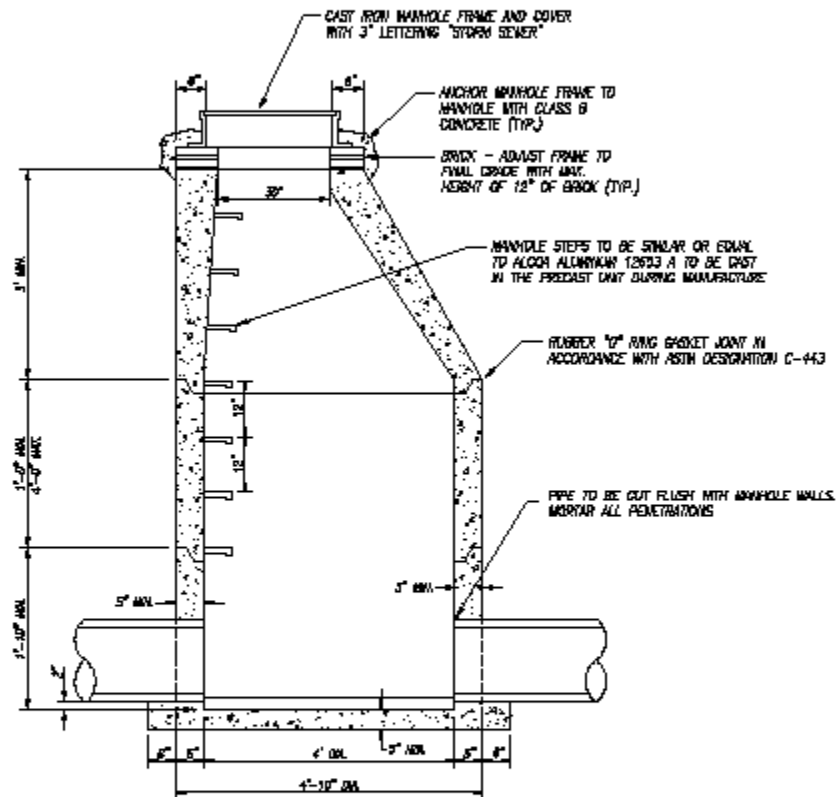


* DIMENSIONS SHOWN ARE MIN. ACTUAL
INSIDE DIMENSIONS ARE BASED ON
 $D + 1'-0"$, WHERE D IS THE HORIZONTAL
INSIDE DIAMETER AS MEASURED FLUSH
TO THE WALL.



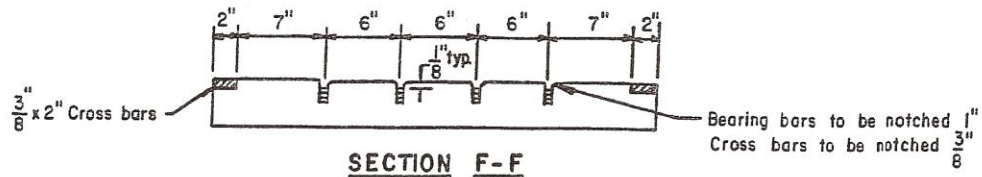
TYPE "C" CATCH BASIN DOUBLE GRATE TYPE I



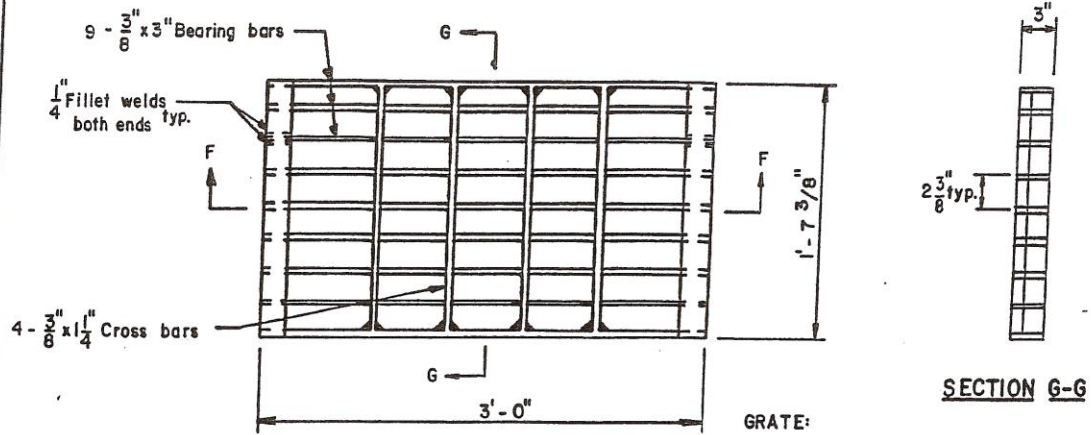


PRECAST REINFORCED
CONCRETE STORM MANHOLE

NOT TO SCALE



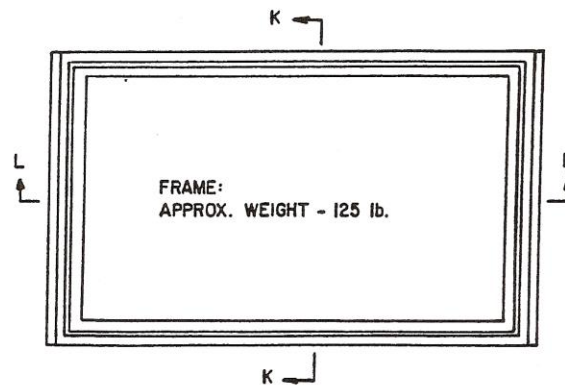
SECTION F-F



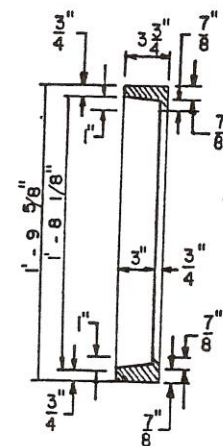
SECTION G-G

GRATE:
APPROX. WEIGHT - 119 lb.

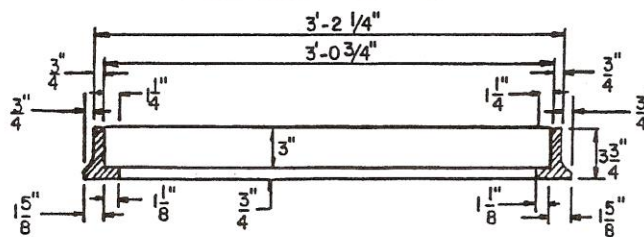
STEEL GRATE



CAST IRON FRAME

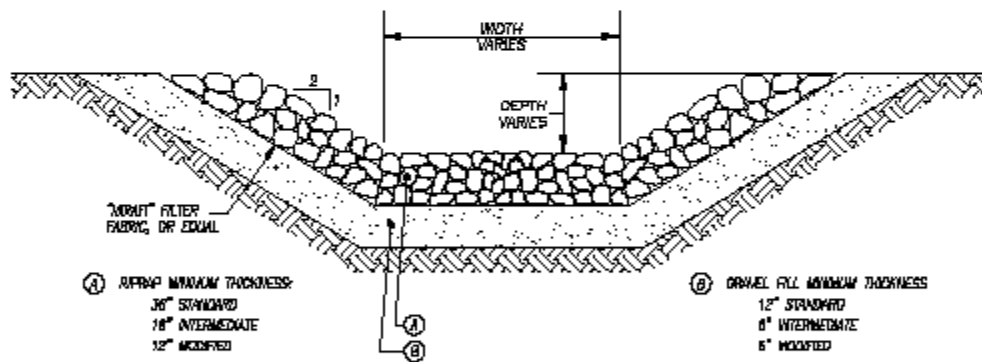


SECTION K-K



SECTION L-L

CAST IRON CATCH
BASIN FRAME
& GRATE

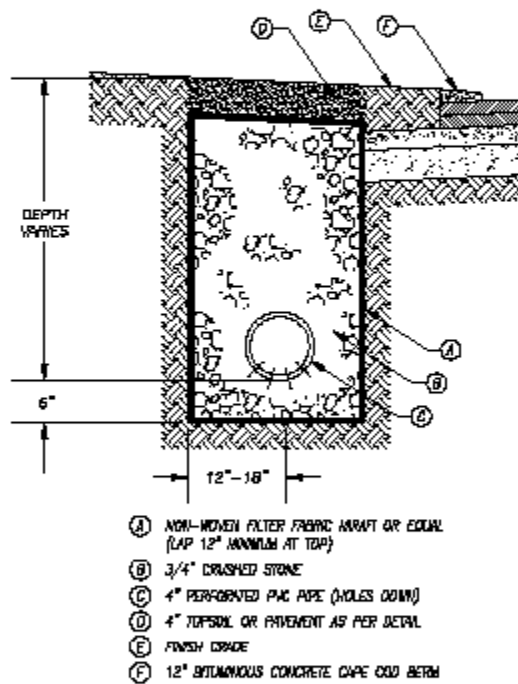


RIPRAP SWALE

NOT TO SCALE

NOTE:

1. THE DEPTH OF THE UNDERDRAIN SHALL BE DICTATED BY THE DEPTH OF GROUNDWATER. UNDERDRAINS SHALL BE INSTALLED WHERE GROUNDWATER IS PRESENT WITHIN 2" OF THE ROADWAY SUBGRADE.
2. UNDERDRAINS SHALL OUTLET TO CATCH BASINS.

**UNDERDRAIN DETAIL**

NOT TO SCALE