Manual Number: _____

ENGINEERING DESIGN STANDARDS

PREPARED BY:

CITY OF CAPE CORAL
PUBLIC WORKS DEPARTMENT

APPROVED BY:

CITY COUNCIL
CITY OF CAPE CORAL
ON 5-6-2002
BY ORDINANCE NO. 103-2001

Prior revisions:

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April 7, 1992
August 3, 1995

ACKNOWLEDGEMENTS

This Manual is truly the result of the efforts of many peoples. We want to acknowledge their work and thank them for their contributions; most notably the following:

Charles Pavlos, P.E.	Public Works Director
Steve Neff, P.E.	Transportation Manager
Karl Brauer, P.E.	Planning & Construction Manager
Emilio Fernandez, P.E.	Project Manager

Contributing Organizations and Individuals

AIM Engineering & Surveying
Avalon Engineering, Inc.
Brown & Root Engineering &Construction
Cape Coral Construction Industry Association, Inc.
Conklin, Porter and Holmes Engineering, Inc.
Dames & Moore Group
David Douglas Associates, Inc.
Deregulation Committee
Engineering & Design Consultants
Engineers of Cape Coral, Inc.
Florida Gulf Engineering, Inc.
Honc Construction, Inc.
John J. Ruskai, Inc.
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Pitman- Hartenstein & Associates
Postmaster General Office – Lee County
Source, Inc.
Southwest Florida Underground Contractors Association
Tolles Concrete Seawalls, Inc.
Triscari Engineering
William Harrop, Jr.
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ALSO

George Reilly, P.E.
Gerald Russell, P.L.S.
Mark Sanford
Joel Ellis
Chris Martinez
Gabe Nappi
Jeff Bozic
Marcia Bramhall
Linda Anders

Foreword

The Engineering Design Standards are intended to apply to all new development projects within the City Limits of Cape Coral. The Standards are intended to implement the applicable sections of the Comprehensive Plan/Traffic Circulation Element and other standards as referenced.

The Standards are also applicable to existing development where redevelopment of the property occurs to the extent stipulated in the City of Cape Coral's Land Use and Development Regulations.

The Standards herein adopted include all of those standards specifically referenced in this document including those contained in the "Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways for the State of Florida" (MUMSDCM).

The Standards herein adopted include the most current FDOT Design Standards, FDOT Standard Specifications for Road and Bridge Construction, the American Disability Act (ADA) Standards, and the Manual on Uniform Traffic Control Devices "Millennium Edition".

These Standards are intended to present those most frequently employed standards in municipal engineering work. The Directors or designees of the Public Works Department and the Department of Community Development (DCD) may approve deviations to the Standards as applicable, provided the deviations are acceptable engineering practice and meet or exceed the Standards.

Where the requirements for any developments are not specified in these Standards, such requirements will be specified by the Planning and Zoning Commission/City Council in the action approving or conditionally approving the development plan, or, if not specified in such action, by the Public Works Department.

To minimize development planning costs, avoid misunderstandings, misinterpretation, and ensure compliance with the requirements of the City, pre-application consultation between the developer and/or the Engineer and City staff is encouraged. All developers are advised that upon formal submittal, the City charges a plan review and inspection fee. For further information on the fee schedule, please consult the Department of Community Development.

ENGINEERING DESIGN STANDARDS

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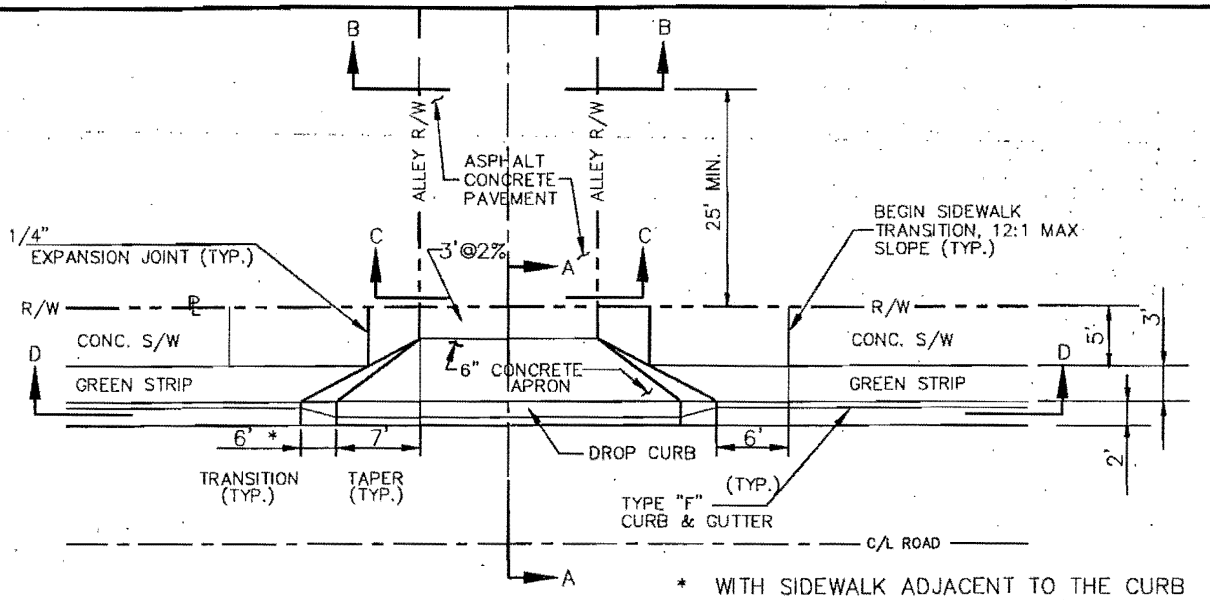
INFRASTRUCTURE INSPECTIONS

The City shall have the right to inspect the installation of all roadways, curbing, gutters, sidewalks, storm water drainage improvements, lighting, landscaping and all other infrastructure improvements installed by a developer or a developer's contractors, which are proposed to be transferred to the city for ownership, operation and control. The inspection is designed to assure the city that these improvements are installed in accordance with approved designs and are consistent with the criteria and specifications governing the kind and quality of the installation. The city shall have the right to be present at tests of component parts of these improvements and systems for the purpose of determining that the improvements, as constructed, conform to the city's criteria. The tests are the responsibility of and will be performed by the developer or the developer's contractor, but only under the direct supervision of the Director of the city's Public Works Department or his or her designated representative.

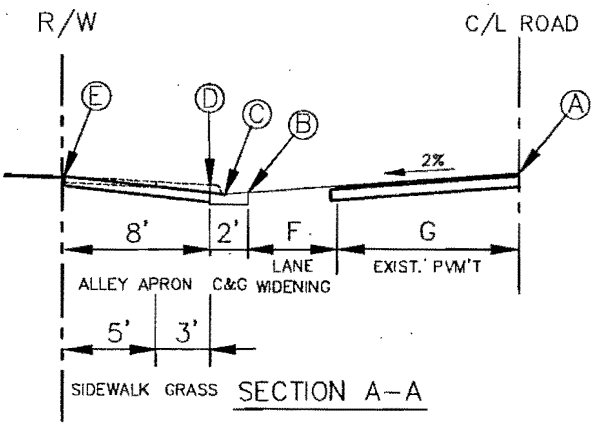
The City may charge the developer an inspection fee, pursuant to Section 5.4(6) of the City Code, for those facilities which are to be transferred to the city for ownership, operation and maintenance.

Revised by ORD 49-09
Effective 8/17/2009



* WITH SIDEWALK ADJACENT TO THE CURB THE MIN. TRANSITION IS 6'-0"

ALLEY PLAN



SECTION A-A

DESIGN ELEVATIONS							
R/W WIDTH	A EXISTING SURVEY ELEVATION	B TOP OF GUTTER AT FACE (E.O.P.)	C INVERT OF DROP CURB (FLOWLINE)	D BACK OF TYPE "F" CURB	E BACK OF APRON (SIDEWALK)	F	G
50'	A'	A'- 0.30'	A'- 0.42'	A'+ 0.08'	A'+ 0.32'	5'	10'
60'	A'	A'- 0.40'	A'- 0.52'	A'- 0.02'	A'+ 0.22'	10'	10'
70'	A'	A'- 0.50'	A'- 0.62'	A'- 0.12'	A'+ 0.12'	15'	10'
100'	A'	A'- 0.50'	A'- 0.62'	A'- 0.12'	A'+ 0.12'	5'	20'
100'	A'	A'- 0.60'	A'- 0.72'	A'- 0.22'	A'+ 0.02'	10'	20'

EXAMPLE: EXISTING C/L ELEV. AT (A) OF 9.60'(A), & R/W WIDTH IS 50'

DESIGN ELEVATIONS: AT (B) IS 9.60'- 0.30'= 9.30'

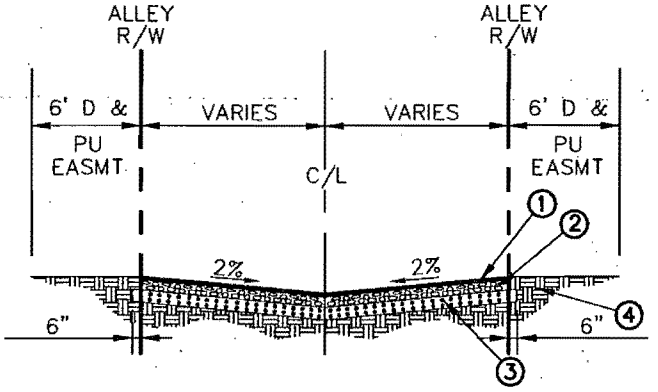
AT (C) IS 9.60'- 0.42'= 9.18'

AT (D) IS 9.60'+ 0.08'= 9.68'

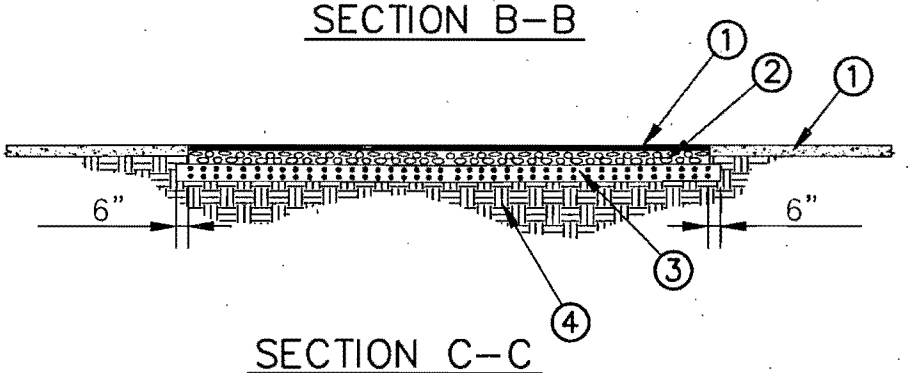
AT (E) IS 9.60'+ 0.32'= 9.92'

CITY OF CAPE CORAL ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: ALLEY DETAILS	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		A-1

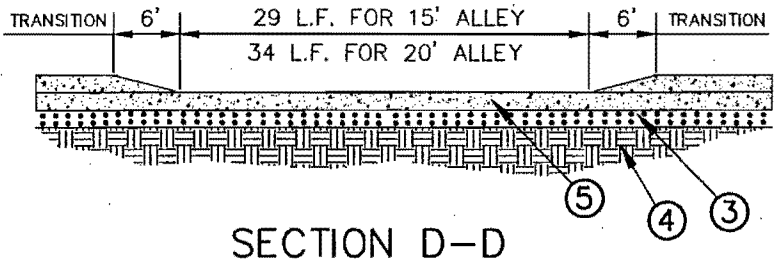


SECTION B–B



SECTION C–C

DROP CURB



SECTION D–D

MATERIAL LIST

① 2" S1 ASPHALT CONCRETE

② MIN. 8" LIMEROCK, MIN. LBR 100 COMPACTED TO 98% AASHTO T–180

③ MIN. 12" STABILIZED SUB–GRADE, MIN. LBR 40 COMPACTED TO 98% AASHTO T–180

④ EXISTING SOIL, COMPACTED IN PLACE

⑤ 6" CLASS I CONCRETE, 3000 PSI, 28 DAY, MIN. STRENGTH

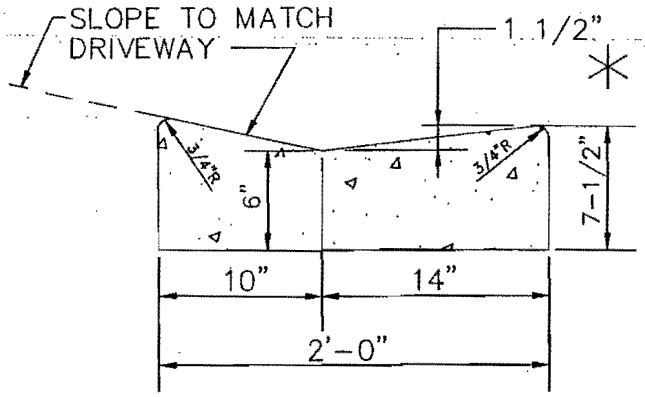
⑥ OPTIONAL DESIGN SECTIONS WILL BE REVIEWED BY THE PUBLIC WORKS DEPARTMENT

⑦ ALL CONSTRUCTION IN THE CITY R.O.W. SHALL HAVE A TRAFFIC CONTROL PLAN.

⑧ ALTERNATE PAVEMENT AND BASE MATERIALS WILL BE CONSIDERED FOR USE. REQUESTS MUST BE SUMBITTED AND APPROVED BY THE PUBLIC WORKS DIRECTOR.

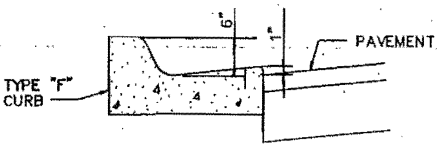
CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: ALLEY CROSS SECTIONS	REVISIONS :	SHEET NO. A–2
PUBLIC WORKS DIRECTOR	DATE 03–28–2002		

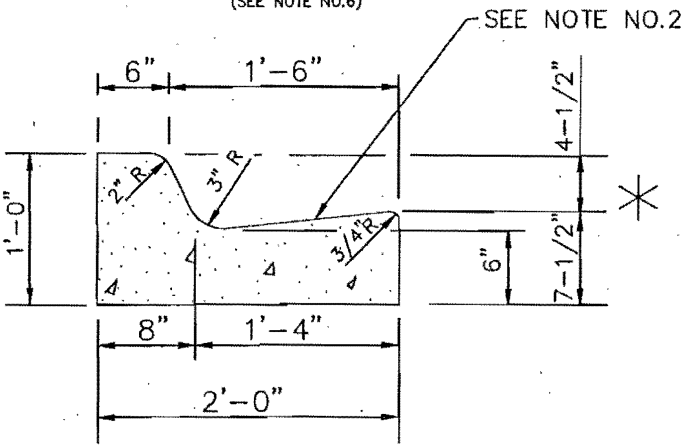


DROP CURB

AREA = 1.27 SQ.FT.
VOL.= 0.0471 C.Y./ LIN.FT.

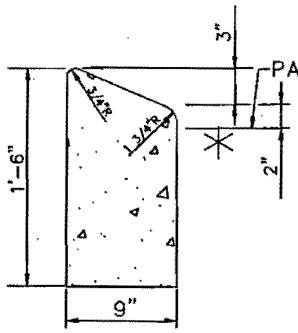


CURB REVEAL DETAIL
(SEE NOTE NO.6)



TYPE "F" CURB

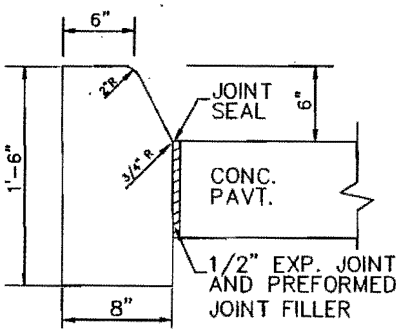
AREA = 1.379 SQ.FT.
VOL.= 0.0511 C.Y./ LIN.FT.



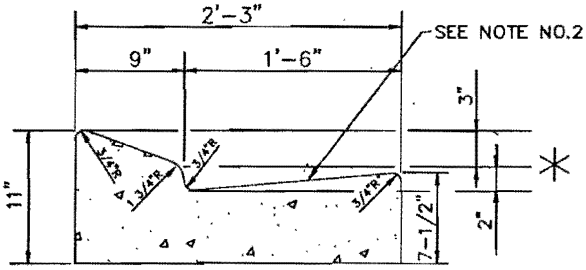
TYPE "B" CURB

AREA = 1.0275 SQ.FT.
VOL.= 0.0381 C.Y./ LIN.FT.

* = PAVEMENT SIDE OF CURB



TYPE "D" CURB



TYPE "E" CURB

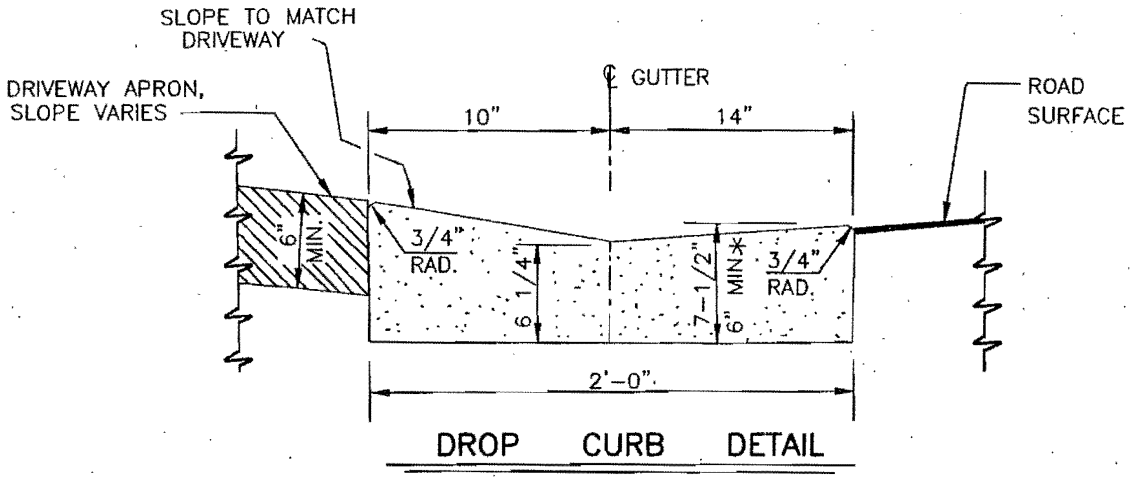
AREA = 1.434 SQ.FT.
VOL.= 0.0531 C.Y./ LIN.FT.

NOTES

1. MINIMUM COMPRESSIVE STRENGTH OF CONCRETE SHALL BE 3,000 P.S.I.
2. WHEN USED ON HIGH SIDE OF ROADWAY, THE CROSS SLOPE OF THE GUTTER SHALL MATCH THE CROSS SLOPE OF THE ADJACENT PAVEMENT AND THE THICKNESS OF THE LIP SHALL BE 6"MIN. UNLESS OTHERWISE SHOWN ON PLANS.
3. CONSTRUCT 1/2" EXPANSION JOINTS AT 100' O.C. AND SAWCUT CONTRACTION JOINTS AT 10' O.C.
4. REF. F.D.O.T. INDEX 300 FOR ADDITIONAL DETAILS.
5. SEE PARKING LOT STANDARDS FOR INTERNAL CURBING DETAIL.
6. LOCATIONS FOR USE OF REVEAL WILL BE DETERMINED BY THE ENGINEERING DIV. AT TIME OF STAKEOUT.
7. MIN. SAWCUT DEPTH IS 1/4 THE DEPTH OF THE MIN. CURB DEPTH.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: TYPICAL CURB SECTIONS	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		B-1



DROP CURB DETAIL

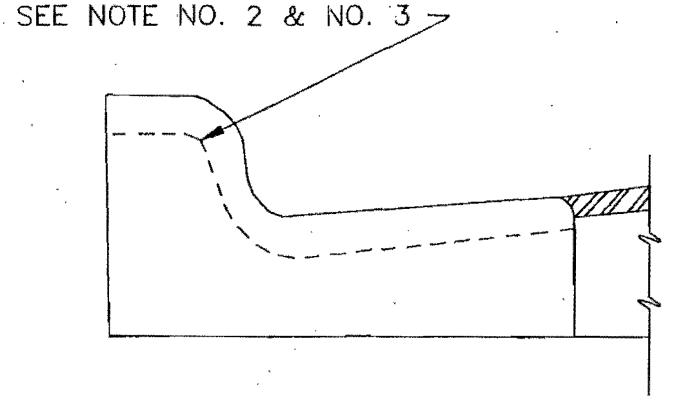
* WHEN USED ON HIGH SIDE OF ROADWAYS, THE CROSS SLOPE OF THE GUTTER SHALL MATCH THE CROSS SLOPE OF THE ADJACENT PAV'T. THE THICKNESS OF THE LIP SHALL BE 6", UNLESS OTHERWISE SHOWN ON PLANS.

NOTES:

1. MINIMUM COMPRESSIVE STRENGTH OF CONCRETE SHALL BE 3000 P.S.I.
2. WHERE THERE IS AN EXISTING SIDEWALK, IT SHALL BE REMOVED TO THE NEAREST JOINT AND REPLACED WITH A 4" THICK MINIMUM SIDEWALK AND A 6" MINIMUM IN DRIVEWAY.
3. WHERE THERE IS NO EXISTING SIDEWALK, THE APRON SHALL EXTEND A MINIMUM OF 6' OR TO THE RIGHT OF WAY LINE, WHICHEVER IS LESS AND SHALL RISE A MINIMUM OF 4" ABOVE THE GUTTER ELEVATION.
4. WHERE THE LOT IS LOWER THAN THE STREET, THE APRON MUST RISE 4", FROM THE GUTTER FLOW LINE TO THE R/W LINE, THEN SLOPE DOWN TO LOT.
5. REF. F.D.O.T. INDEX 300 FO ADDITIONAL DETAILS.
6. TO BE PAID FOR AS PARENT CURB.
7. FOR CONSTRUCTION OF DRIVEWAY WHERE THERE IS EXISTIING CURB & GUTTER, REMOVE CURB & GUTTER AND INSTALL DROP CURB.
8. WHEN CURB & GUTTER TO BE REMOVED IS 3' OR CLOSER TO THE NEAREST JOINT, THE SECTION SHALL BE REMOVED ENTIRELY.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: DRIVEWAY DROP CURB DETAIL	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		B-2



REMOVAL OF CURB & GUTTER

NOTES:

1. FOR CONSTRUCTION OF DRIVEWAY WHERE THERE IS EXISTING CURB & GUTTER, REMOVE CURB & GUTTER (REFER TO NOTES 2 AND 3) OR REMOVE CURB ONLY (REFER TO 2 AND 4) IN ACCORDANCE WITH DETAILS SHOWN.

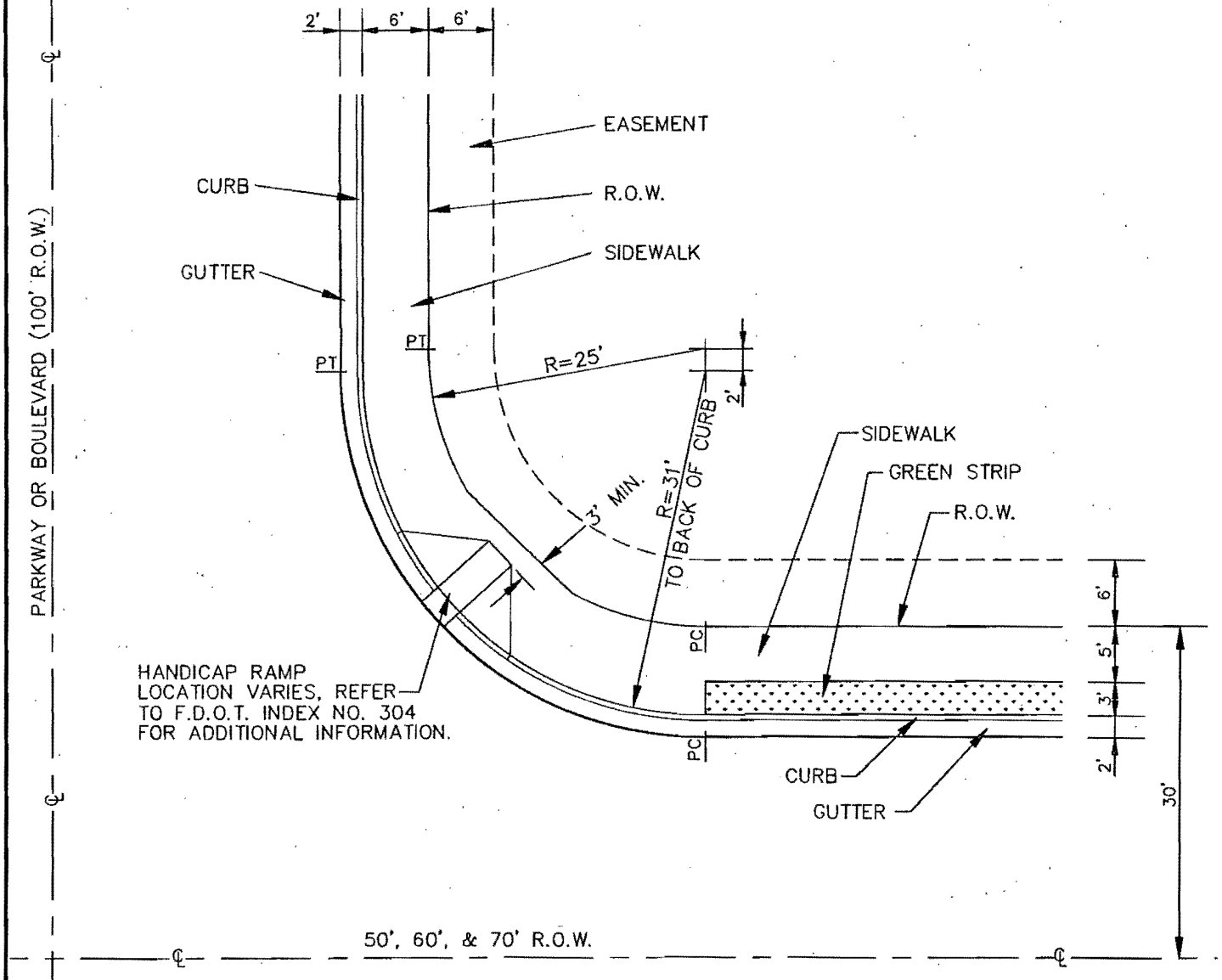
2. WHEN CURB & GUTTER TO BE REMOVED IS 3' OR CLOSER TO THE NEAREST JOINT OR WHEN CURB TO BE REMOVED IS 1' OR CLOSER TO THE NEAREST JOINT, THAT END OF THE SECTION SHALL BE ENTIRELY REMOVED.

3. WHEN THE END OF THE EXISTING CURB & GUTTER IS NOT TO BE REMOVED (COMPLIES WITH NOTE 2) THE CURB & GUTTER SHALL HAVE A 2" VERTICAL SAW CUT PERPENDICULAR TO THE BACK OF CURB EXTENDING FROM THE TOP BACK OF CURB TO THE FRONT OF THE GUTTER.

4. WHEN THE END OF THE EXISTING CURB IS NOT TO BE REMOVED (COMPLIES WITH NOTE 2) THE CURB SHALL HAVE A 2" DEEP VERTICAL SAW CUT PERPENDICULAR TO THE BACK OF CURB EXTENDING FROM THE TOP BACK OF CURB TO THE 2" DEEP LONGITUDINAL SAW CUT.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: DRIVEWAY REMOVAL OF TYPE "F" CURBING	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		B-3

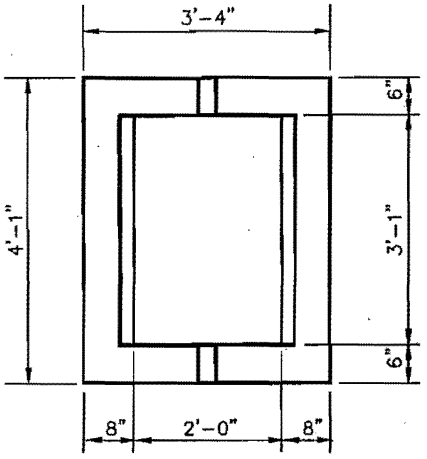


NOTE:

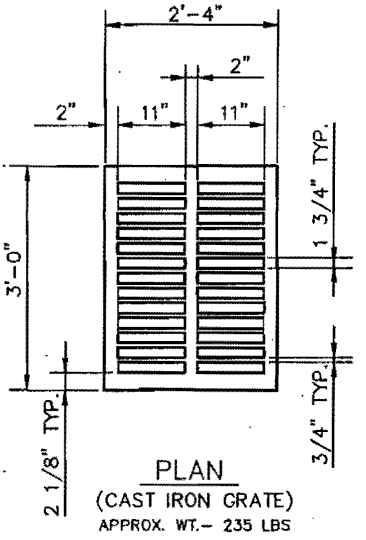
1. 3' GREEN STRIP IS TO BE ELIMINATED ON ALL 50' R.O.W.. SEE SHEET G15.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

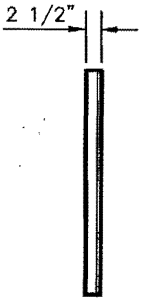
APPROVED:	TITLE: CURB, GUTTER, SIDEWALK, & F.D.O.T. RAMP AT LOCATION OF ADJOINING PKWY. OR BLVD.	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		B-4

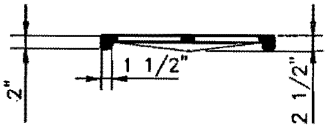


PLAN

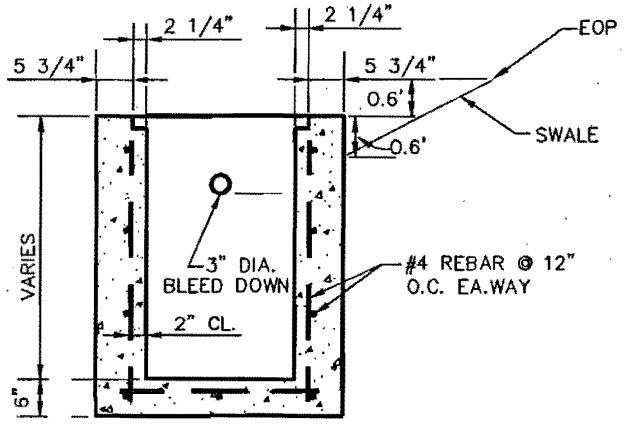


PLAN
(CAST IRON GRATE)
APPROX. WT.- 235 LBS





SECTION



SECTION

RECOMMENDED MAXIMUM PIPE SIZE:

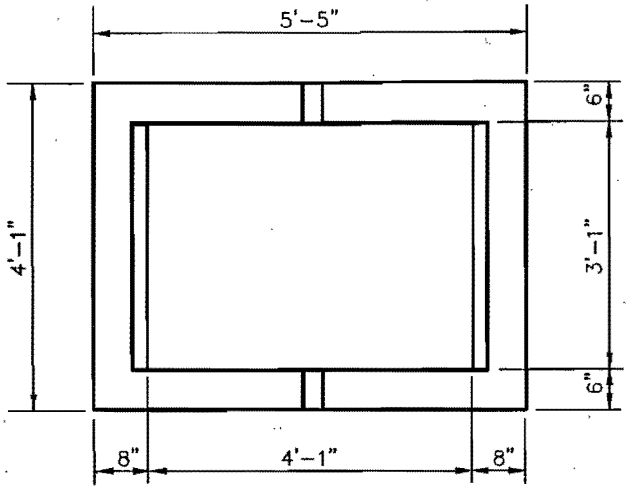
2'-0"	WALL - 18"	PIPE
3'-1"	WALL - 24"	PIPE

NOTES:

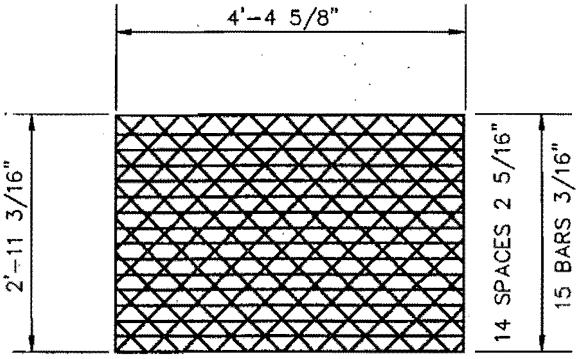
1. FOR TRAFFIC AREAS - USE USF 6611 DITCH BOTTOM INLET STEEL GRATE TYPE "C" WITH H-20 RATING, AS MANUFACTURED BY THE U.S. FOUNDRY & MANUFACTURING CORP.,OR EQUAL.
2. FOR STEEL REINFORCEMENT DETAIL, REFER TO F.D.O.T. STANDARD 201/232.
3. FOR ADDITIONAL DETAILS, REFER TO F.D.O.T. INDEX NO. 232.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: F.D.O.T. TYPE "C" INLET WITH GRATE	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE DATE 03-28-2002		C-1



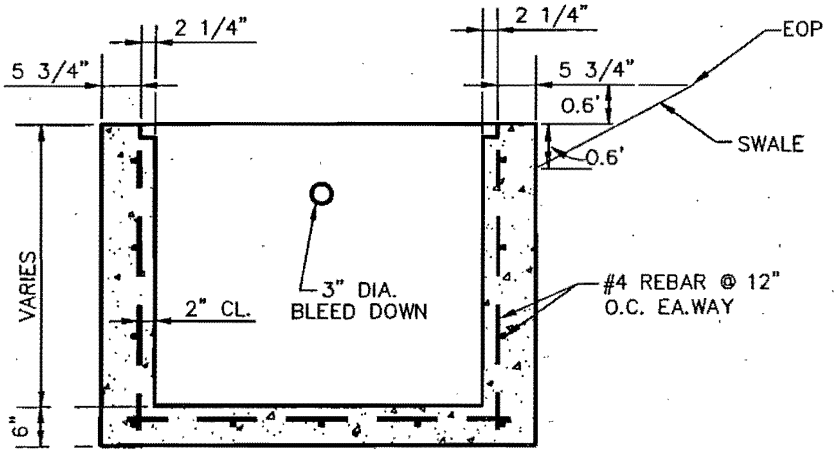
PLAN



PLAN

(STEEL GRATE / H-20 RATED FOR TRAFFIC AREAS)

STRAIGHT BARS - 2" X 3/16"
RETICULINE BARS - 1 1/4" X 3/16"
BANDS - 1 1/2" X 1/4"
APPROX. WT.- 235 LBS



SECTION

RECOMMENDED MAXIMUM PIPE SIZE:

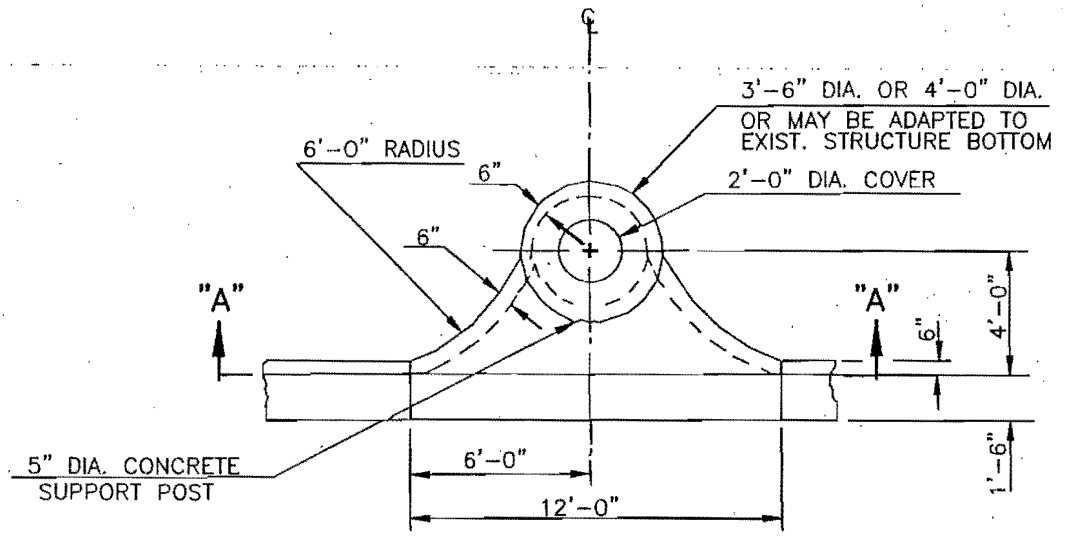
3'-1"	WALL - 24"	PIPE
4'-1"	WALL - 36"	PIPE

NOTES:

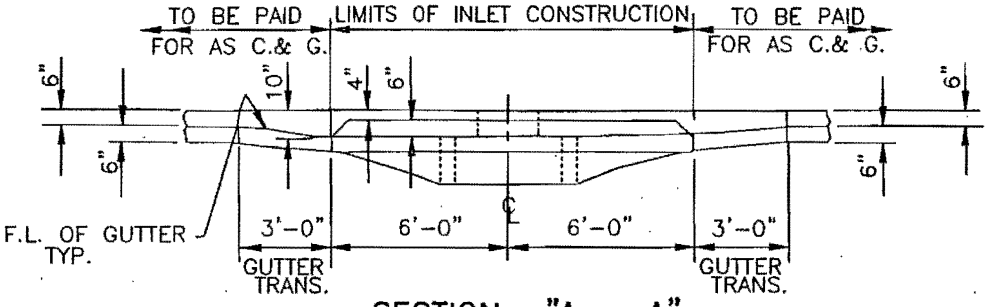
1. FOR TRAFFIC AREAS - USE USF 6626 DITCH BOTTOM INLET STEEL GRATE TYPE "D" WITH H-20 RATING, AS MANUFACTURED BY THE U.S. FOUNDRY & MANUFACTURING CORP.,OR EQUAL.
2. FOR STEEL REINFORCEMENT DETAIL, REFER TO F.D.O.T. STANDARD 201/232.
3. FOR ADDITIONAL DETAILS, REFER TO F.D.O.T. INDEX NO. 232.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

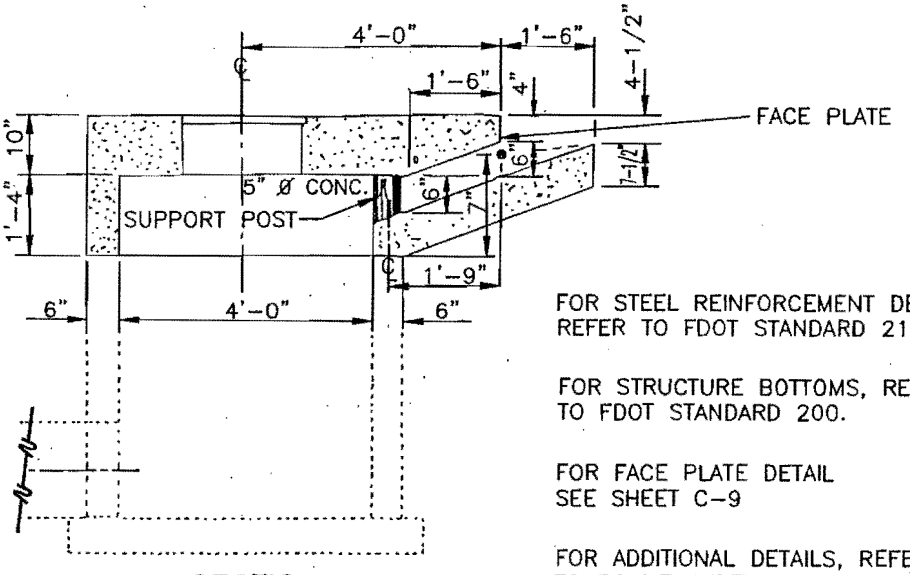
APPROVED:	TITLE: F.D.O.T. TYPE "D" INLET WITH GRATE	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE DATE 03-28-2002		C-2



INLET TYPE 4



SECTION "A – A"



SECTION

FOR STEEL REINFORCEMENT DETAIL, REFER TO FDOT STANDARD 210.

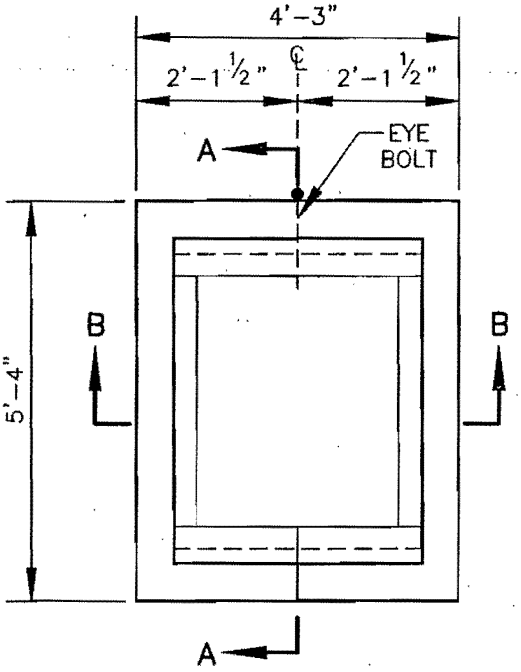
FOR STRUCTURE BOTTOMS, REFER TO FDOT STANDARD 200.

FOR FACE PLATE DETAIL SEE SHEET C-9

FOR ADDITIONAL DETAILS, REFER TO F.D.O.T. INDEX NO. 210.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

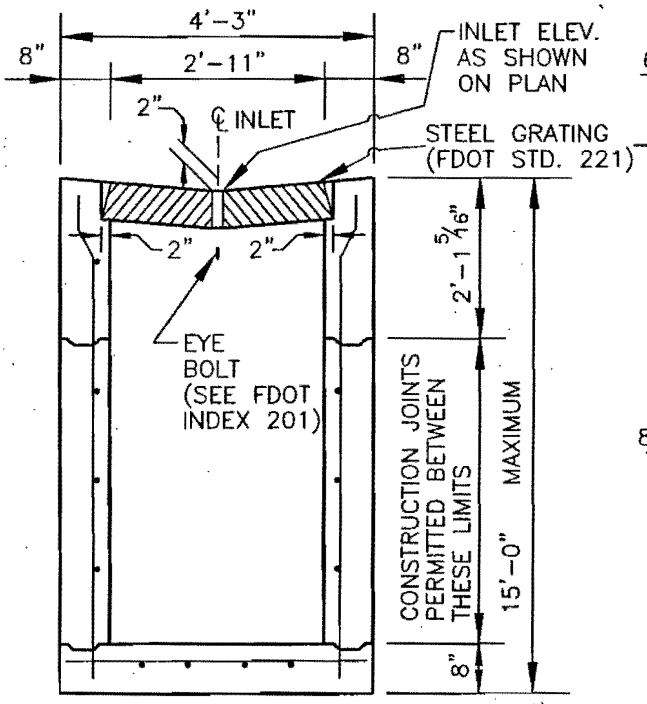
APPROVED:	TITLE: FDOT CURB INLET TOP TYPE 4	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		C-3



PLAN

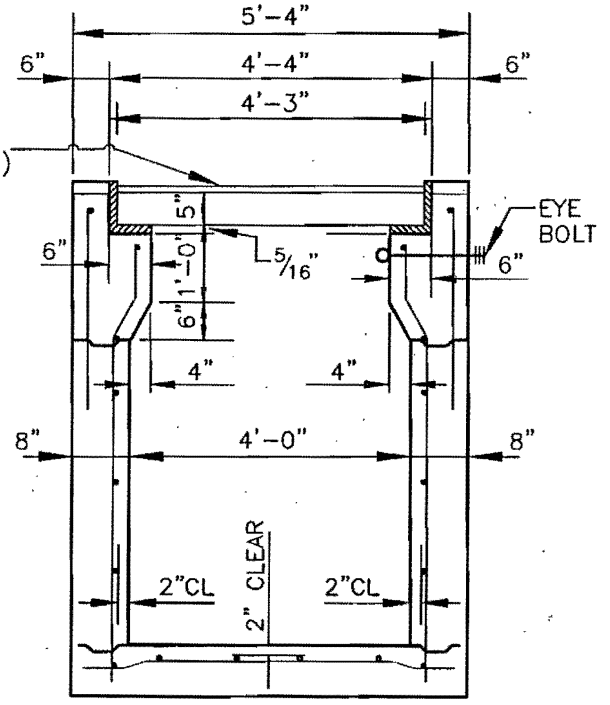
NOTE:

FOR ADDITIONAL DETAILS, REFER TO F.D.O.T. INDEX NO. 221.



SECTION "B-B"

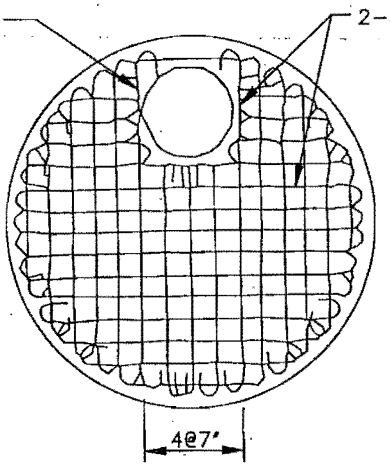
(FOR PIPE 24" DIA. AND UNDER)



SECTION "A-A"

CITY OF CAPE CORAL ENGINEERING STANDARD

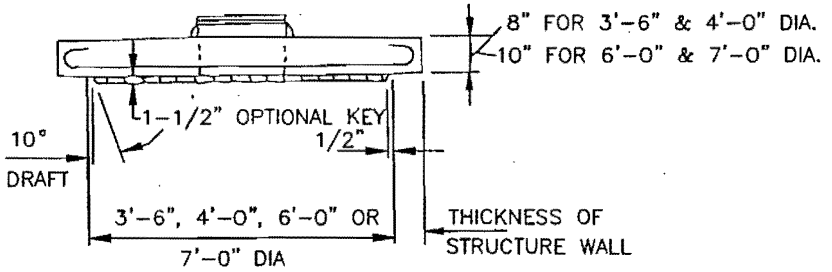
APPROVED:	TITLE: FDOT GUTTER INLET TYPE V	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		C-4



ALL REINFORCEMENT – #6 BARS EXCEPT 6 – #8 BARS SHOWN. BARS SPACED AT 6" CENTERS BOTH WAYS EXCEPT MIDDLE BARS SHOWN AT 7" CENTERS. ALL BARS WITH A.C.I.* STANDARD HOOKS CANTED APPROX. 45°, OR EMBEDDED IN ACCORDANCE WITH THE SLAB REINFORCEMENT DETAIL SHOWN UNDER OPTIONAL CONSTRUCTION JOINTS, SHEET NO.3 OF 6, FDOT INDEX 201, EXCEPT ALL #8 BARS AND #6 BARS AROUND MANHOLE OPENING SHALL BE HOOKED.

REINFORCEMENT PLAN

* A.C.I. – AMERICAN CONCRETE INSTITUTE



SECTION

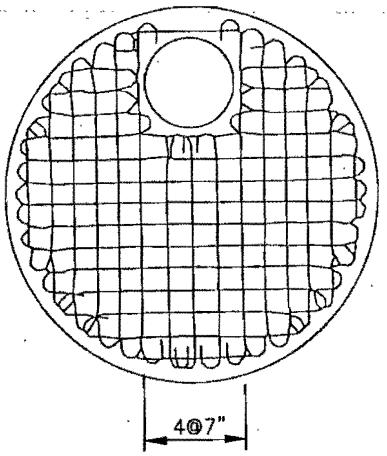
TYPE 7-T (TRAFFIC)(H-20)

NOTES (TOPS, FRAMES, AND COVER):

1. ALL STEEL BARS SHALL HAVE 1-1/4" MINIMUM COVER UNLESS OTHERWISE SHOWN AND SHALL BE HOOKED WHERE INDICATED.
2. MANHOLE TOP TYPE 7 SLABS SHALL BE OF CLASS II CONCRETE AS SPECIFIED IN ASTM C-478 MAY BE USED FOR PRECAST UNITS.
3. MANHOLE TOP TYPE 7 SLABS MAY BE OF CAST-IN-PLACE OR PRECAST CONSTRUCTION. THE OPTIONAL KEY IS FOR PRECAST TOPS AND IN LIEU OF DOWELS. FRAME AND SLAB OPENINGS ARE TO BE OMITTED WHEN TOP IS USED OVER A JUNCTION BOX. FRAMES CAN BE ADJUSTED WITH FROM ONE TO SIX COURSES OF BRICK.
4. MANHOLE TOPS SHALL BE SECURED TO STRUCTURES BY OPTIONAL CONSTRUCTION JOINTS AS SHOWN ON SHEET 3 OF 6, FDOT INDEX 201.
5. ALL COVERS TO BE TACK WELDED TO FRAMES AT THIRD POINTS OR GROUTED AT THIRD POINTS WITH EPOXY (TOTAL ELEVEN (11) OUNCES OF MIXED EPOXY).
6. THE 212 LB. COVER IS THE REPLACEMENT FOR ALL PREVIOUS 1-1/2"DEEP FRAMES (TRAFFIC TYPE). THE 185 LB. COVER IS THE REPLACEMENT FOR ALL PREVIOUS 1/2" DEEP FRAMES (NON-TRAFFIC TYPE).
7. FOR STRUCTURE BOTTOMS, REFER TO FDOT STANDARD 200.
8. FOR ADDITIONAL DETAILS, REFER TO F.D.O.T. INDEX NOS. 200 & 201.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: STRUCTURE TOPS FOR MANHOLES OR JUNCTION BOXES – TRAFFIC	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		C-5

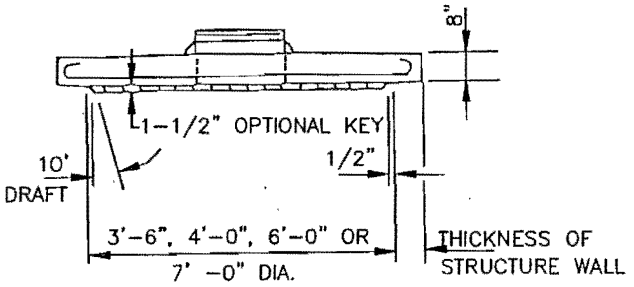


REINFORCING BARS @ 6" CENTERS BOTH WAYS EXCEPT MIDDLE BARS SHOWN 7" CENTERS. ALL BARS WITH A.C.I. * STANDARD HOOKS CANTED APPROX, 45°, OR EMBEDDED IN ACCORDANCE WITH THE SLAB REINFORCEMENT DETAIL SHOWN UNDER OPTIONAL CONSTRUCTION JOINTS, SHEET NO. 3 OF 6, FDOT INDEX 201, EXCEPT BARS AROUND MANHOLE OPENING SHALL BE HOOKED.

BAR SIZE	TOP DIA.
NO. 4	3'-6", & 4'-0'
NO. 5	6'-0"
NO. 6	7'-0"

REINFORCEMENT PLAN

* A.C.I. – AMERICAN CONCRETE INSTITUTE



SECTION

TYPE 7-NT (NON-TRAFFIC)

NOTES (TOPS, FRAMES, AND COVER):

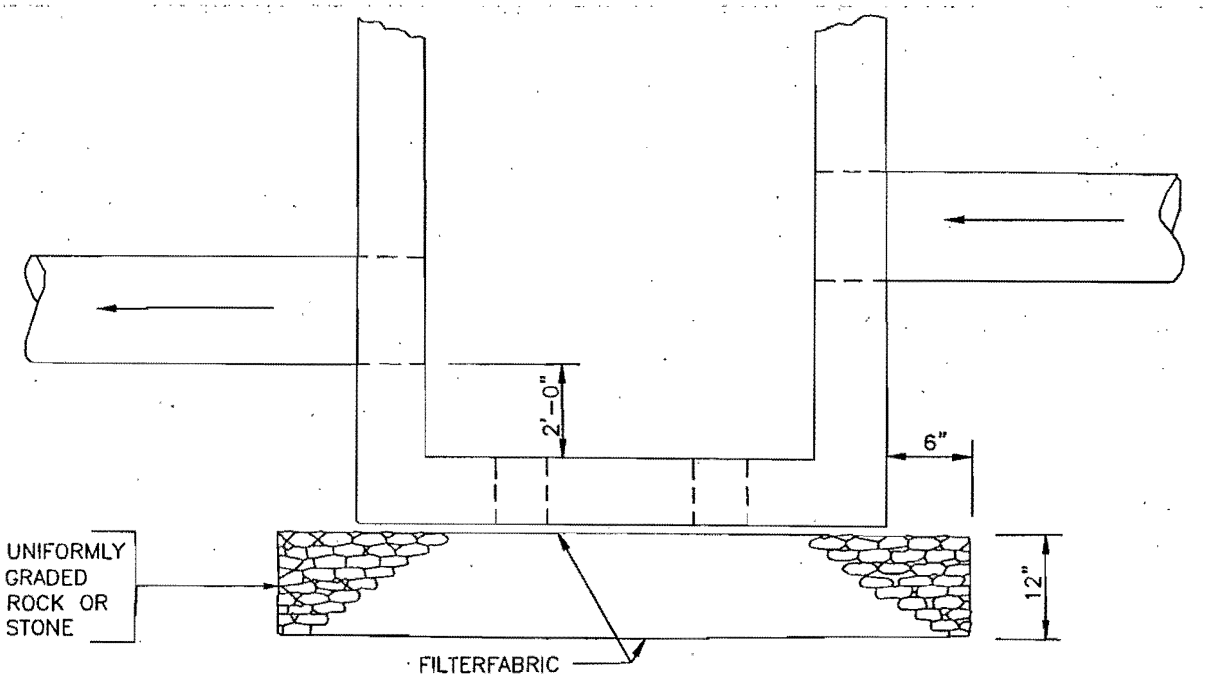
1. ALL STEEL BARS SHALL HAVE 1-1/4" MINIMUM COVER UNLESS OTHERWISE SHOWN AND SHALL BE HOOKED WHERE INDICATED.
2. MANHOLE TOP TYPE 7 SLABS SHALL BE OF CLASS II CONCRETE AS SPECIFIED IN ASTM C-478 MAY BE USED FOR PRECAST UNITS.
3. MANHOLE TOP TYPE 7 SLABS MAY BE OF CAST-IN-PLACE OR PRECAST CONSTRUCTION. THE OPTIONAL KEY IS FOR PRECAST TOPS AND IN LIEU OF DOWELS. FRAME AND SLAB OPENINGS ARE TO BE OMITTED WHEN TOP IS USED OVER A JUNCTION BOX. FRAMES CAN BE ADJUSTED WITH FROM ONE TO SIX COURSES OF BRICK.
4. MANHOLE TOPS SHALL BE SECURED TO STRUCTURES BY OPTIONAL CONSTRUCTION JOINTS AS SHOWN ON SHEET 3 OF 6, FDOT INDEX 201.
5. ALL COVERS TO BE TACK WELDED TO FRAMES AT THIRD POINTS OR GROUTED AT THIRD POINTS WITH EPOXY (TOTAL ELEVEN (11) OUNCES OF MIXED EPOXY).
6. THE 212 LB. COVER IS THE REPLACEMENT FOR ALL PREVIOUS 1-1/2" DEEP FRAMES (TRAFFIC TYPE). THE 185 LB. COVER IS THE REPLACEMENT FOR ALL PREVIOUS 1/2" DEEP FRAMES (NON-TRAFFIC TYPE).
7. FOR STRUCTURE BOTTOMS, REFER TO FDOT STANDARD 200.
8. FOR ADDITIONAL DETAILS, REFER TO F.D.O.T. INDEX NOS. 200 & 201.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: STRUCTURE TOPS FOR MANHOLES OR JUNCTION BOXES – NON-TRAFFIC	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		C-6

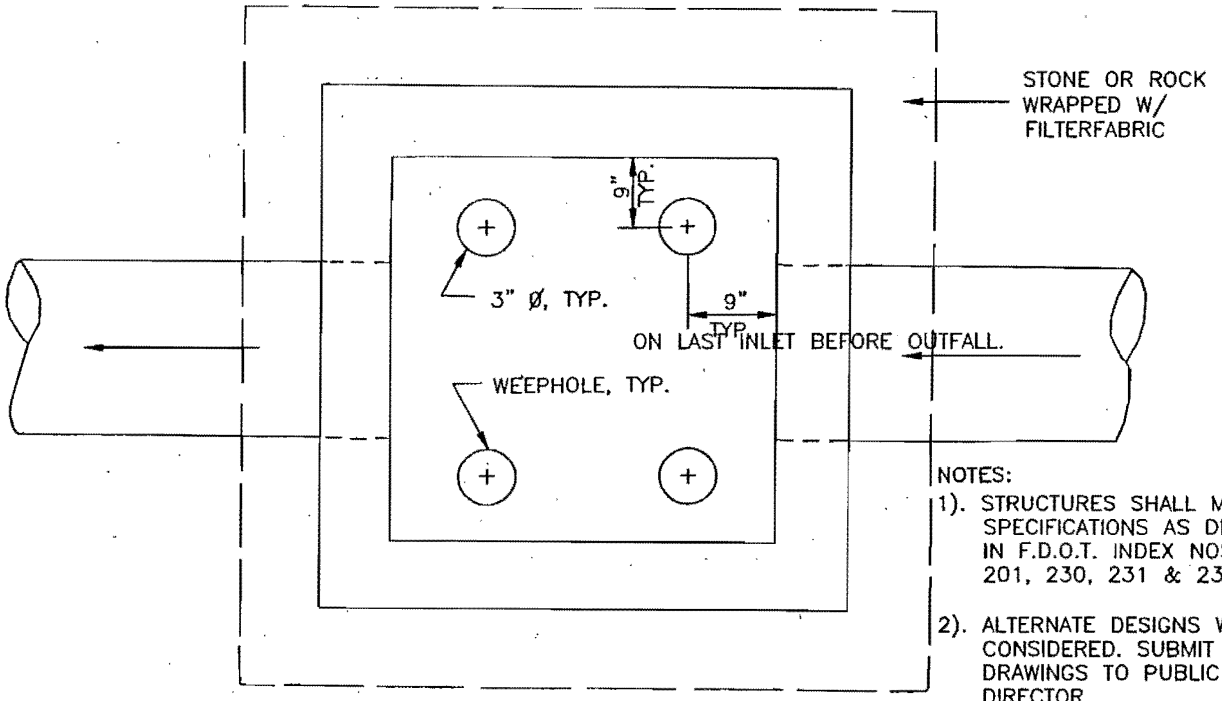
SUMP CROSS SECTION

N.T.S.



SUMP PLAN VIEW

N.T.S.



NOTES:

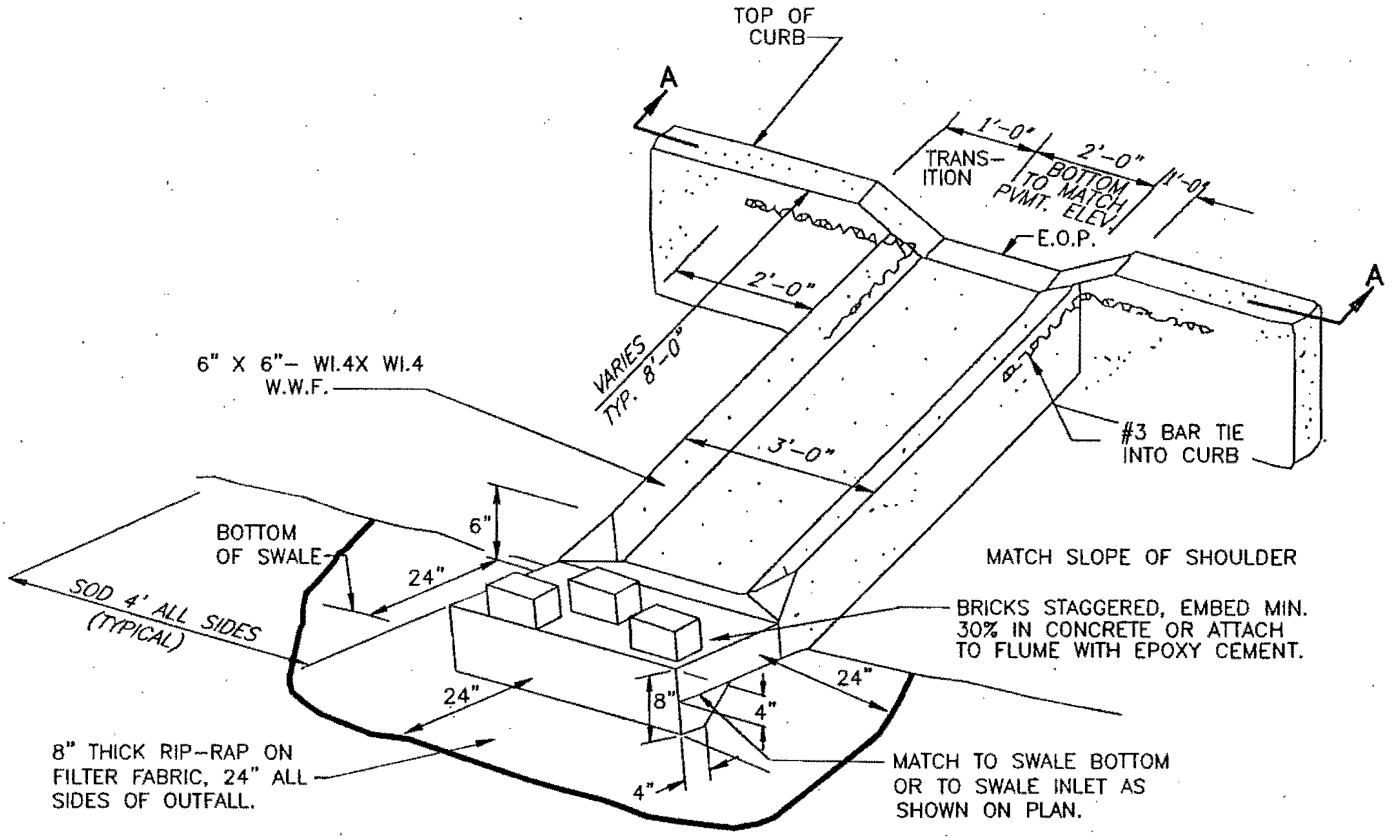
1). STRUCTURES SHALL MEET SPECIFICATIONS AS DETAILED IN F.D.O.T. INDEX NOS. 200, 201, 230, 231 & 232.

2). ALTERNATE DESIGNS WILL BE CONSIDERED. SUBMIT SHOP DRAWINGS TO PUBLIC WORKS DIRECTOR.

NOTE: A SUMP MUST BE INSTALLED ON LAST INLET BEFORE OUTFALL. FOR NEW INSTALLATION OR WHERE EXIST. STRUCTURE MUST BE REPLACED.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: CATCH BASIN SUMP DETAIL	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 2-8-2002		C-7



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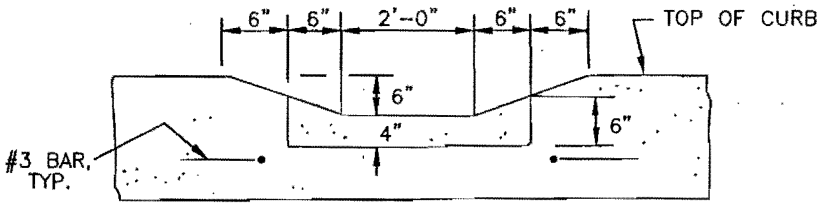


SECTION A-A

CONCRETE FLUME DETAIL

N.T.S.

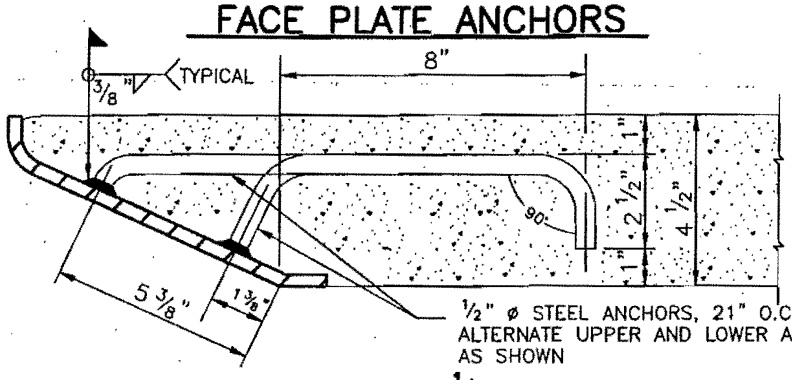
NOTES:

1. FLUME MAY OR MAY NOT ALIGN WITH THE DITCH BOTTOM INLET.
2. MINIMUM COMPRESSIVE STRENGTH OF CONCRETE SHALL BE 3000 P.S.I.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

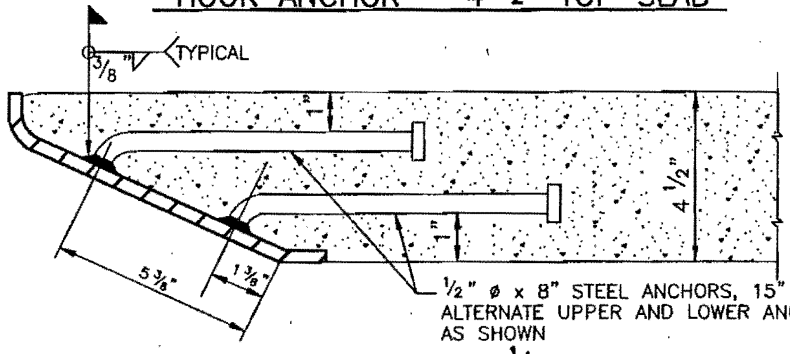
APPROVED:	TITLE: CONCRETE FLUME DETAIL	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 2-8-2002		C-8

FACE PLATE ANCHORS



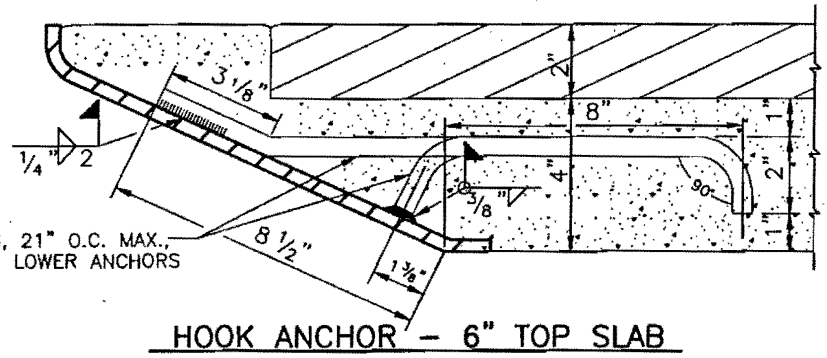
1/2" ø STEEL ANCHORS, 21" O.C. MAX., ALTERNATE UPPER AND LOWER ANCHORS AS SHOWN

HOOK ANCHOR – 4 1/2" TOP SLAB



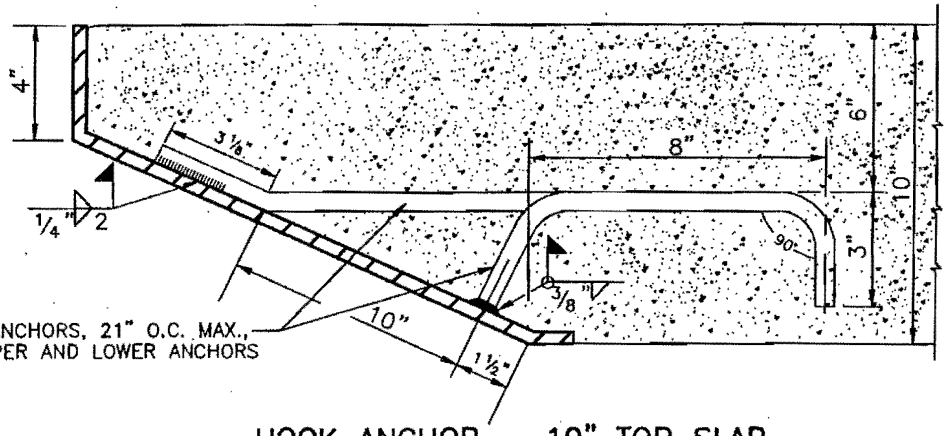
1/2" ø x 8" STEEL ANCHORS, 15" O.C. MAX., ALTERNATE UPPER AND LOWER ANCHORS AS SHOWN

ROUND HEAD ANCHOR – 4 1/2" TOP SLAB



1/2" ø STEEL ANCHORS, 21" O.C. MAX., ALTERNATE UPPER AND LOWER ANCHORS AS SHOWN

HOOK ANCHOR – 6" TOP SLAB



1/2" ø STEEL ANCHORS, 21" O.C. MAX., ALTERNATE UPPER AND LOWER ANCHORS AS SHOWN

HOOK ANCHOR – 10" TOP SLAB

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: STEEL FACE PLATE DETAIL FOR CURB INLET TOPS	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		C-9

DRIVEWAY CONTROL

The Public Works Department must approve the design, number and location of driveways. Approvals are required for new driveways or existing driveways when their use or operation is changed. The number of driveways particularly on arterial roads must be kept to a minimum. No driveways will be approved without a site plan.

Driveway Maneuvers Driveways will not be approved for parking or loading areas that require backing maneuvers in a public street right-of-way except for single family or duplex residential uses on local streets. Such residential uses on other class streets are required to utilize circular or hammerhead driveways provided with a turn around area. See sheet D-12.

COMMERCIAL DRIVEWAYS – All uses, except single family and duplex dwelling units

Driveway Location - If a property has frontage on more than one street, driveway access will be permitted only on those street frontages where driveway location standards contained in these Standards can be met. If a property cannot be serviced by a driveway access meeting those standards, the City will designate access points based on traffic safety, operational needs and conformance to as much of the requirements of these guidelines as possible.

Joint Driveways - Joint driveways must be constructed for two adjacent developments where a proposed new driveway will not meet the spacing requirement set forth in sheet D-5. The driveway must be constructed on the lot line with an agreement to provide an access easement and ownership of half of the driveway to the adjoining property owner at such time as that property develops. See Sheets D-8 and D-9.

Restriction of Turning Movements – Where necessary for the safe and efficient movement of traffic, the City may require driveways to have certain turn movements restricted.

Number of Driveways – One driveway per property ownership will be permitted, unless the spacing requirements set forth on sheet D-5 can be met, or as necessary for traffic safety.

Abandoned Driveways – Existing driveways, even if not in use, must not be relocated, altered or reconstructed without approval from the City.

Speed Change Lanes – For arterial and collectors streets, the City requires the provision of left turn lanes at all public intersections and private driveways, at which median openings exist or are being permitted. In addition, right turn lanes will be required at high volume driveways in accordance with the Lee County turn lane policy.

DRIVEWAY DESIGN

This section describes width, alignment, driveway island design, driveway corner radii, and sight distance requirements for non-residential and multifamily development.

The Florida Department of Transportation and Lee County regulate driveways onto State and County roads respectively. Driveway permits on these roads must be obtained directly from the appropriate agency. "PDP" developments will be constructed to meet approved Master Plan.

Repair and maintenance of all driveways is the responsibility of the property owner, including portion in the public right of way.

Driveways for Commercial, Professional, Industrial and Multifamily (except duplexes)

Shopping center and large project driveways must be designed to all street intersection design requirements.

Spacing – Non-residential and multifamily driveway spacing standards are shown on sheets D-3, D-4, D-5, D-6. Spacing on Del Prado Blvd. between SR-78 (Pine Island Road) and U.S. 41 only is shown on sheet D-5 - Notes 4 and 5. Where driveways are in closer proximity than the distances shown, joint driveways will be required per sheets D-8 and D-9.

Alignment – Minimum sight distance must be provided at all access points as described in MUMSDCM, Section III-7, which applies to both public streets and private driveway intersections. Driveways should intersect a public street at no less than 80 degrees.

Driveway Grades – For maximum grades, see sheet D-13.

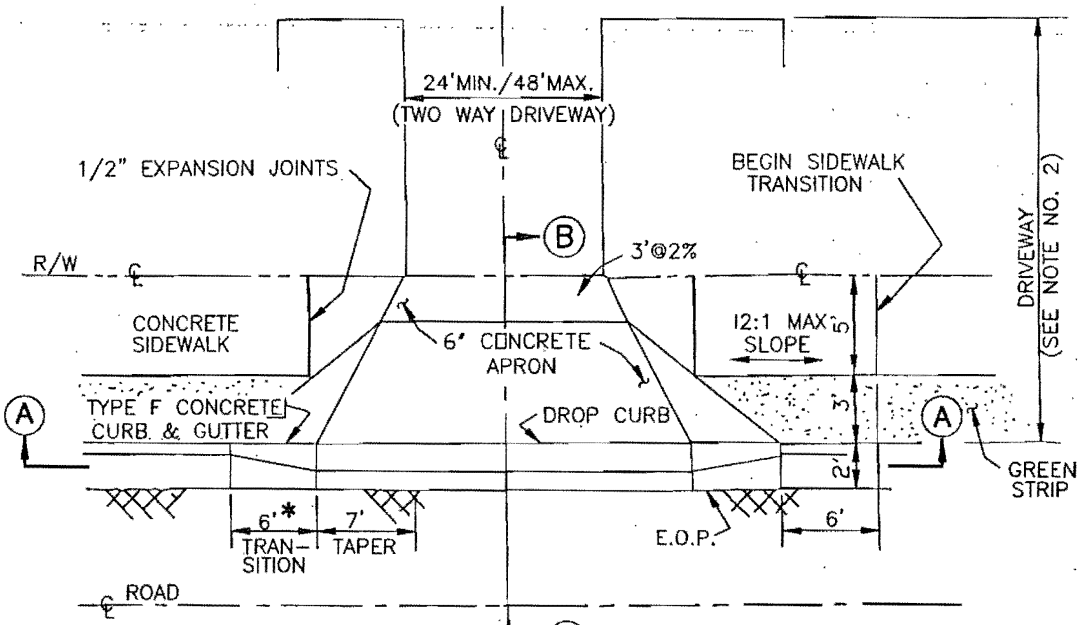
Residential Driveway – Single Family and Duplex Residence

This section describes driveways alignment, design, dimensions, profiles, and sight distance requirements. Back-out driveways are very undesirable along Boulevards and Parkways and other specified roadways. See Sheet D-12. It is, therefore, required that when new single family or multiplex development facing these roadways are permitted, that circular or hammerhead driveways with turnaround features be provided. Standard residential (single and duplex) driveway spacing criteria are shown on sheet D-10.

Restoration

Whenever an area in the Public Right of Way adjacent to the work is disturbed, the area shall be restored, including the installation of sod or alternate approved methods.

Rev. Ord. 57-07; 6-7-07, eff. 7-1-07



PLAN VIEW

* IF SIDEWALK IS ADJACENT TO THE CURB, THE MINIMUM CURB TRANSITION IS 6'

NOTES:

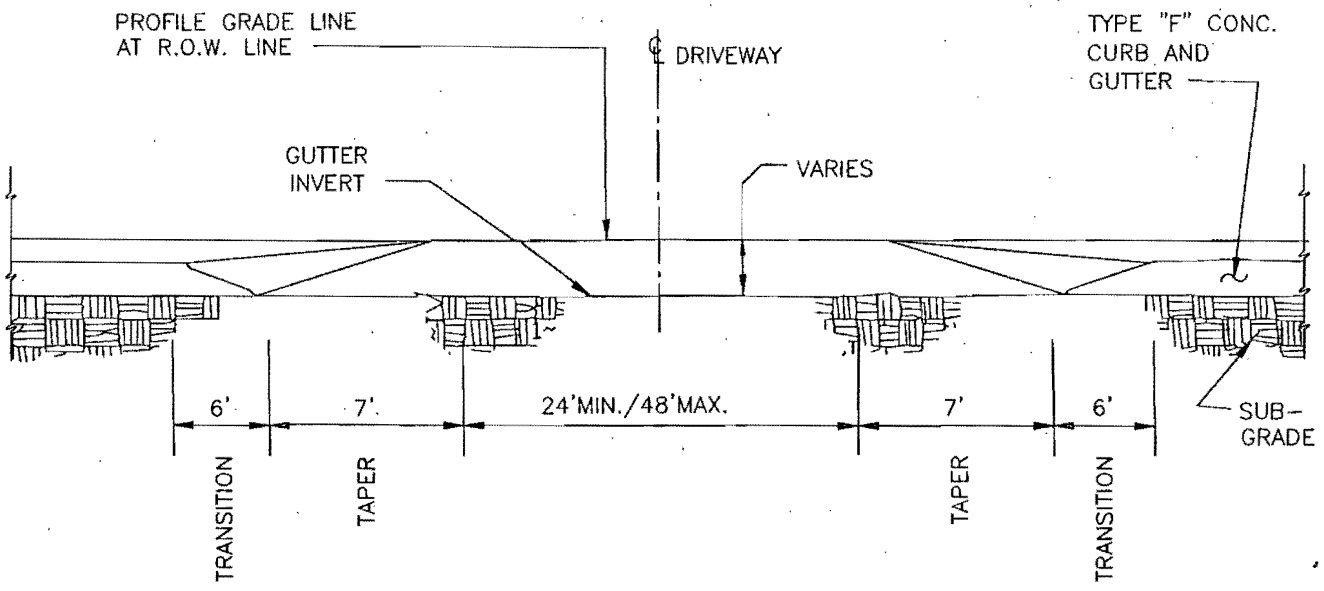
1. ALL CONCRETE SHALL BE MINIMUM 3000 P.S.I. IN 28 DAYS
2. THE DESIRED THROAT LENGTH IS 50'
   THE MINIMUM THROAT LENGTH IS 20'
3. SAWCUT SIDEWALK AT 5' ON CENTERS.
   SAWCUT CURB AT 10' ON CENTERS.
4. MAXIMUM COMBINED DRIVEAWAY SLOPE MAY NOT EXCEED 12%.
   SEE SHEET NO. D-13 FOR DETAILS & DEFINITIONS
5. MINIMUM WIDTH FOR ONE-WAY DRIVE IS 15'.
6. MINIMUM BASE SHALL BE 6" COMPACTED LIMEROCK
   LBR 100 COMPACTED TO 98%, AASHTO T-180

DESIGN ELEVATIONS (SEE SHEET D-4)						
R/W WIDTH	A EXISTING SURVEY ELEVATION	B TOP OF GUTTER AT FACE (E.O.P.)	C INVERT OF DROP CURB (FLOWLINE)	D BACK OF TYPE "F" CURB	F	G
50'	A'	A'-0.30'	A'-0.42'	A'+0.08'	5'	10'
60'	A'	A'-0.40'	A'-0.52'	A'-0.02'	10'	10'
70'	A'	A'-0.50'	A'-0.62'	A'-0.12'	15'	10'

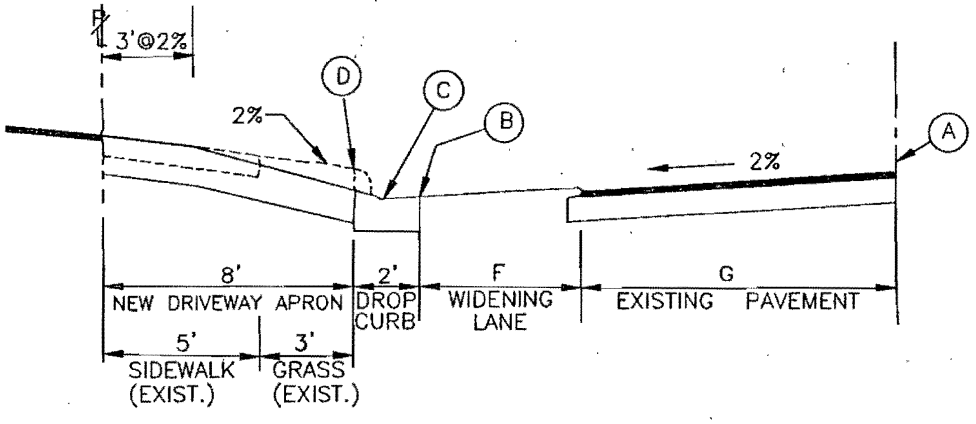
EXAMPLE: EXISTING ℄ ELEV. AT Ⓐ OF 9.60'(A'), & R/W WIDTH IS 50'.
DESIGN ELEVATIONS AT Ⓑ IS 9.60' - .0.30' = 9.30'
AT Ⓒ IS 9.60' - 0.42' = 9.18'
AT Ⓓ IS 9.60' + 0.08' = 9.68'

CITY OF CAPE CORAL ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: COMMERCIAL/PROFESSIONAL DRIVEWAYS LOCAL STREETS ONLY	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		D-3



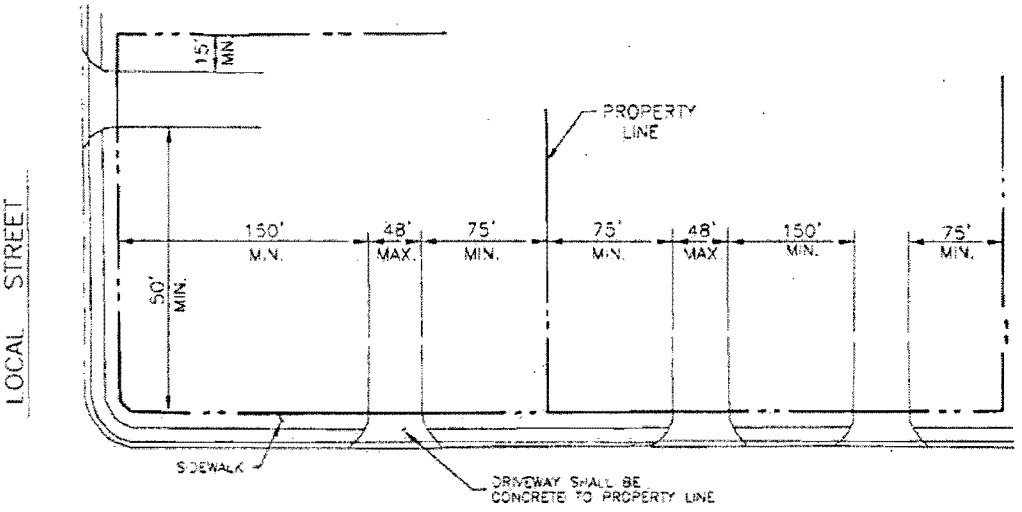
SECTION A–A



SECTION B–B

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

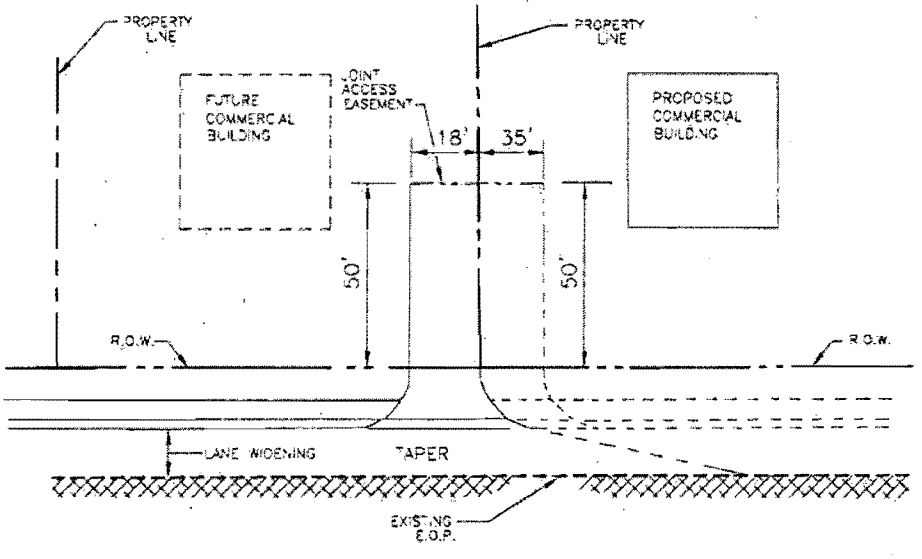
APPROVED:	TITLE: COMMERCIAL/PROFESSIONAL DRIVEWAYS LOCAL STREETS ONLY – SECTIONS	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		D–4



ARTERIAL/COLLECTOR STREET

NOTES:

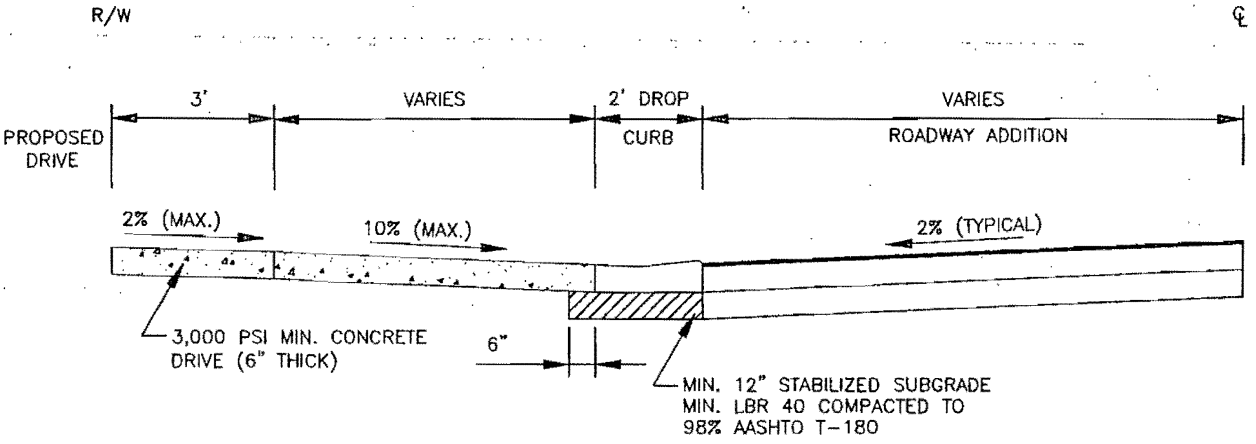
1. IF COMM./PROF./IND. PROPERTY CANNOT MEET THESE MINIMUM DISTANCES, THEN A JOINT COMMERCIAL DRIVE MUST BE USED.
2. THE CITY PUBLIC WORKS DEPT. MAY APPROVE VARIATIONS TO THIS STANDARD IF PROPERTY ON BOTH SIDES OF THE NEW COMM./PROF./IND. PROPERTY ARE DEVELOPED.
3. FOR OTHER ALTERNATIVES ON LOCAL STREETS, CONSULT WITH PUBLIC WORKS DEPARTMENT FOR APPROVAL.
4. FLORIDA DOT ACCESS CLASSIFICATION #3 GREATER THAN 45 MPH AT 660' SPACING. (DEL PRADO BLVD. FROM KISMET PKWY. TO US 41)
5. FLORIDA D.O.T. ACCESS CLASSIFICATION #2 (MODIFIED) MINIMUM DRIVEWAY CONNECTION: 1320' WITH MEDIAN OPENINGS AT: N.E. 10TH TER., N.E. 14TH ST., DIPLOMAT PKWY., N.E. 20TH ST., AND KISMET PKWY.. (DEL PRADO BLVD. FROM S.R.-78 TO KISMET PKWY.)



JOINT COMM./PROF./IND. EASEMENT FOR FUTURE JOINT DRIVEWAYS

CITY OF CAPE CORAL ENGINEERING DESIGN STANDARD

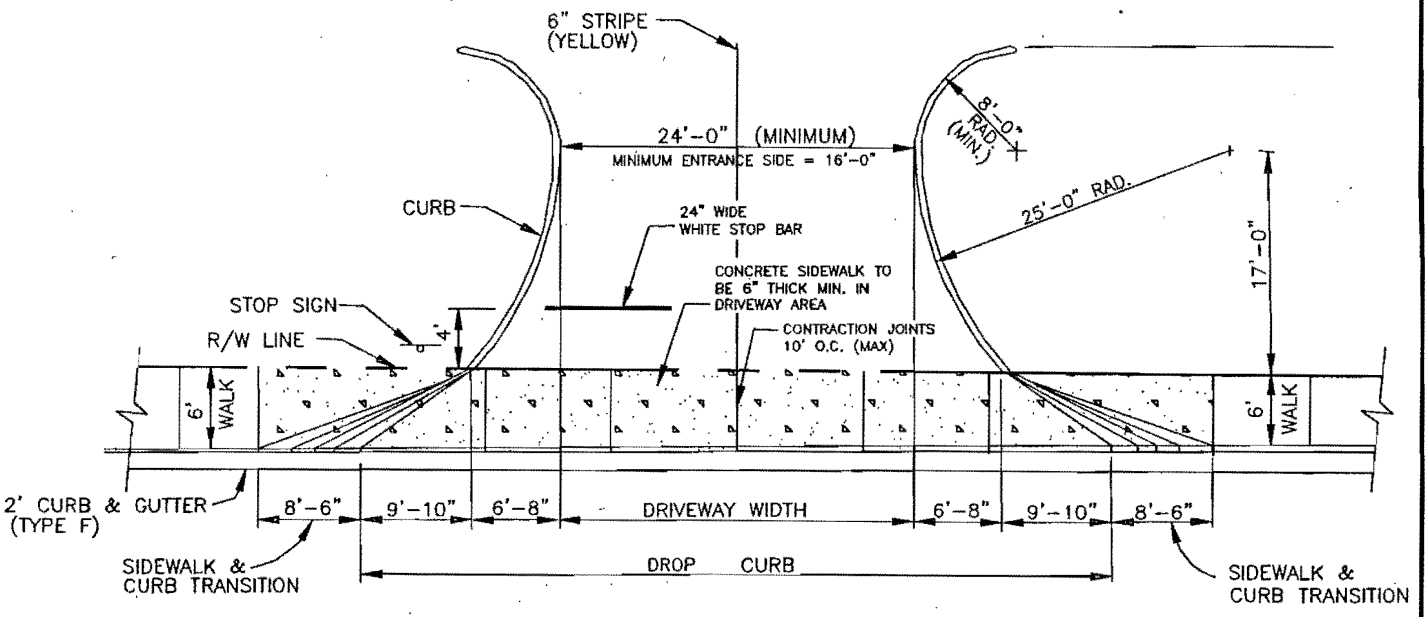
APPROVED:	TITLE: COMMERCIAL / PROFESSIONAL INDUSTRIAL DRIVEWAYS COLLECTOR STREETS AND ARTERIALS – EASEMENT & SPACING	REVISIONS : Rev. Ord. 57-07; 6-4-07 Effective 7-1-07	SHEET NO. D–5
PUBLIC WORKS DIRECTOR	DATE 03–28–2002		



NOTES:

1. CONTRACTOR SHALL HAVE DRIVEWAY FORMING INSPECTED FOR H/C COMPLIANCE BEFORE PLACING CONCRETE.
2. THE SIDEWALK FOUNDATION SHALL BE COMPACTED TO A FIRM EVEN SURFACE AND BE FREE OF SOD AND OTHER ORGANIC MATERIAL. SIDEWALK SAWCUT JOINTS SHALL BE ON 5' CENTERS AND 1/3 THE SLAB THICKNESS.

DRIVEWAY CROSS SECTION DETAIL

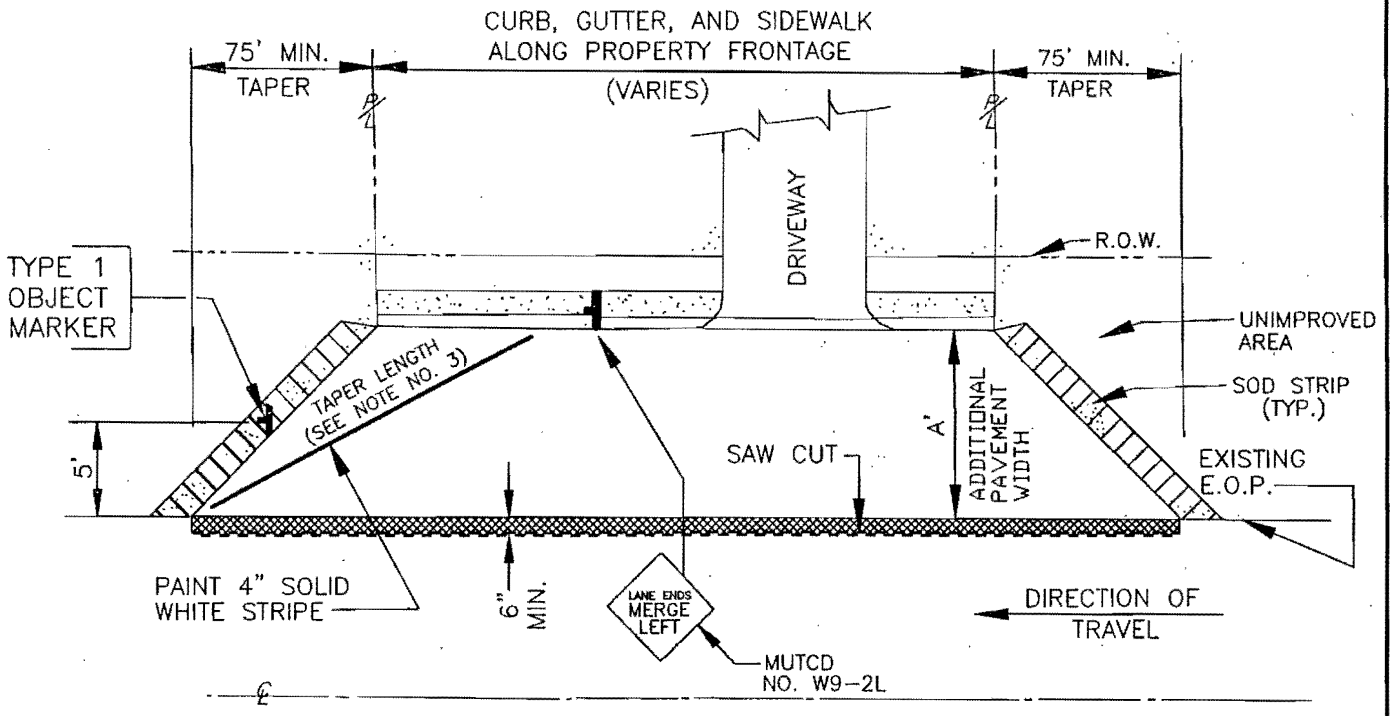


NOTES:

1. MAXIMUM COMBINED SLOPE SHALL NOT EXCEED 12%. SEE SHEET D-13
2. A STOP BAR AND STOP SIGN ARE REQUIRED AT THE EXIT SIDE OF THE DRIVEWAY. SIGNS TO BE INSTALLED PER MUTCD.
3. SIDEWALK DESIGN TO MEET ADA REQUIREMENTS.
4. CONCRETE SIDEWALK TO BE 6" THICK (MIN.) IN DRIVEWAY AREA.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: COMMERCIAL/PROFESSIONAL/INDUSTRIAL DRIVEWAY ON COLLECTOR STREETS AND ARTERIALS - DETAILS	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		D-6

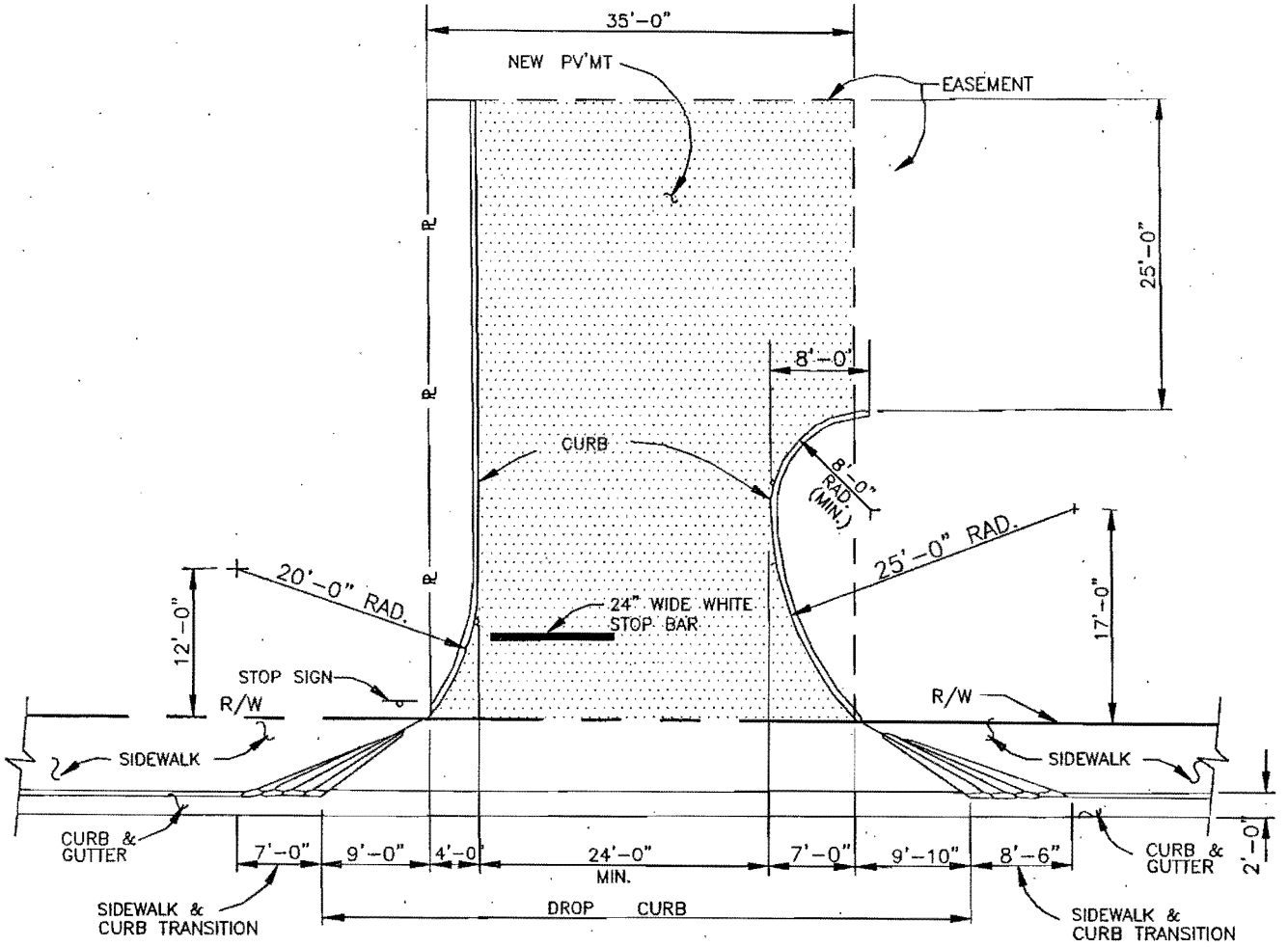


NOTES:

1. SEE TYPICAL CROSS SECTION SHEETS FOR PAVEMENT REQUIREMENTS.
2. THE EXISTING PAVEMENT SHALL BE SAW CUT TO PROVIDE A STRAIGHT, NONDAMAGED EDGE AND SHALL BE PARALLEL TO ROADWAY CENTERLINE.
3. STRIPED TAPER LENGTH SHALL BE:
   A.) 30 MPH $\leq$ DESIGN SPEED $<$ 45 MPH, $L = A' \times 8$.
   B.) DESIGN SPEED $\geq$ 45MPH, $L = A' \times 12$.
4. TAPER IS NOT TO BE CONSTRUCTED ON ADJACENT "R-1" ZONED PROPERTY.
5. AT COMMENCEMENT OF WORK IN THE R.O.W., BARRICADES SHALL BE PLACED ALONG EXISTING PAVEMENT EDGE UNTIL WIDENING IS COMPLETE.
6. REQUIREMENTS FOR INDUSTRIAL, COMMERCIAL, PROFESSIONAL CONSTRUCTION IMPROVEMENTS IN RIGHTS-OF-WAYS SHALL NOT RESTRICT, IMPEDE OR IMPACT EXISTING STORM WATER DRAINAGE ON THE ADJACENT CITY RIGHTS-OF-WAYS. THE OWNER/DEVELOPER WILL BE RESPONSIBLE FOR ALL NEW INSTALLATION AND NECESSARY ADJUSTMENTS TO EXISTING DRAINAGE FACILITIES AND RIGHTS-OF WAYS TO ENSURE PROPER, ADEQUATE AND CONTINUOUS FUNCTION. THIS MAY INVOLVE BUT IS NOT LIMITED TO SWALE REGARDING, MODIFICATION OR INSTALLATION OF PIPES, DRAINAGE STRUCTURES, CURB AND CURB INLETS.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: **COMMERCIAL, PROFESSIONAL, & INDUSTRIAL WIDENING ZONING STRIP**	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		D-7



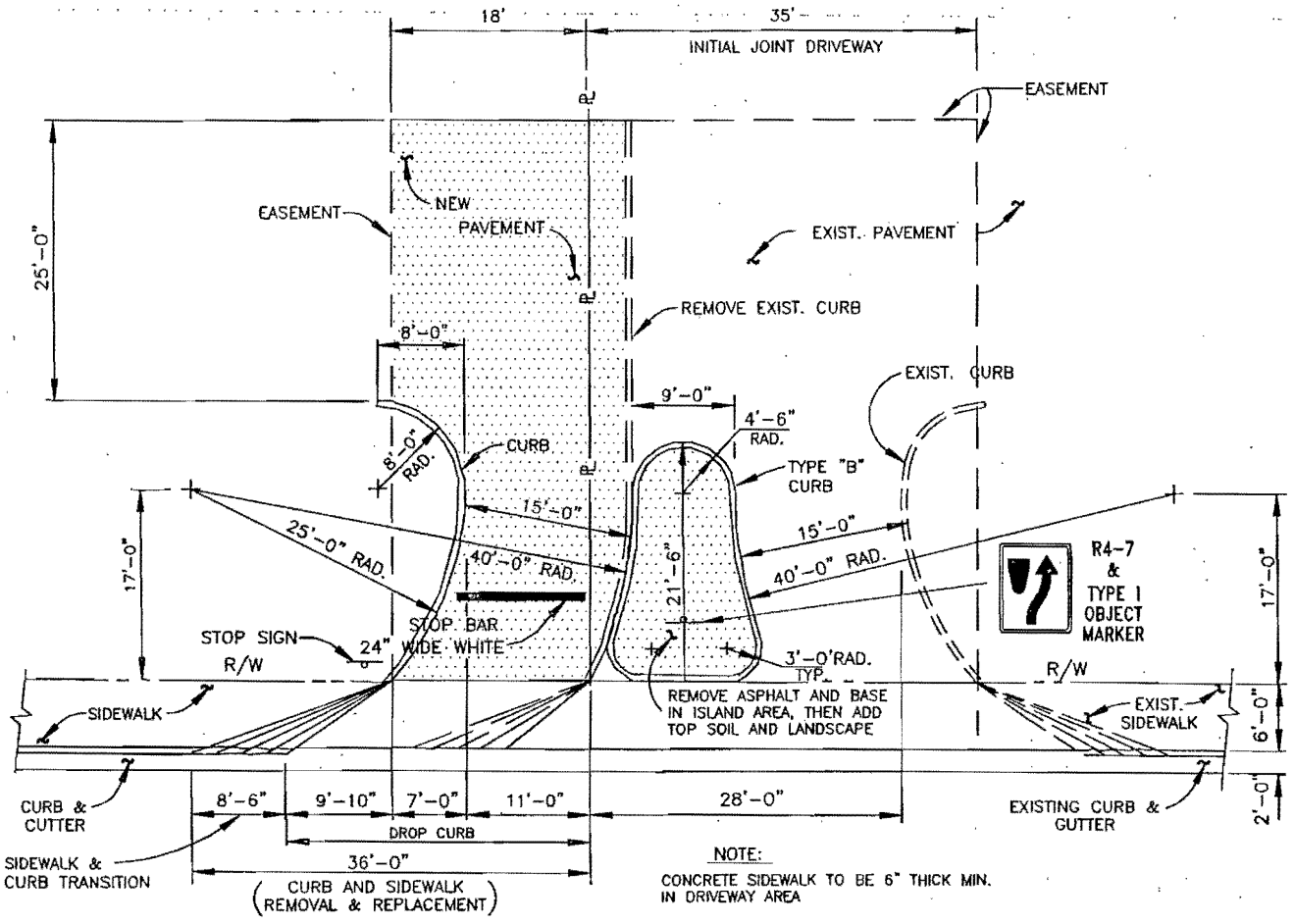
INITIAL JOINT DRIVEWAY

NOTES:

1. MAXIMUM COMBINED SLOPE SHALL NOT EXCEED 12%. SEE SHEET D-13
2. A STOP BAR AND STOP SIGN ARE REQUIRED AT THE EXIT SIDE OF THE DRIVEWAY. SIGNS TO BE INSTALLED PER MUTCD.
3. SIDEWALK DESIGN TO MEET ADA REQUIREMENTS.
4. CONCRETE SIDEWALK TO BE 6" THICK (MIN.) IN DRIVEWAY AREA.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: PHASE I JOINT DRIVEWAYS	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		D-8



ULTIMATE JOINT DRIVEWAY

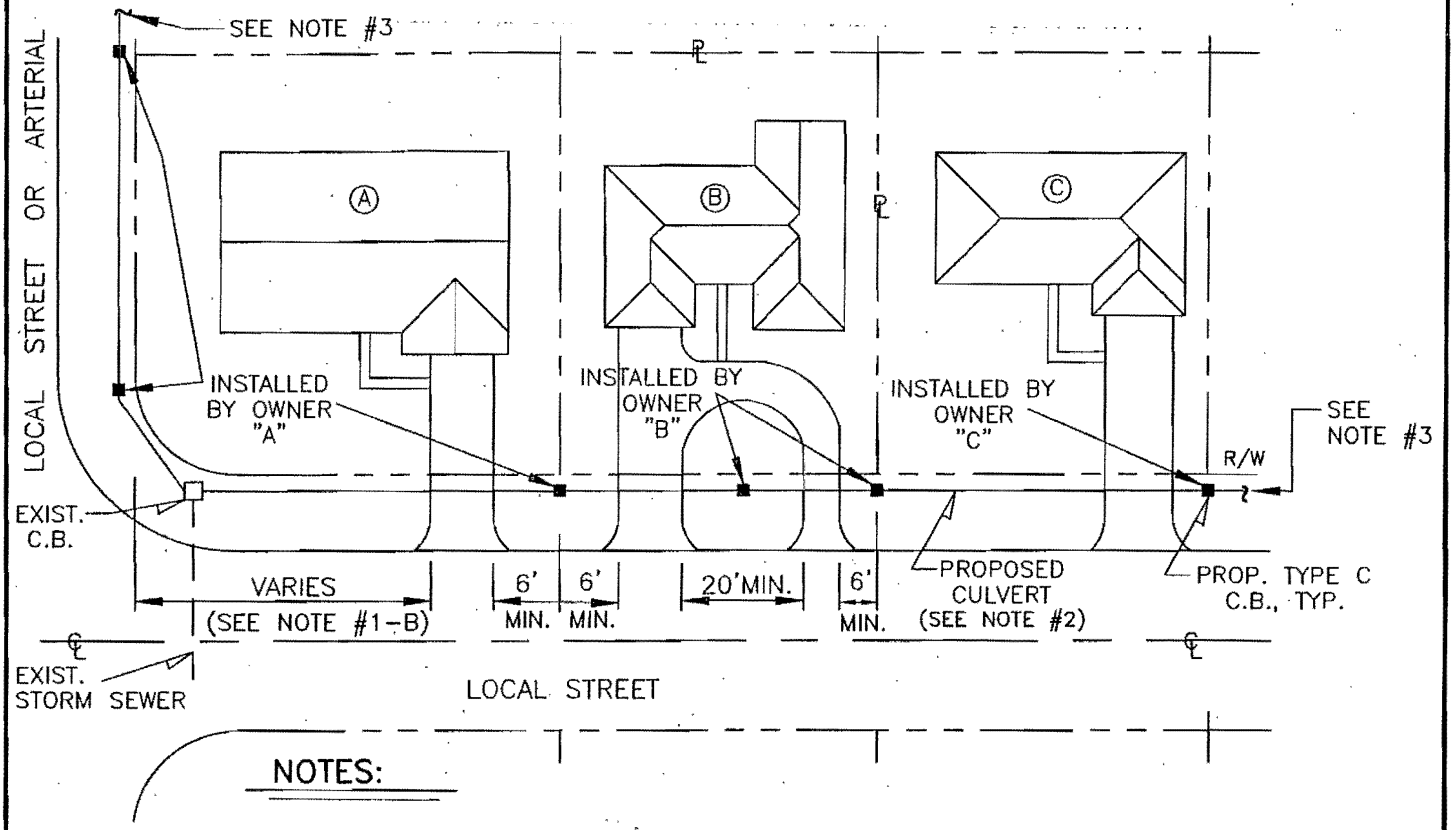
NOTES:

1. ISLAND IS REQUIRED TO ISOLATE EXISTING UTILITY CONFLICTS FROM TRAFFIC AND IS OPTIONAL IN ALL OTHER CASES.
2. ISLAND LANDSCAPING SHALL CONFORM TO HEIGHT REQUIREMENTS AS SPECIFIED ON PAGE G-12 OF THE CITY of CAPE CORAL ENGINEERING DESIGN STANDARDS.
3. DEVIATIONS FROM THIS STANDARD WILL BE REVIEWED BY THE CITY PUBLIC WORKS DEPARTMENT AT TIME OF PLAN SUBMITTAL.
4. MAXIMUM COMBINED SLOPE SHALL NOT EXCEED 12%. SEE SHEET D-13.
5. A STOP BAR AND STOP SIGN ARE REQUIRED AT THE EXIT SIDE OF THE DRIVEWAY. SIGNS ARE INSTALLED PER MUTCD.
6. SIDEWALK DESIGN TO MEET ADA REQUIREMENTS.
7. CONCRETE SIDEWALK TO BE 6" THICK (MIN.) IN DRIVEWAY AREA.

CITY OF CAPE CORAL ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: PHASE II JOINT DRIVEWAYS	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		D-9

DRIVEWAY AND FULL CULVERT PLAN



NOTES:

1. MINIMUM DRIVEWAY SEPARATION:

   A. 20' MIN. BETWEEN CIRCULAR DRIVEWAY.
   B. LOCAL STREET/LOCAL STREET INTERSECTION: 25' MIN. FROM THE PROPERTY LINE POINT OF INTERSECTION OF THE BLOCK CORNER. ALL OTHER INTERSECTION TYPES: 45' MIN. FROM THE POINT OF INTERSECTION OF THE BLOCK CORNER..
   C. 6' MIN. OFFSET AT PROPERTY LINE BETWEEN INDIVIDUAL DRIVEWAYS.

2. ELIMINATION OR REDUCTION OF SWALE SHALL REQUIRE CULVERT CAPACITY DESIGN. MINIMUM PIPE SIZE SHALL BE 15 INCHES OR EQUIVALENT. FULL CULVERTS SHALL USE PERFORATED PIPE WRAPPED IN FILTER FABRIC TO PROVIDE EXFILTRATION. SEE DETAIL D-19. SEE SECTION L FOR STORM DRAINAGE REQUIREMENTS.

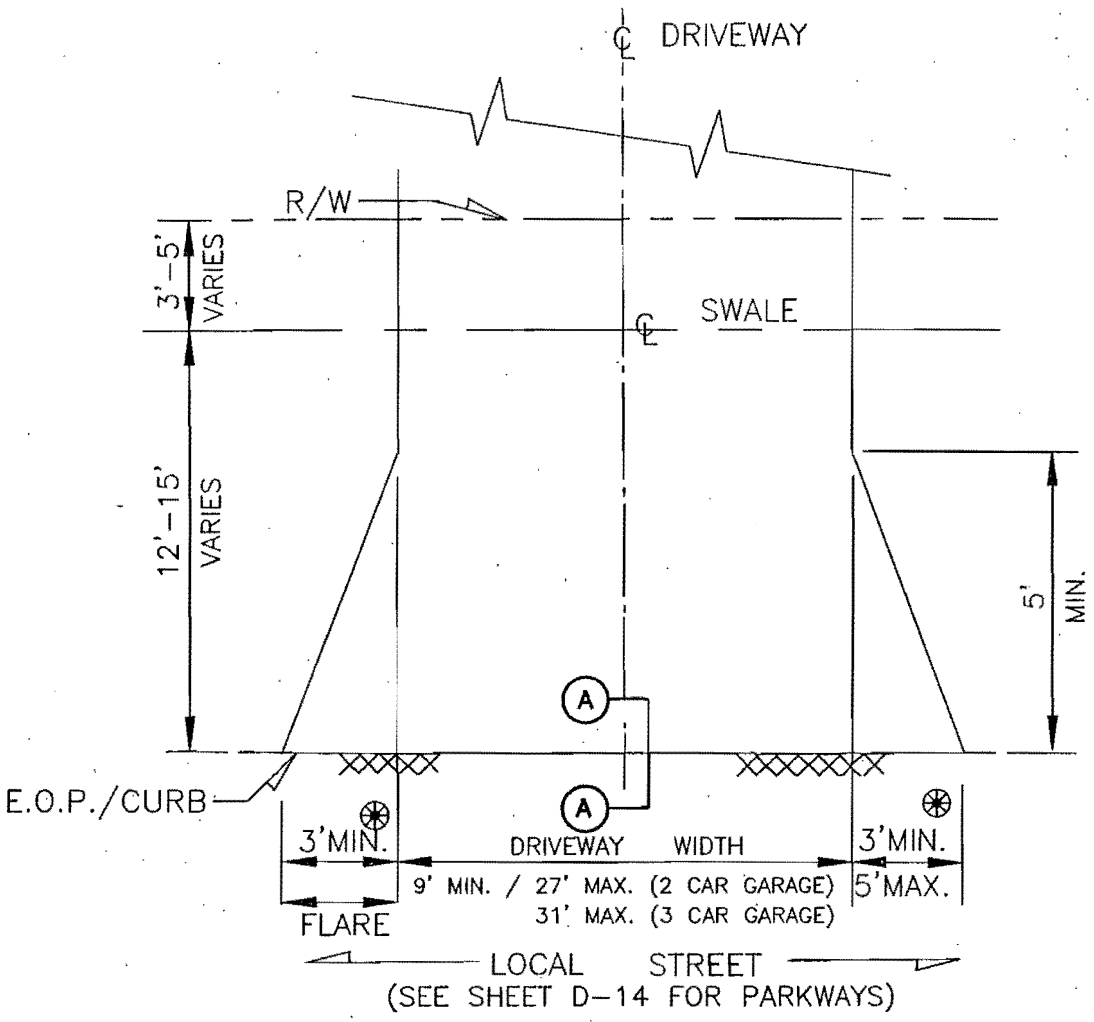
3. TERMINATING CATCH BASIN OR INLET MAY REQUIRE AN ADDITIONAL FOUR (4) FEET OF STUB-OUT ON SWALE SIDE, AS DETERMINED BY THE PUBLIC WORKS DEPARTMENT.

4. ANY VARIATION MUST BE APPROVED BY THE PUBLIC WORKS DEPARTMENT.

5. TEMPORARY EROSION CONTROL FEATURES SHALL BE USED DURING CONSTRUCTION TO PREVENT HARMFUL RUNOFF FROM LEAVING THE CONSTRUCTION SITE AND/OR ENTERING THE STORM DRAINAGE SWALE AND INLET SYSTEM. THE TEMPORARY EROSION CONTROL SHALL BE MAINTAINED BY THE CONTRACTOR AND REMAIN OPERATIONAL DURING ALL CONSTRUCTION AND UNTIL THE PERMANENT EROSION CONTROL IS IN SEE SECTION M FOR EROSION CONTROL DETAILS.

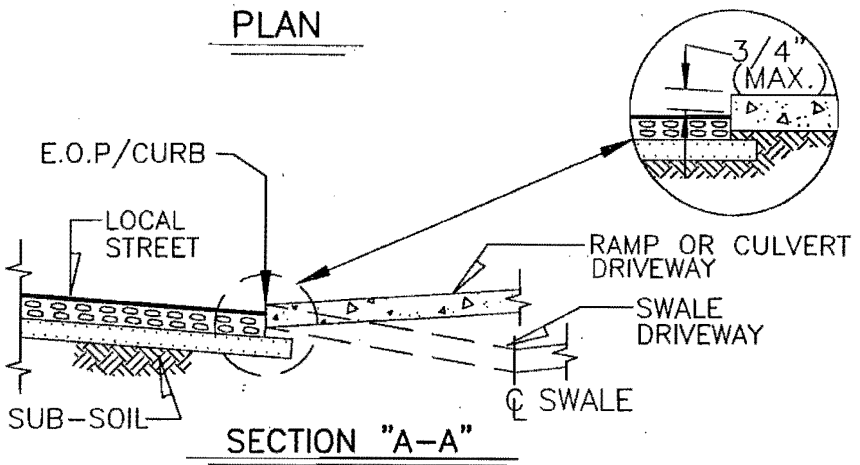
CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: RESIDENTIAL DRIVEWAY'S	REVISIONS :	SHEET NO. D-10
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		



PLAN

✱ THE FLARE IS NOT TO EXCEED THE PROPERTY LINE EXTENDED TO THE EDGE OF PAVEMENT.

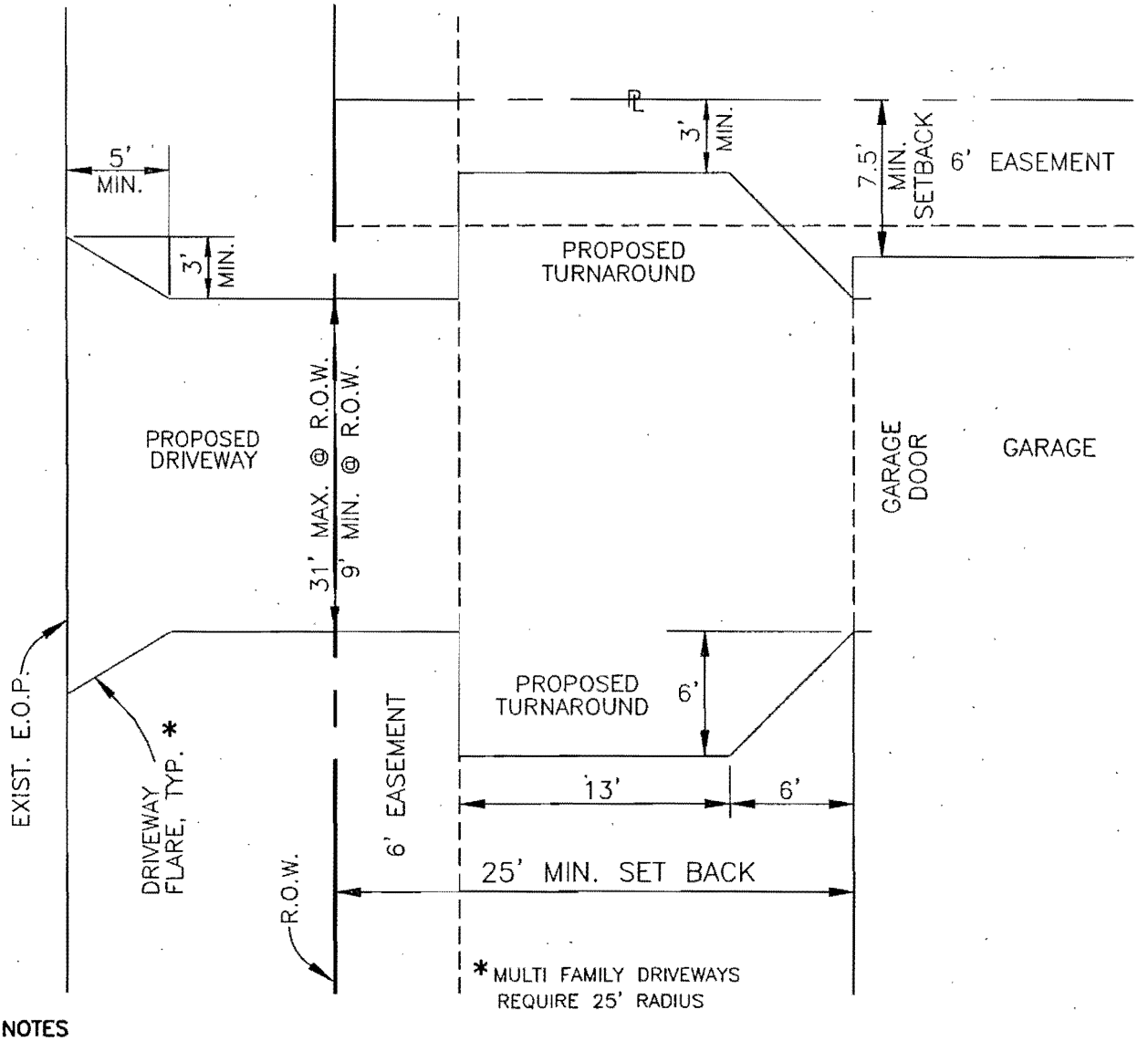


SECTION "A-A"

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE:	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	RESIDENTIAL DRIVEWAYS DETAILS DATE 03-28-2002		D-11

RESIDENTIAL DRIVEWAYS
ON ALL BOULEVARDS AND PARKWAYS



NOTES

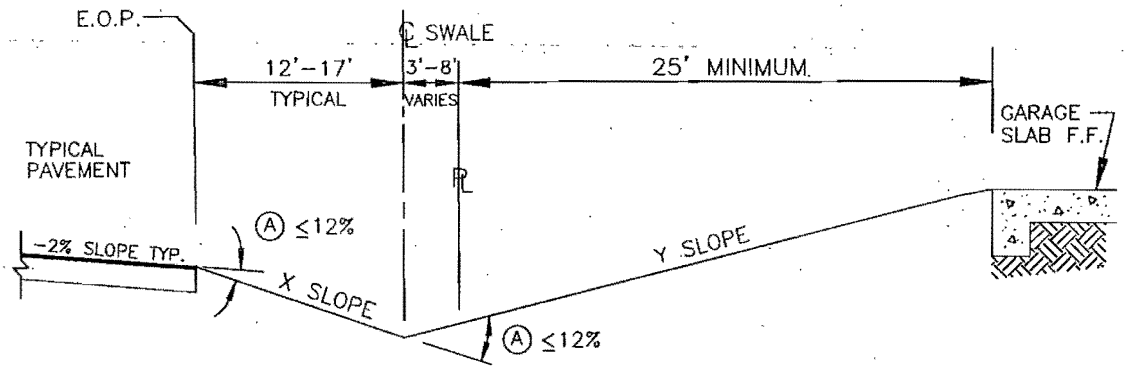
1. CIRCULAR DRIVEWAY MAY BE SUBSTITUTED FOR TURNAROUND AREA.
2. TURNING AREA MAY BE CONSTRUCTED ON EITHER THE LEFT OR RIGHT SIDE OF DRIVEWAY.
3. FOR COLLECTOR STREETS THE PUBLIC WORKS DEPARTMENT HIGHLY RECOMMENDS THE DESIGN TO BE CONSTRUCTED FOR THE SAFETY OF THE RESIDENT.
4. FOR LOCATIONS WHERE THE TURNAROUND LAYOUT CAN NOT BE BUILT ON EITHER SIDE, CONSULT THE PUBLIC WORKS DEPARTMENT.
5. THIS STANDARD IS ALSO APPLICABLE TO PROPERTIES FACING THE FOLLOWING ROADWAYS: S.E. 24TH AVENUE, N.E. 24TH AVENUE, NELSON ROAD, BURNT STORE ROAD, OLD BURNT STORE ROAD, PINE ISLAND ROAD, BRIDLEWOOD AVENUE, ROSE GARDEN ROAD, AND GATOR CIRCLE.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: DRIVEWAY TURNAROUNDS ON BOULEVARDS & PARKWAYS	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		D-12

CASE #1

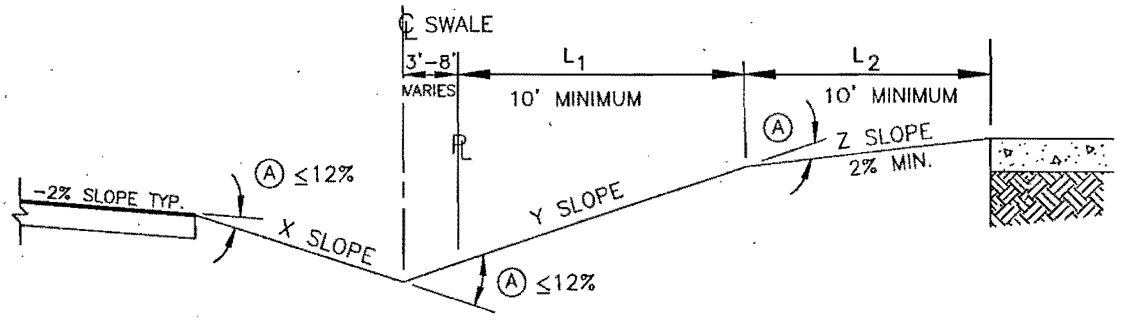
$X \leq -14\%$
&
$|X| + |Y| \leq 12\%$



SWALE DRIVE

CASE #2

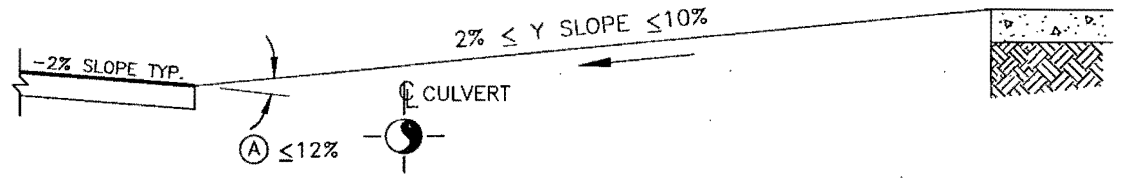
$X \leq -14\%$
&
$|X| + |Y| \leq 12\%$
&
$|Y| - |Z| \leq 12\%$



SWALE DRIVE

CASE #3

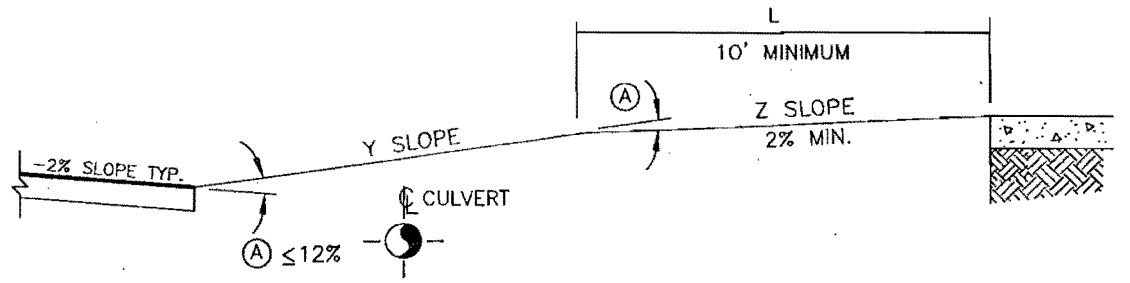
$2\% \leq Y \leq 10\%$



CULVERT DRIVE

CASE #4

$Y \leq 10\%$
&
$|Y| - |Z| \leq 10\%$



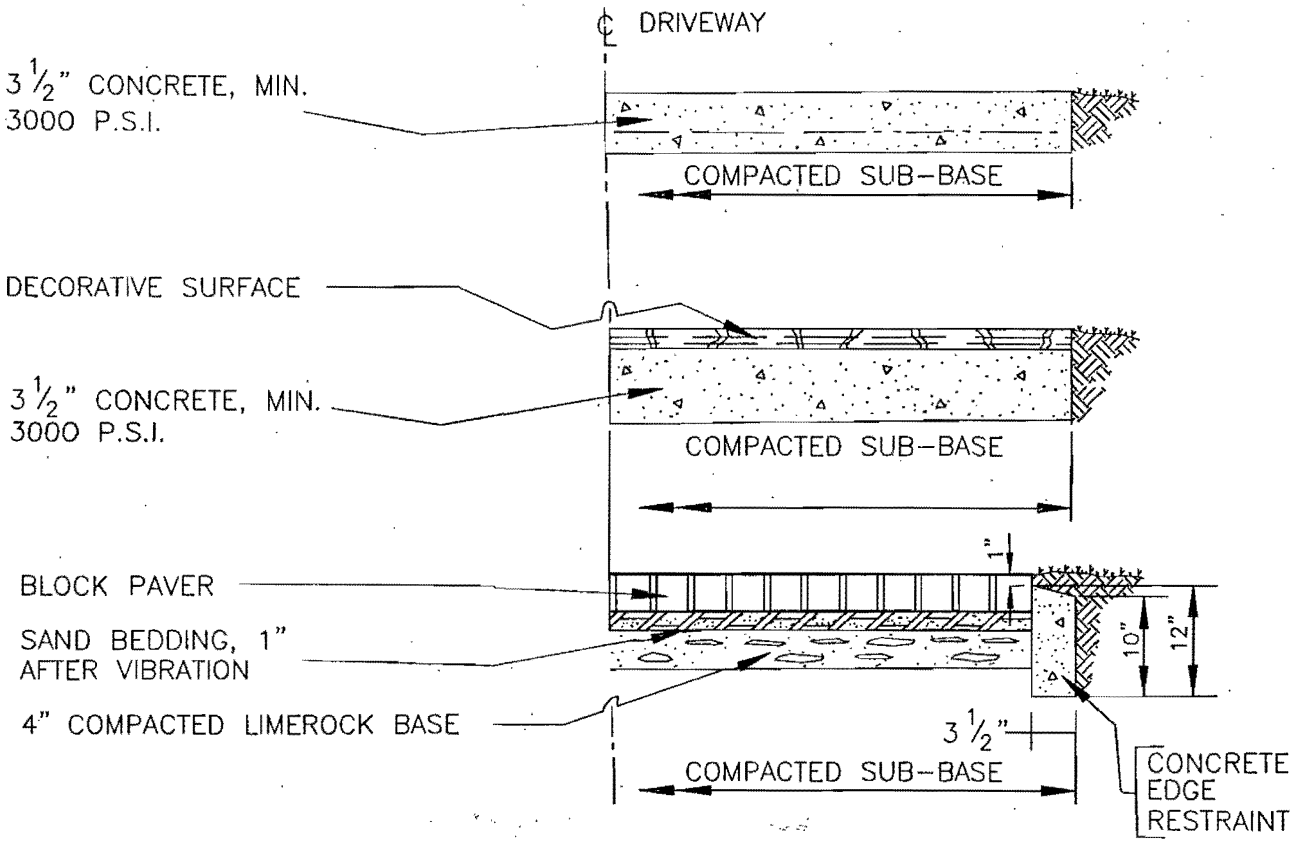
CULVERT DRIVE

Ⓐ MAXIMUM SLOPE CHANGE AT ANY VERTICAL ANGLE POINT NOT TO EXCEED 12%.
I. SWALE & CULVERT ℄ SHALL BE FIELD DETERMINED BY PUBLIC WORKS DEPT.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: DRIVEWAY PROFILE GRADELINES	REVISIONS :	SHEET NO. D-13
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		

RESIDENTIAL DRIVEWAYS



TYPICAL SECTIONS

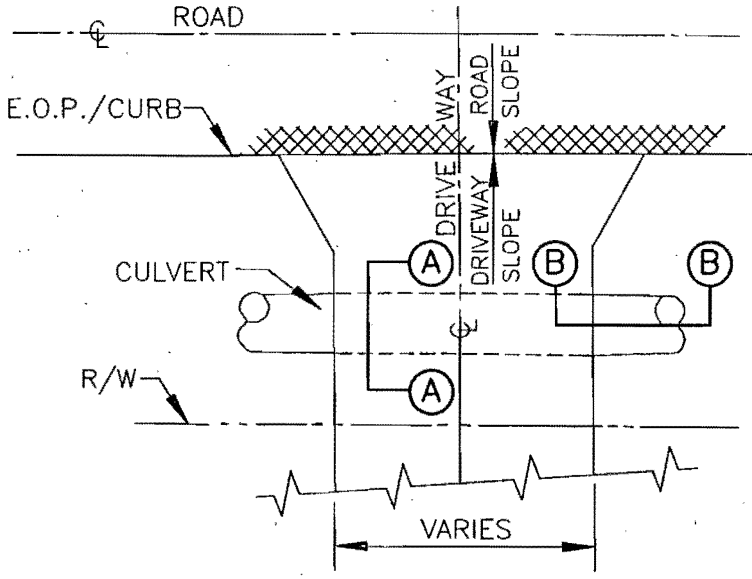
NOTESI

1. THE CONTRACTOR IS RESPONSIBLE FOR ATTAINING SUFFICIENT COMPACTION AND STABILIZATION BY EITHER VIBRATION OR ROLLER FOR DRIVEWAY PORTION INSIDE THE RIGHT OF WAY.
2. ALL OTHER DRIVEWAY CONSTRUCTION MATERIALS SHALL BE SUBMITTED TO THE PUBLIC WORKS DEPARTMENT FOR APPROVAL.
3. ALL DRIVEWAYS SHALL RECEIVE A PERMIT AND THE PUBLIC WORKS DEPARTMENT SHALL ESTABLISH GRADES.
4. AN INSPECTION IS REQUIRED FOR THE BASE & EDGE RESTRAINTS, PRIOR TO PAVER INSTALLATION.
5. OPTIONAL CONC. REINFORCEMENT SHALL BE 6" x 6" #10/10 W.W.M.

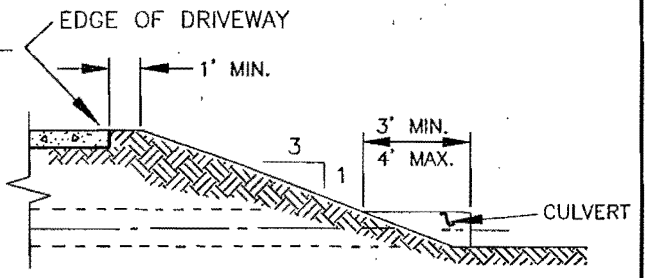
CITY OF CAPE CORAL ENGINEERING STANDARD

APPROVED:	TITLE: DRIVEWAY DETAILS	REVISIONS :	SHEET NO. D-14
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		

DRIVEWAYS

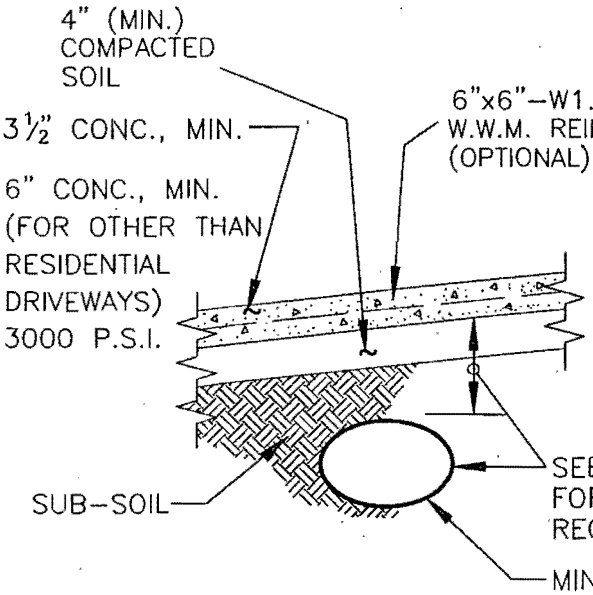


DRAINAGE PLAN



SECTION "B–B"

NTS



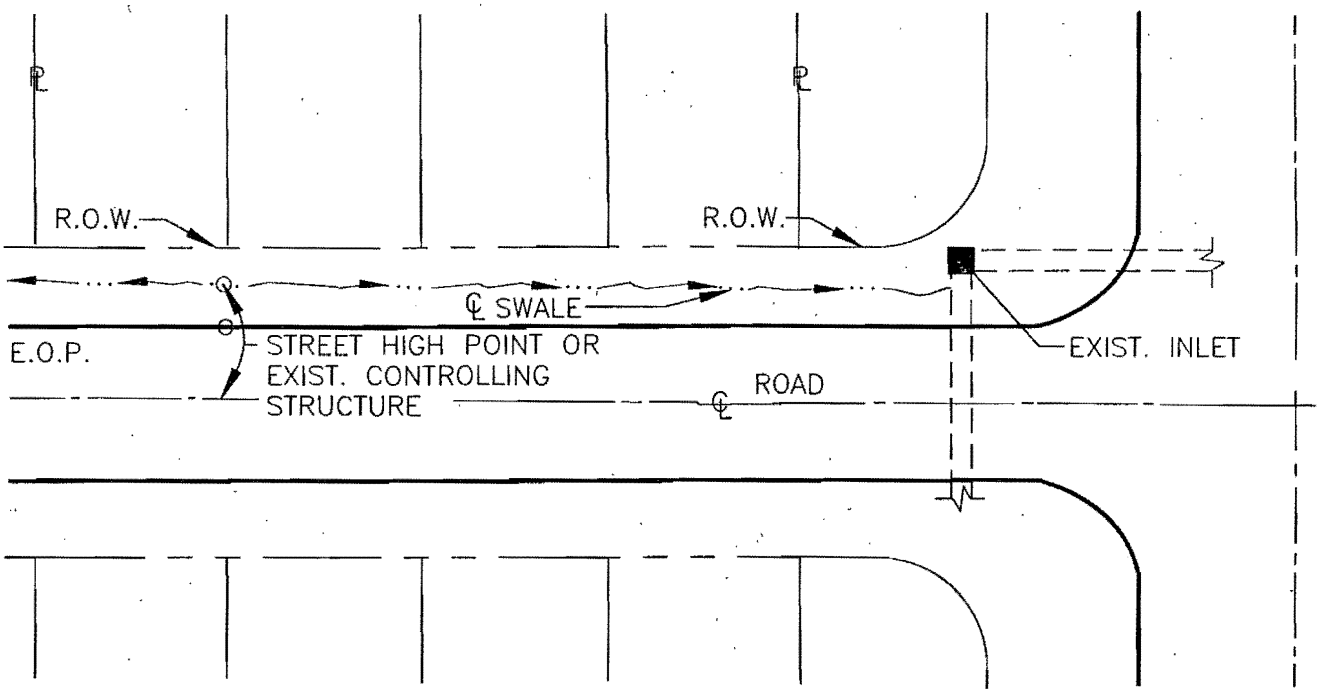
TYP. SECTION AT "A–A"

NOTES:

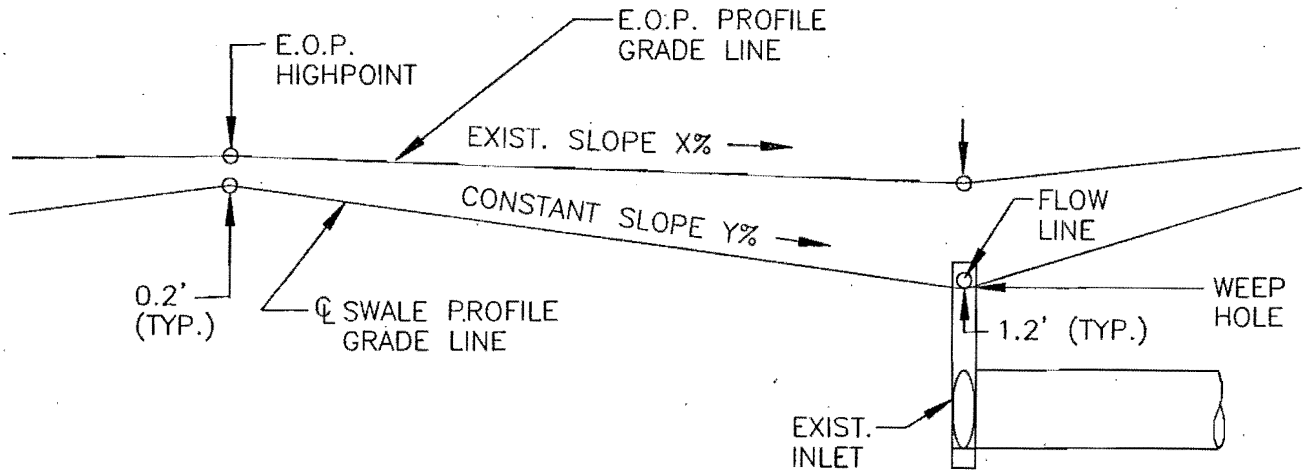
1. MINIMUM CROSS SLOPE GRADIENT OF DRIVEWAY SWALE IS 0.2%, OR MUST MATCH SWALE SLOPE.
2. IF COMBINED DRIVEWAY SLOPES EXCEED 12%, THEN A CULVERT DRIVE SHALL BE CONSTRUCTED.
3. CULVERT COVER
   CONCRETE PIPE, MIN. 4" COVER OR 6" FOR OTHER THAN RESIDENTIAL DRIVEWAYS.
   SPIRAL RIB ALUM. PIPE, MIN. 12" COVER.
   CORRUGATED ALUM. PIPE, MIN. 15" COVER.
   POLYETHYLENE PIPE, MIN. 15" COVER.
4. THIS SHEET APPLIES WHERE EVER INSTALLATION OF CURBS AND/OR WIDENING IMPROVEMENTS ARE NOT REQUIRED.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: DRIVEWAY DETAILS	REVISIONS :	SHEET NO. D–15
PUBLIC WORKS DIRECTOR	DATE 03–28–2002		



PLAN VIEW

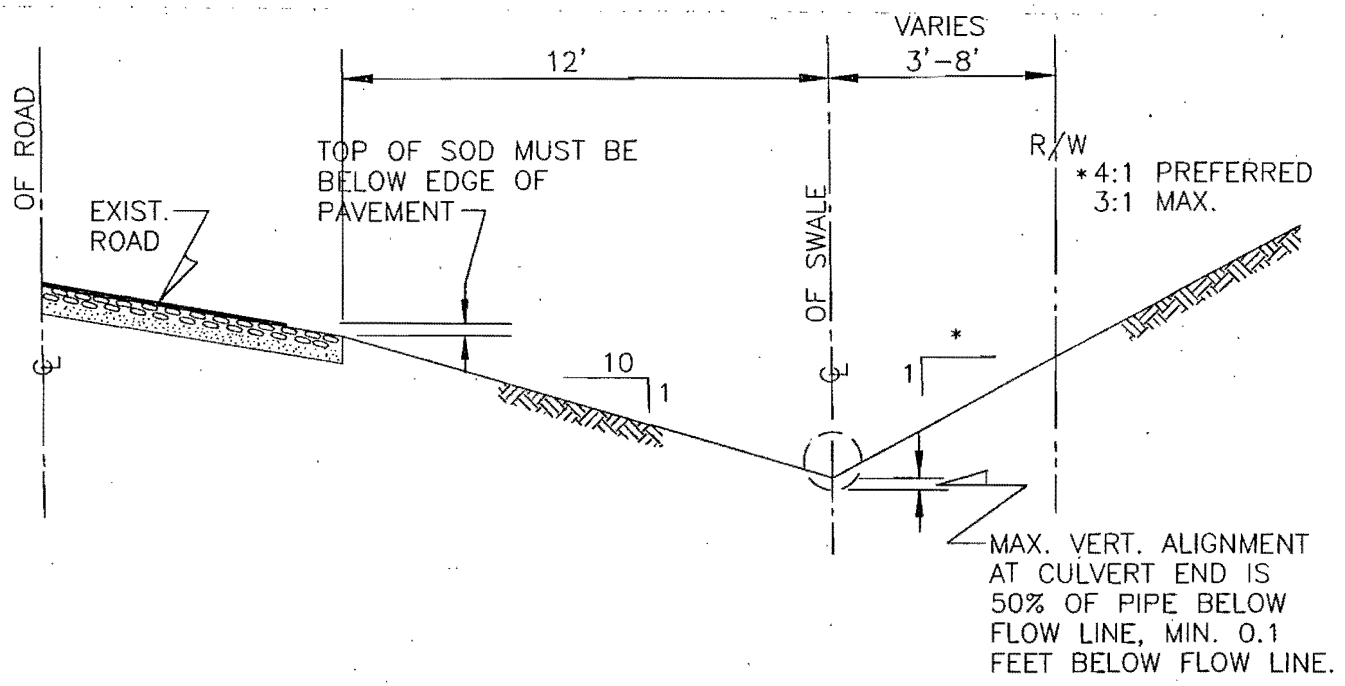


PROFILE VIEW

NOTE: REFER TO D-17 FOR ADDITIONAL DETAILS

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: TYPICAL SWALE GRADIENT DESIGN PROCEDURE	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		D-16



NOTES:

1. SWALE FLOWLINE MUST MATCH BLEED DOWN ORIFICE ELEVATION AT EXISTING CATCH BASIN.
   ALLOWABLE VARIANCE = 0.0 FT. TO −0.1 FT.

2. MAXIMUM ALLOWABLE DEVIATION FROM DESIGN DIMENSIONS;
   A = VERTICAL ALIGNMENT OF SWALE FLOW LINE −0.0 FT. HIGH TO −0.1 FT. LOW.
   B = HORIZONTAL ALIGNMENT OF SWALE FLOW LINE ±1.0 FT. OFF CENTERLINE.

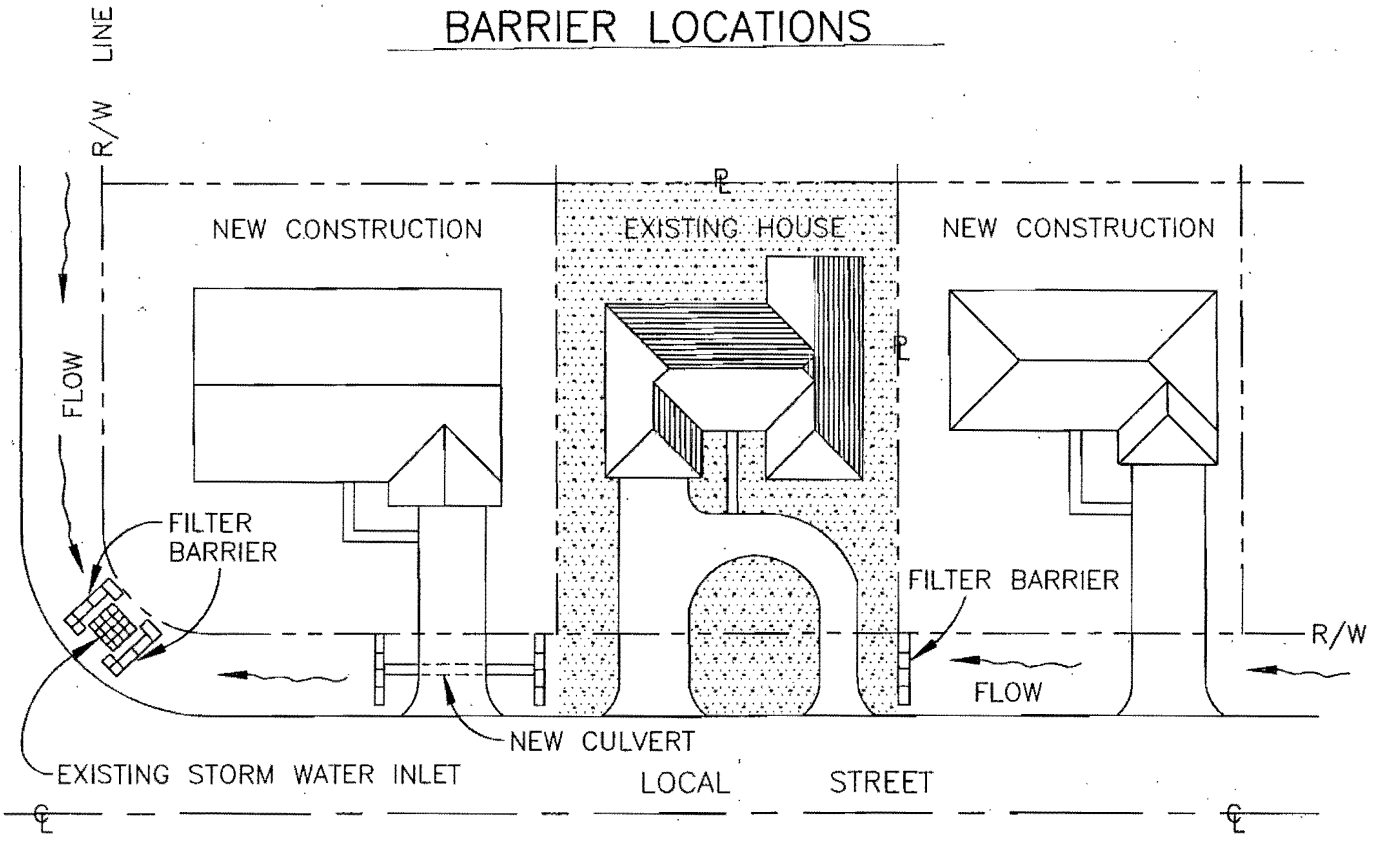
3. MINIMUM LONGITUDINAL DESIGN GRADIENT IS 0.20% SLOPE, RECOMMENDED IS 0.40% SLOPE OR 0.3 FT. PER 80 FT.

4. MAXIMUM ALLOWABLE VERTICAL ALIGNMENT DEVIATION FOR FINISHED GRADE OF THE SOD SHALL BE +0.1 FT. TO −0.2 FT.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: SOD SWALES	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		D-17

TYPICAL SILT AND SEDIMENT BARRIER LOCATIONS



NOTES:

1. PRIOR TO CONSTRUCTION OR RECONSTRUCTION, WITHIN THE RIGHT-OF-WAY, FILTER FABRIC, SILT SCREENS, STRAW BALES OR OTHER APPROVED EROSION CONTROL DEVICES SHALL BE INSTALLED ACROSS THE SWALE AT THE LOWEST DISTURBED POINT TO PREVENT EROSION MATERIAL FROM LEAVING THE CONSTRUCTION AREA, INCLUDING ANY VACANT AREAS USED FOR INGRESS AND EGRESS. SEE SECTION M FOR DETAILS.

2. ALL AFFECTED STORMWATER PIPES, INLETS, AND CATCH BASINS SHALL BE PROTECTED BY EROSION CONTROL DEVICES TO PREVENT CONSTRUCTION RELATED EROSION MATERIAL FROM ENTERING THE STORMWATER SYSTEM.

3. THE EROSION CONTROL DEVICES SHALL BE INSTALLED PRIOR TO ANY CONSTRUCTION PROCESS AND SHALL REMAIN IN PLACE UNTIL THE RIGHT-OF-WAY IS STABILIZED WITH SOD AND THE VACANT AREAS ARE SEEDED AND MULCHED.

PARKING LOTS

A. GENERAL

This section is established to provide minimum requirements for off-street parking, loading, access and circulation for new or enlarged land uses.

Space Requirements – All structures built or erected and all uses established after the effective date of these Engineering Design Standards shall provide parking and circulation facilities in accordance with this section. The Land Use and Development Regulations of the City Code shall be used to determine the number of spaces for each land use type.

Stall Layout – Conventional stall layouts are shown on sheet E-5. Other angled parking layouts meeting the approval of the City will be permitted where possible. For 90 degree parking, the minimum stall width shall be 9 feet and the minimum stall length shall be 18 feet.

Parking areas shall be designed so vehicles can proceed safely without posing a danger to pedestrians or other vehicles. Lots shall be designed so that, without resorting to extraordinary movements, vehicles may exit from all spaces (when all spaces are filled) without backing onto a public street right-of-way.

Parking lots shall have internal vehicular circulation and storage. Vehicle circulation shall be completely contained within the facility, and vehicles located within one portion of the facility shall have access to all other portions without using the adjacent street system. Parking lot curbing and paving requirements are shown on sheets E-6 through E-7.

Lot Signing & Striping – the developer shall provide all traffic signs and pavement marking stipulated on the approved plans. State law requires traffic control devices, in public access areas including signs and pavement markings on private property, to meet state standards. These standards are contained within the manual of traffic control devices (MUTCD.) Parking signing and striping requirements are contained in the footnotes of sheets E-4 and E-5.

Handicapped Parking – Refer to Americans with Disabilities Act, current standards.

All handicap spaces shall be a minimum of 12 feet in width and be located in close proximity to the use and/or building. The location shall be free from standing water and in a location where disabled persons will not have to walk or maneuver behind other parked vehicles. Special signing and striping requirements for handicapped parking are found in the accessibility requirement

manual. These parking spaces shall have easy access to handicap sidewalk ramps. Parking access aisles must be no less than 5 feet wide.

In Business, Commercial or Residential Districts – The clearance to the bottom of traffic signs shall be at least 7 feet above the edge of the pavement. The lateral clearance for regulatory and warning signs or small directional signs shall be 6 feet from the edge of the pavement or 2 feet in back of the face of curb. Standard size and shape signs as described in the Manual of Uniform Traffic Control Devices (MUTCD) are required.

Truck loading where the use of a parking lot includes a truck (including garbage truck) loading, unloading, parking or service facility – Adequate space shall be provided as such that truck maneuvering is performed off the street, coordinate with trash hauler.

Road features, which are required on both public right-of-ways and private property, include traffic signs and pavement markings. These features are shown in Sheets E-4 and E-5.

Emergency Access Lanes – Special emergency access lanes in accordance with Fire Department requirements must be provided for larger developments. These, when provided, should be at least 25 feet in width and provide a 25 foot inside radius and a 45 foot outside radius at building corners. These lanes may be used for maneuver of vehicles, but cannot be used for parking or storage of vehicles. All such lanes should be signed per the Manual of Uniform Traffic Control Devices (MUTCD) and the NFPA Life Safety Code.

B. CITY DEDICATED PARKING LOTS

In addition to the requirements set forth herein, and the adopted Land Use and Development Regulations (Section 5.1 and Schedule B) of the City of Cape Coral the following required improvements shall be applicable to any City Dedicated Parking Lot to be either constructed or reconstructed. The applicant is responsible for all improvements required by this Standard.

1) Lighting – Fixtures are to be of uniform style and color. Minimum recommended average illumination level shall be 3 foot-candles, with illuminance ratios of:

   average/minimum of 4:1, and
   maximum/minimum of 10:1

   All light fixture wiring is to be placed in underground conduit.

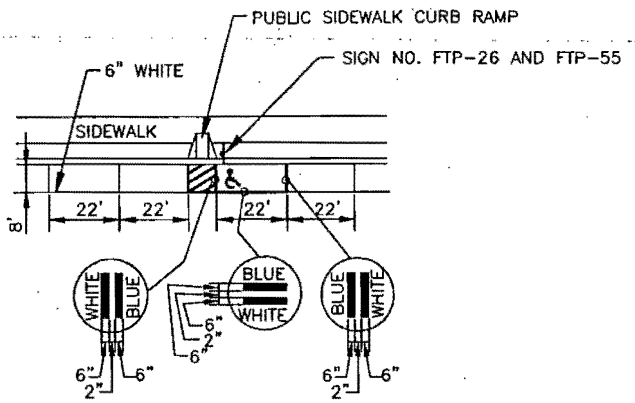
2) Storm Water Management – Current City and South Florida Water Management District (SFWMD) rules for storm water system design shall be followed to compensate for the addition of paved surfaces.

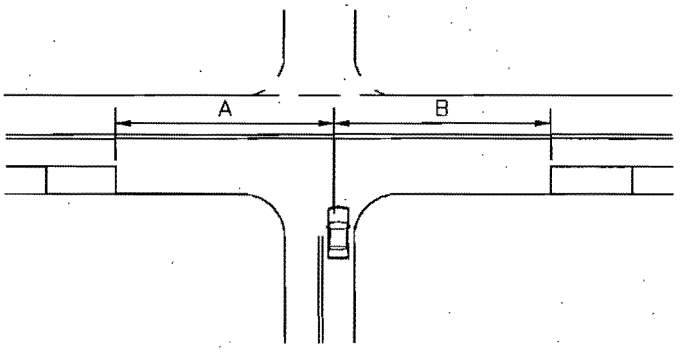
3) Landscaping – A minimum of 12% of the total paved vehicular use area shall be provided for landscaping. All landscaping shall meet the minimum standards set forth in Article 5.13 of the Land Use Regulation.

4) Irrigation – All landscaped areas shall be provided with adequate underground irrigation and conform to State and Local Governing Agency requirements and industry standards

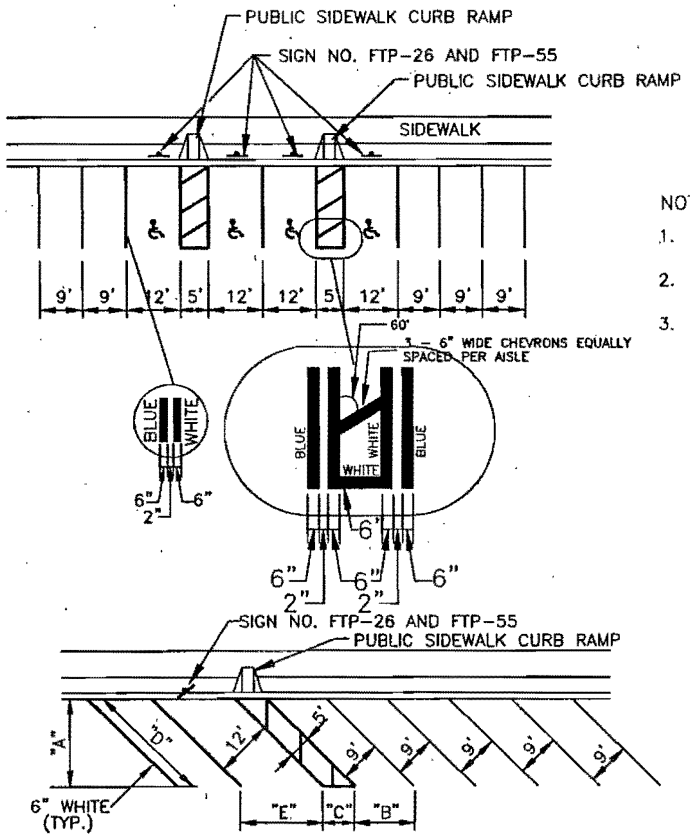
5) Capacity – In the event the City's dedicated parking lot has reached parking space capacity, the property owner shall pay to the City an amount equal to the current cost to construct his required parking spaces and related required improvements. This payment shall be placed into a dedicated parking lot fund to be utilized to either maintain, construct, reconstruct or bond improvements thereto.

6) Maintenance – Whenever a property owner has either constructed or paid to the City an amount equal to his off-street parking requirements, the City shall maintain the completed portion(s) of the City Dedicated Parking Lot to these design standards.





SPEED MPH	SPEED KM/H	UP STREAM (A)	DOWN STREAM (B) 2 LANE	4 LANE
0-30	0-50	84'	59'	45'
35	60	98'	69'	49'



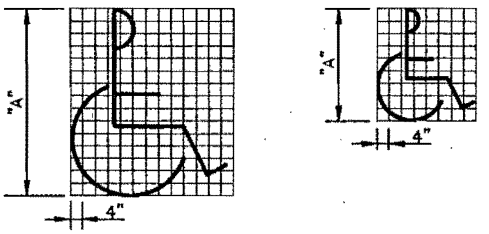
△ o	"DIMENSIONS" "A"	"B"	"C"	"D"	"E"
45°	19	13	7.5	26.9	17.4
60°	20	10.6	6.2	23.3	14.1

NOTES:
1. DIMENSIONS ARE TO THE CENTERLINE OF MARKINGS.
2. AN ACCESS AISLE IS REQUIRED FOR EACH ACCESSIBLE SPACE WHEN ANGLE PARKING IS USED.
3. CRITERIA FOR PAVEMENT MARKINGS ONLY, NOT PUBLIC SIDEWALK CURB RAMP LOCATIONS, FOR RAMP LOCATIONS REFER TO PLANS.
4. BLUE PAVEMENT MARKINGS SHALL BE TINTED TO MATCH SHADE 15180 OF FEDERAL STANDARDS 595A.
5. THE FTP-55 PANEL SHALL BE MOUNTED BELOW THE FTP-26 SIGN.

PAVEMENT MARKING FOR PUBLIC SIDEWALK CURB RAMPS IN REST AREAS

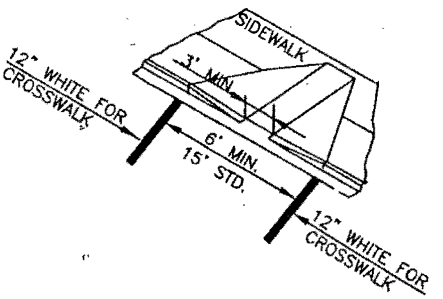
NOTES:
1. DISTANCES MEASURED LONGITUDINALLY ALONG THE STREET FROM DRIVER LOCATION OF ENTERING VEHICLE TO END OF PARKING RESTRICTION.
2. DISTANCES APPLICABLE TO INTERSECTING STREET, MAJOR DRIVEWAYS AND OTHER DRIVEWAYS TO THE EXTENT PRACTICAL.
3. FOR NON-SIGNALIZED INTERSECTIONS, THE VALUES ABOVE SHALL BE COMPARED WITH THE VALUES FOR SIGNALIZED INTERSECTIONS AND THE MAXIMUM RESTRICTIONS IMPLEMENTED. THESE RESTRICTIONS APPLY TO BOTH ACCESSIBLE AND NON-ACCESSIBLE PARKING.

MINIMUM PARKING RESTRICTION FOR NON-SIGNALIZED INTERSECTIONS



USE OF PAVEMENT SYMBOL IN ACCESSIBLE PARKING SPACES IS OPTIONAL, WHEN USED THE SYMBOL SHALL BE 3' OR 5' HIGH AND WHITE IN COLOR.

"UNIVERSAL SYMBOL OF ACCESSIBILITY"

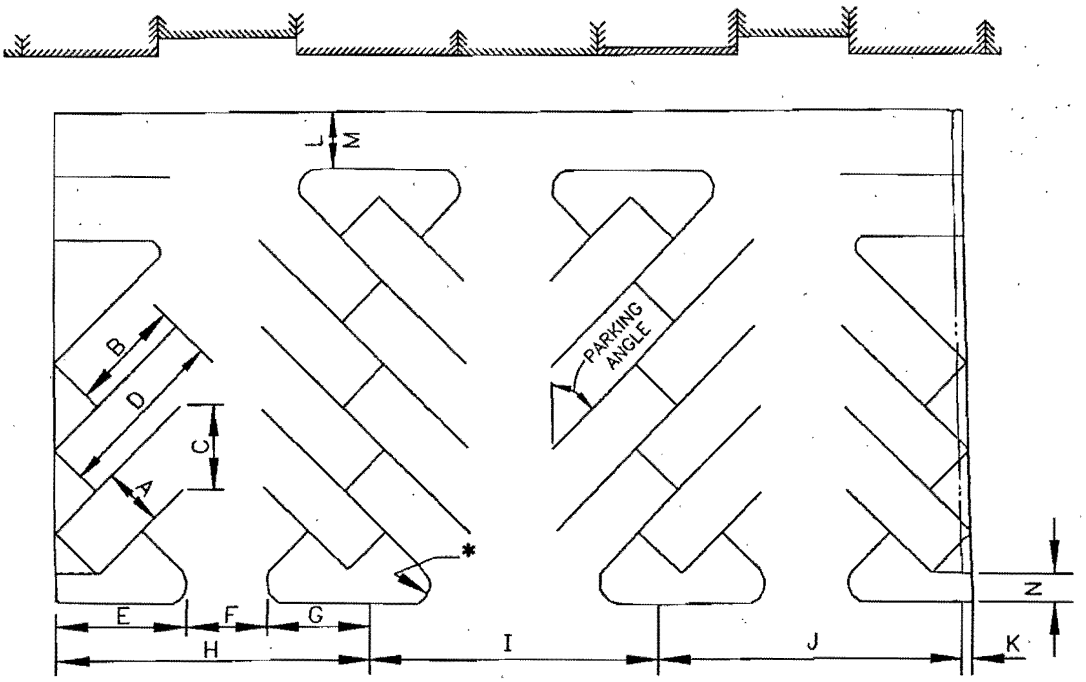


TYPICAL MARKINGS FOR CROSSWALKS

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: PARKING MARKINGS AND STRIPING	REVISIONS :	SHEET NO.
D.C.D. DIRECTOR	DATE 03-28-2002		E-4

PEDESTRIAN DESTINATION



* = MIN. DESIRED RADIUS -3.0'
TYP.

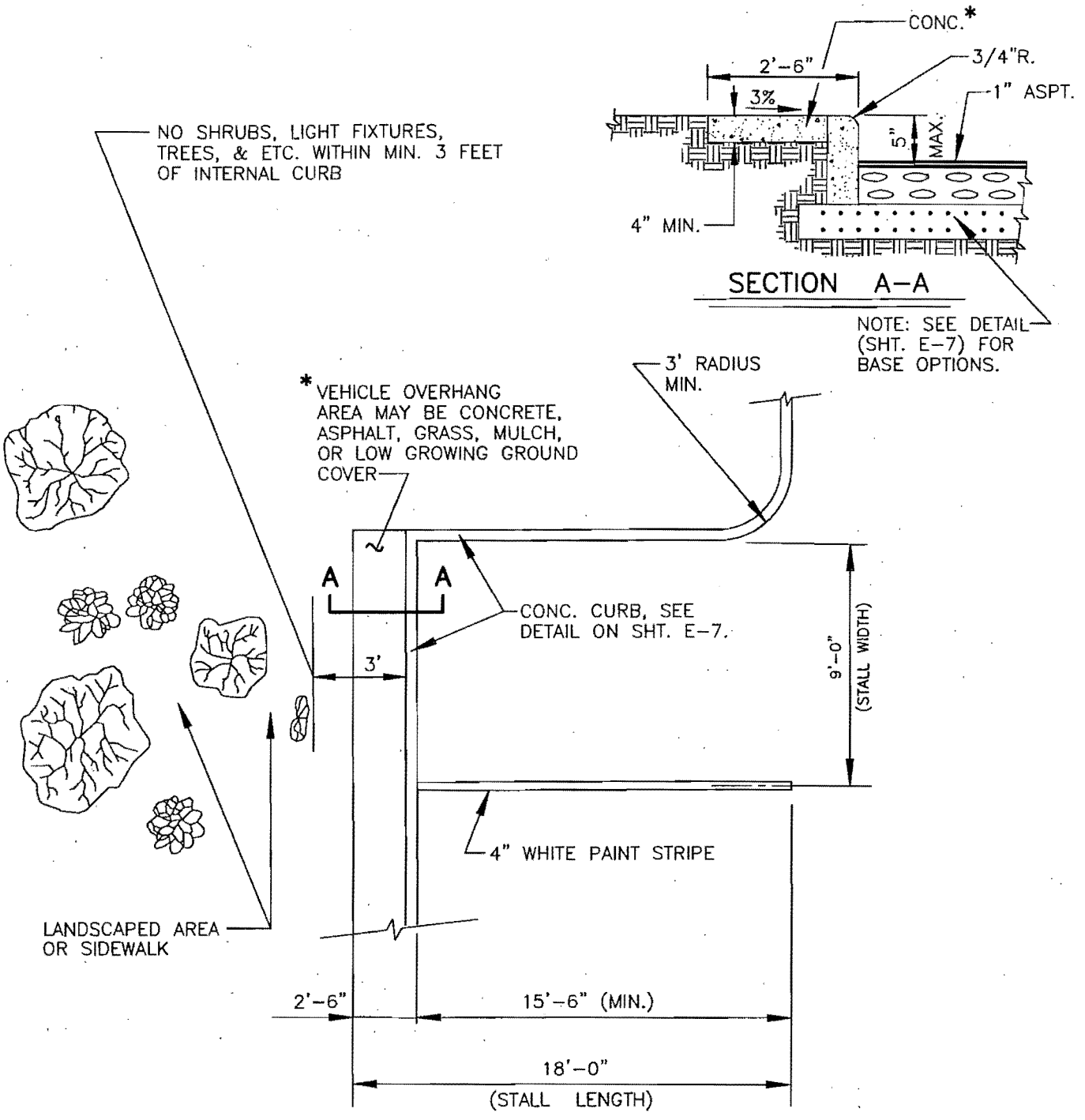
DIMENSION DESCRIPTION	ON DIAGRAM	PARKING ANGLE 30°	45°	60°	90°
STALL WIDTH	A	9.0'	9.0'	9.0'	9.0'
STALL LENGTH	B	18.0'	18.0'	18.0'	18.0'
STALL WIDTH, PARALLEL TO AISLE	C	18.0'	12.7'	10.4'	9.0'
STALL LENGTH OF LINE	D	33.6'	27.0'	23.2'	18.0'
STALL DEPTH TO WALL	E	16.8'	19.1'	20.1'	18.0'
AISLE WIDTH BETWEEN STALLS	F	12.0'	14.0'	20.0'	24.0'
STALL DEPTH, INTERLOCK	G	12.9'	15.9'	17.8'	18.0'
MODULE, WALL TO INTERLOCK	H	41.7'	49.0'	57.9'	60.0'
MODULE, INTERLOCKING	I	37.8'	45.8'	55.7'	60.0'
MODULE, INTERLOCK TO CURB FACE	J	39.2'	46.5'	55.4'	57.5'
BUMPER OVERHANG (TYPICAL)	K	2.5'	2.5'	2.5'	2.5'
CROSS AISLE WIDTH, ONE-WAY	L	14.0'	14.0'	14.0'	14.0'
CROSS AISLE WIDTH, TWO-WAY	M	24.0'	24.0'	24.0'	24.0'
SET BACK, MINIMUM	N	12.0'	10.0'	8.0'	6.0'

NOTES:

1. PARKING SPACE STRIPING SHALL BE 4" WIDE WHITE STRIPES.
2. LANE LINES BETWEEN TRAFFIC LANES IN THE SAME DIRECTION SHALL BE WHITE.
3. CENTER LINES BETWEEN TRAFFIC IN OPPOSING DIRECTIONS SHALL BE YELLOW.
4. CROSSWALKS SHALL BE 6' WIDE WITH 12" WIDE WHITE STRIPES.
5. STOP LINES SHALL BE 24" WIDE WHITE.
6. SIGNS SHALL HAVE 4" HIGH LETTERING.
7. STRIPES CAN BE PAINTED WITH LATEX PAINT OR THERMOPLASTIC MATERIAL.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

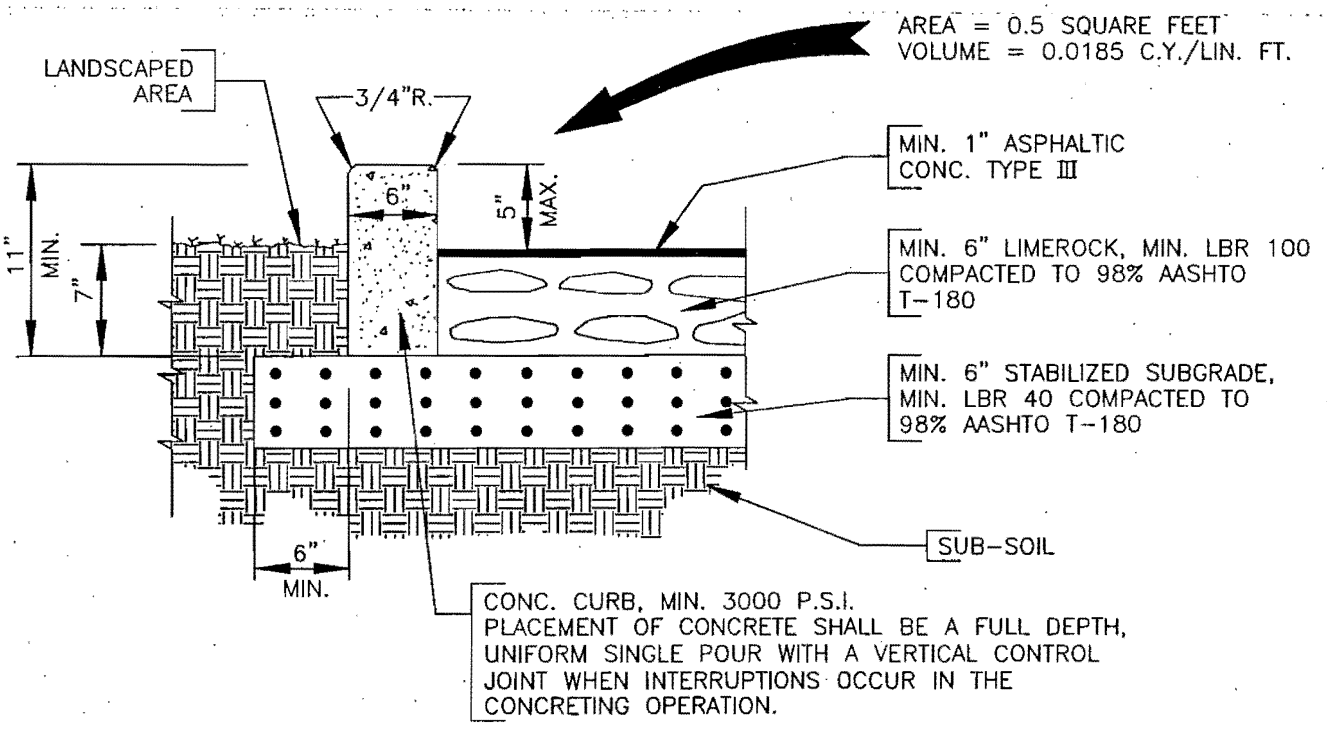
APPROVED:	TITLE: PARKING LOT STANDARDS	REVISIONS :	SHEET NO.
D.C.D. DIRECTOR	DATE 03-28-2002		E-5



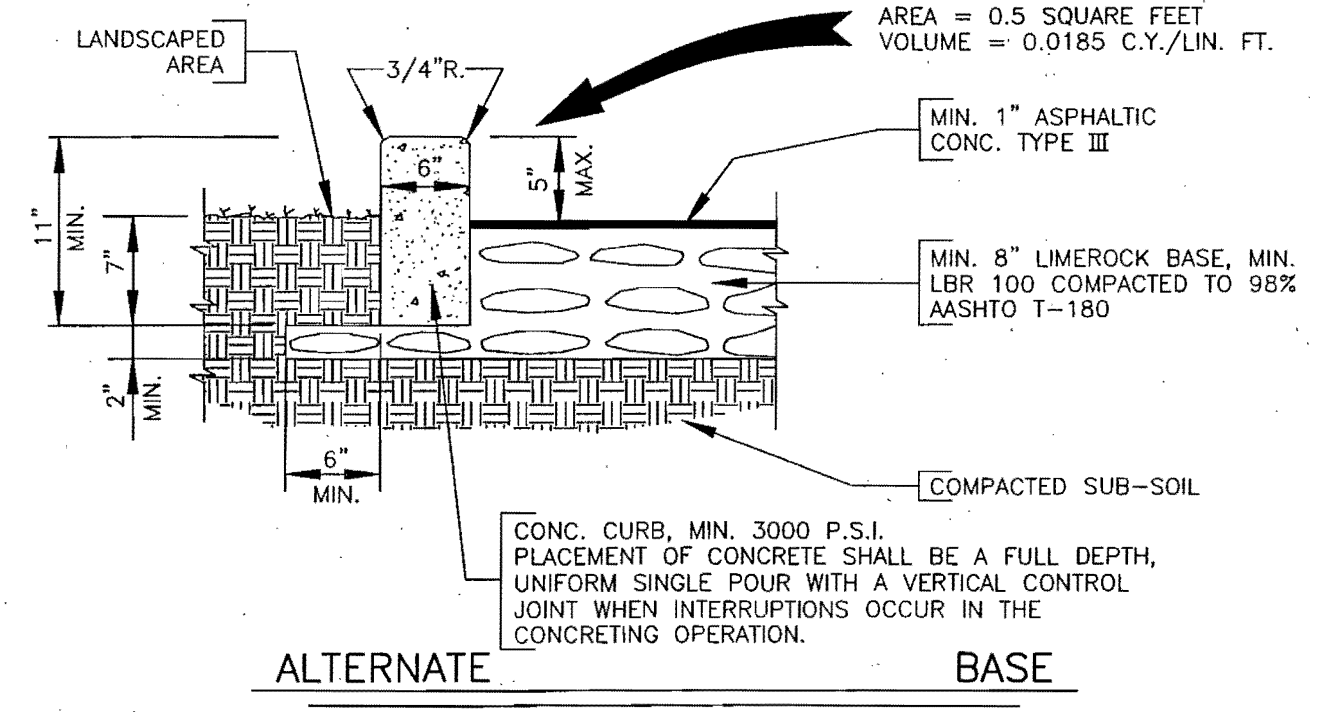
ALTERNATE STALL LAYOUT WHERE PARKING STALL ABUTS LANDSCAPED AREA OR SIDEWALK

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: PARKING LOT STANDARDS	REVISIONS :	SHEET NO.
D.C.D. DIRECTOR	DATE 03-28-2002		E-6



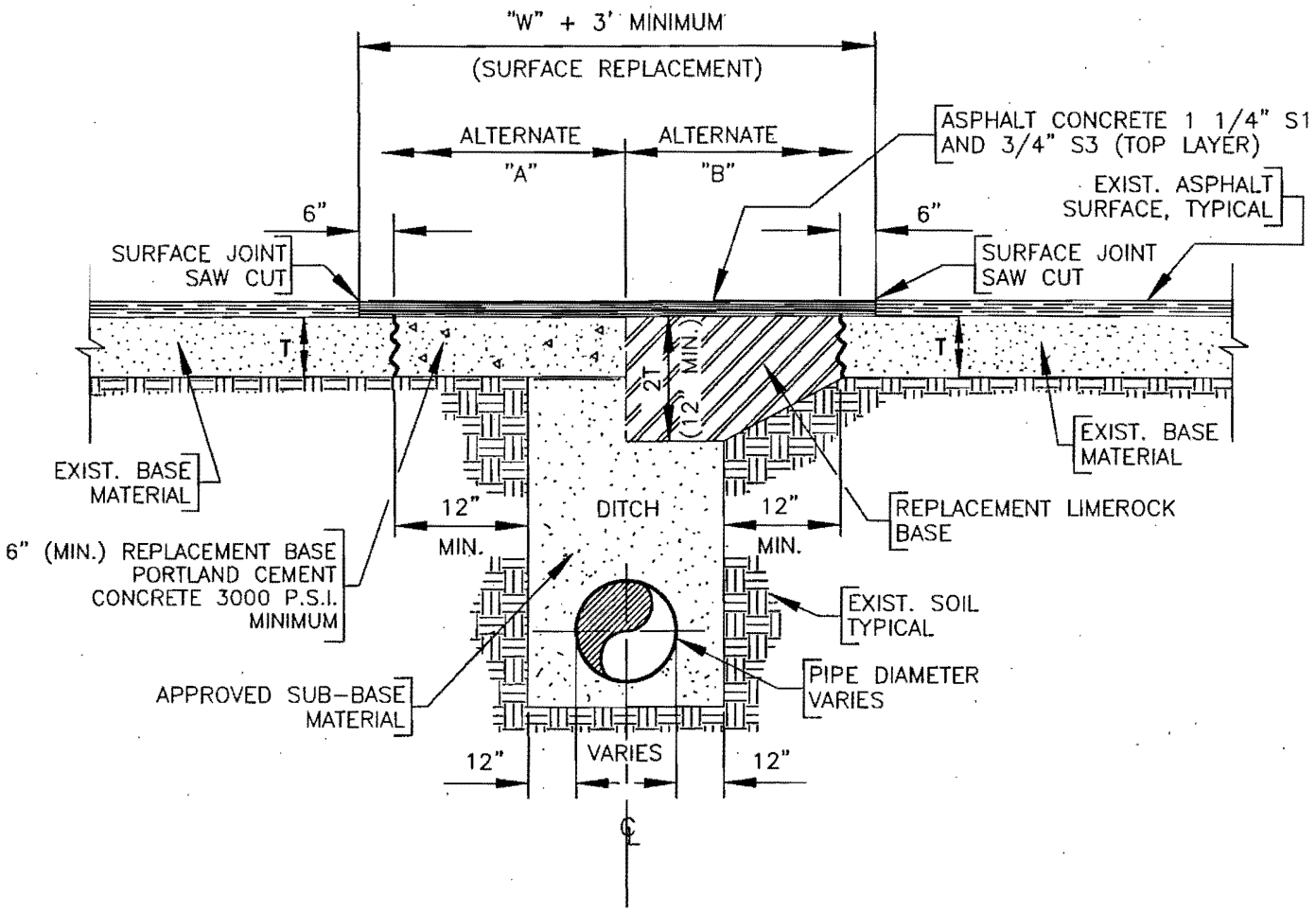
STANDARD BASE



ALTERNATE BASE

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: INTERNAL CURB & BASE OPTIONS	REVISIONS :	SHEET NO.
D.C.O. DIRECTOR	DATE 03-28-2002		E-7

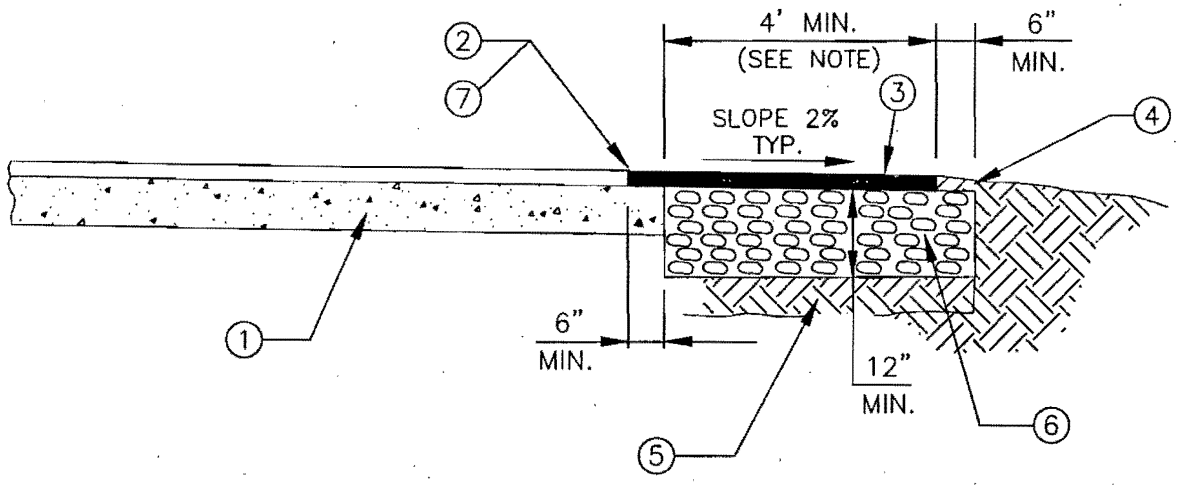


NOTES:

1. LIMEROCK MATERIAL (MIN. LBR 100) SHALL BE COMPACTED TO 98% DENSITY, AASHTO T-180.
2. APPROVED SUB-BASE MATERIAL (MIN. LBR 40) SHALL BE COMPACTED IN 6" LAYERS MAXIMUM, TO 98% DENSITY, AASHTO T-180.
3. ASPHALT CONCRETE PAVEMENT JOINT SHALL BE MECHANICALLY SAWED.
4. "W" IS WIDTH OF DITCH AT ITS WIDEST POINT.
5. OTHER OPTIONS WILL BE CONSIDERED. DETAILS MUST BE SUBMITTED TO AND APPROVED BY THE PUBLIC WORKS DIRECTOR.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: PAVEMENT RESTORATION	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		F-1



LEGEND

(1) EXISTING BASE AND PAVEMENT.

(2) STRAIGHT SAWCUT JOINT.

(3) ASPHALTIC CONCRETE, 1 1/4" S1 AND 3/4" S3 (TOP LAYER) (MIN. MARSHALL STABILITY 1000 lbs.)

(4) MIN. 12" SOD STRIP (SOD NOT TO BE HIGHER THAN E.O.P.)

(5) COMPACTED SUBGRADE.

(6) 12" MIN. LIMEROCK BASE MATERIAL (MIN. LBR 100) SHALL BE COMPACTED TO 98% DENSITY IN 4" LIFTS, AASHTO T-180 OR OPTIONAL BASE GROUP 11. FOR LOW TRAFFIC VOLUME RESIDENTIAL STREETS USE GROUP 7.

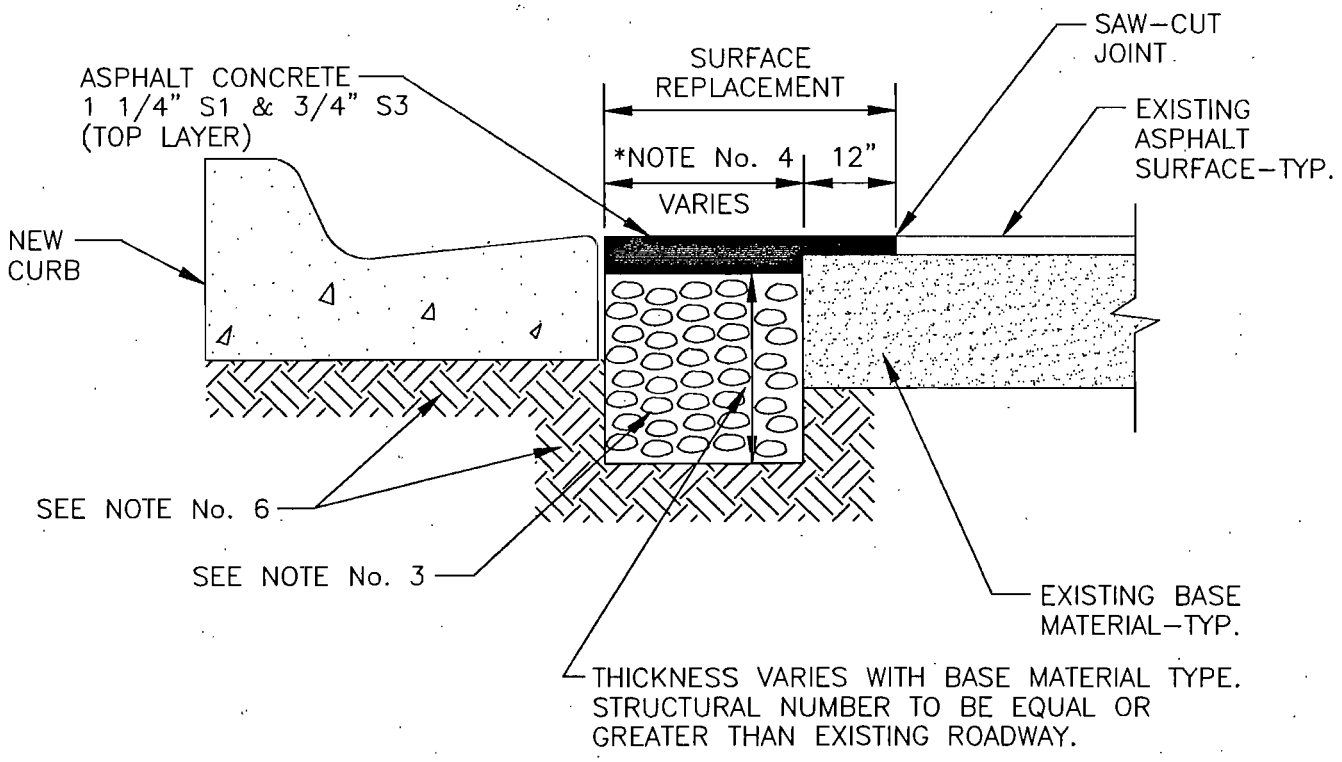
(7) ASPHALT JOINT AND BASE MATERIAL SHALL BE TACK COATED PRIOR TO INSTALLING NEW ASPHALT.

NOTE:

MINIMUM WIDTH OF STRUCTURAL REPAIR TO BE 4'.
ADDITIONAL REPAIR WIDTH MAY BE REQUIRED IF MORE BASE MATERIAL IS DAMAGED OR OTHERWISE FAILED.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: TYPICAL STRUCTURAL REPAIR AND PAVEMENT RESTORATION	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		F-2



NOTES:

1. REMOVE EXISTING ROAD AS NEEDED TO INSTALL FORMS FOR EDGE OF CURB.
2. FOR BASE MATERIAL OPTIONS, USE GROUP 11 (FDOT INDEX 514)
3. LIMEROCK BASE MATERIAL (LBR 100, MIN.) SHALL BE COMPACTED TO 98% DENSITY, AASHTO T-180.
4. ASPHALT CONCRETE JOINT SHALL BE MECHANICALLY SAW CUT IN A STRAIGHT CONTINUOUS LINE.
5. ASPHALT JOINT AND BASE MATERIAL SHALL BE TACK COATED PRIOR TO INSTALLING NEW ASPHALT.
6. MIN. 12" STABILIZED SUBGRADE MIN. LBR 40 COMPACTED TO 98% AAHTO T-180.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: NEW CURB ALONG EXISTING ROAD PAVEMENT	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		F-3

ROADWAY STANDARDS

This section deals with the construction of new roads, with widening of existing streets, curve radii, left turn storage, typical sections and intersections.

All streets are required to have a paved surface and comply with the "Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways for the State of Florida" (MUMSDCM.), in addition to the specific design considerations herein. Design conditions, which are noted as permissive in the MUMSDCM, may be modified upon approval of the Public Works Director if determined to provide equal or improved engineering.

The widths and locations of all streets are required to be in compliance with the Comprehensive Plan's Traffic Circulation Element. Where, in the opinion of the City it is desirable to provide street access to adjoining properties, proposed new streets being platted shall be extended by dedication to the boundaries of such properties.

Right-Of-Way, Street and Lane Width – The minimum required right-of-way width for a street is based on the required width of paving plus an additional width on each side of the paving to accommodate curbs, sidewalks and utilities. These minimum requirements are shown below and on the following sheets

Street Type	Minimum Dedicated ROW	Engineering Standard Sheet #
6 Lane Urban Section	120 FT	G-6
6 Lane Urban Section – Ltd	100 FT	G-7
4 Lane Urban Section	100 FT	G-8, G-9, G-10 and G-11
Lane Widening Existing Roads	Varies	
Local Roads	60 FT (MIN.)	G-5

Right-Of-Way Dedication – Minimum ROW dedication shall be 60 feet. Where a subdivision is on both sides of a street, the entire right-of-way shall be dedicated, as platted.

When new development is on an existing street with substandard right-of-way, the minimum required right-of-way width of 60' shall be dedicated to the City.

Subdivisions platted along existing streets shall dedicate additional right-of-way if necessary to meet the minimum street width regulations.

Parallel Access Roads – Where a proposed subdivision abuts or contains an existing or proposed arterial street or highway on which traffic volumes and vehicular speeds warrant special safety, the Council may require that parallel access roads be provided in order that no lots will front on such existing or proposed arterial street or highway.

The City may require the reservation of additional width for needed through lanes, turn lanes, speed change lanes and where it is necessary to accommodate drainage structures.

Horizontal Alignment – Street locations must conform to the pattern of thoroughfares designated in the Traffic Circulation Element of the Comprehensive Plan. Proposed streets with widths different from existing streets to which they are being connected must be transitioned using transition tapers required by the MUMSDCM. Minimum horizontal curve design criteria must comply with the MUMSDCM.

Vertical Alignment – Grades and vertical sight distance must conform to State standards as outlined in the MUMSDCM. All streets shall be designed so as to provide for the discharge of surface water from the pavement and from the right-of-way per South Florida Water Management District criteria. The minimum street grade required shall be approved by the Public Works Director.

Drainage openings shall be designed so as not to restrict the flow of water and thereby unduly increase flood heights.

Superelevation on Horizontal Curves – maximum superelevation rates for arterials and collectors are 0.05 ft/ft. Superelevation is not recommended for use on local street curves and discouraged on others as well. For design details the MUMSDCM should be consulted.

Turn Lanes – The City will require the minimum criteria specified in the Lee County Turn Lane Policy (See Appendix #1). Right turn lanes may be required for high traffic generation projects. All commercial, professional or industrial properties will, at a minimum, be required to provide lane widening adjacent to their properties and provide a 75 foot taper between the edge of pavement and existing pavement (see sheet G-18). Driveways at new approved median openings will be required to provide a left turning lane. Driveways at existing median openings, serving 10 or more new vehicles per hour will be required to provide a left turning lane. That policy contains both signalized and unsignalized storage lane length calculations. The minimum unsignalized intersection may be based on the signalized criteria, provided the common cycle length of the roads signalized intersections, is used. Nothing in this policy shall be construed to place an obligation upon the City to permit left turns into or out of any development, via either any existing or proposed street or access point driveway from any street, or highway facility where the Public Works Director has determined it is not in the best interest of the health, safety and general welfare of the traveling public to allow such left turn movement.

Requirements for tapers and reductions in these lengths under limiting conditions are the same as outlined below for right turn lanes.

Left Turn Lanes

Typically only those developments generating a minimum of 40 left turning vehicles per hour will be considered for new median openings. New median openings that meet the median opening requirements and are approved by the City, shall be provided with a left turn lane and median improvements.

Driveways that utilize an existing approved median opening and generate traffic volumes for left turns equal or in excess of 10 new vehicles per hour, shall require the installation of a left turn lane and associated median improvements.

For Directional Left Turns refer to Sheet G-19.

All left turn lane construction shall be designed to conform to Lee County turn lane configuration and standards.

Right Turn Lanes

In addition to the requirements for commercial, professional & industrial, lane widening, curb & gutter, etc.; driveways that access roadways built with a posted speed limit of 35 miles per hour or greater, and generate right turns equal or in excess of 30 vehicles per hour (either in am or pm peak hours) shall be provided with a right turn lane.

The right turn lane shall be constructed in conformance with Lee County right turn configuration and standards.

Medians –Where median openings with turn lanes are provided, the minimum width of the concrete separator is 3 feet. All designs must conform with pages III 30-36 of the MUMSDCM. No fixed objects - not meeting breakaway standards – will normally be permitted in medians. Plantings must be trimmed so that sight distance requirements specified herein and in the MUMSDCM are met.

The minimum spacing of median openings will be kept to 660 feet; however greater spacing is desirable. The absolute minimum which must be justified by a traffic study is 360 feet. Streets for which access control plans have been prepared, such as S.R. 78, Del Prado Boulevard and Cape Coral Parkway, may have more stringent requirements. Certain streets including Cape Coral Parkway, Santa Barbara Boulevard and Hancock Bridge Parkway, which are subject to future intergovernmental transfers and proposed median openings, are reviewed with the Metropolitan Planning Organization's Traffic Signal Advisory Committee. Special requirements of that committee may be imposed on these streets.

Bicycles – The bicycle is a design vehicle and, therefore, the provision of bicycle features including wide curb lanes and dedicated on-street lanes must be evaluated for each project designed.

Mailboxes – As mailboxes are within the public right-of-way, and specifically roadside shoulders, they must conform to State safety standards. The box supports must be standardized to insure that they will "break away" if struck by a vehicle. See sheet J-3

Clear Zone – Within the area of the "clear zone" adjacent to the right-of-way, there must be no sight obscuring or partly obscuring sight foliage or berm higher than 24 inches above grade or, in the case of trees, foliage lower than 8 feet. Objects that may be located in the clear zone must be of the breakaway type as defined in the Uniform Manual. Fire hydrants, utility junction boxes and poles and trees with greater than 6 inch diameter trunks, which cannot be made breakaway, may not be located in the "clear zone." Within the roadway median, no trees having trunks greater than 6" diameter are to be permitted. These are to be planted no closer than 50' from the end of the median and 6' from the edge of the median. Planting spacing within the median or clear zone shall be spaced based on criteria shown on sheet G-12.

Dead-End Streets – Cul-de-sacs or dead-end streets which are designed so as to have one end permanently closed, shall not be longer than 500 feet and shall be provided at the closed end with a turn around having a radius at the outside of the pavement of a least 45 feet, and a radius at the outside of the right-of-way of at least 55 feet.

Reserve Strips – There shall be no reserve strips in a subdivision except where their control is definitely vested in the City under conditions approved by City Council as authorized in the provisions of this resolution.

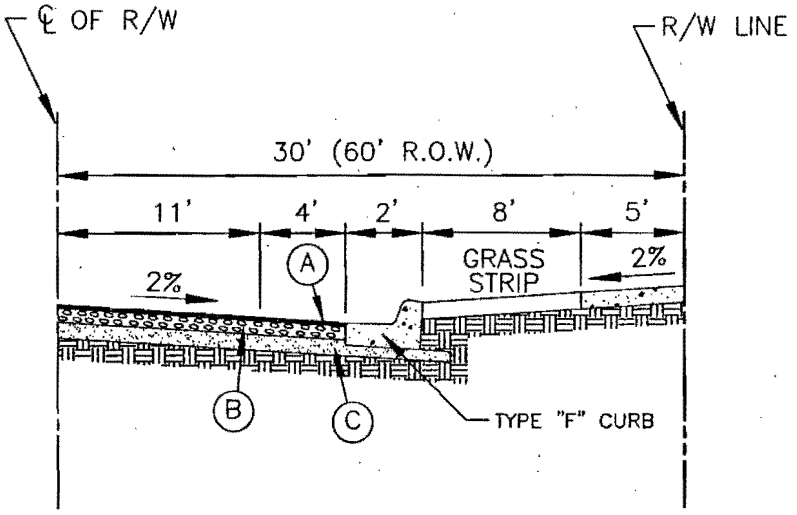
Street Lights – Street lights shall be provided at appropriate locations to maintain City determined levels of illumination.

Signing & Marking - Signing and marking on public streets shall conform to the requirements of the Manual on Uniform Traffic Control Devices.

Construction Zone Traffic Control - Problems arise when traffic must be moved through roadway construction, maintenance operations or utility work. In order to minimize these problems the City has adopted the Manual on Uniform Traffic Control Devices for Streets and Highway (MUTCD). In order to insure compliance with these procedures a Public Works Department Right of Way Usage Permit is required for all work within the public right-of-way. The contractor performing the work is required to submit a Maintenance of Traffic (MOT) plan when applying for the Permit (prior to start work), and is required to provide appropriate work zone control and is subject to work stoppage if the required safety requirements are not fully implemented.

See FDOT Design Standards Indexes #600 - #670 for additional information and examples.

LOCAL ROADS



(A) ASPHALTIC CONCRETE 1 1/4" S1 AND 3/4" S3 (TOP LAYER).

(B) MIN. 8" LIMEROCK – MIN. L.B.R. 100 COMPACTED TO 98% AASHTO T-180.

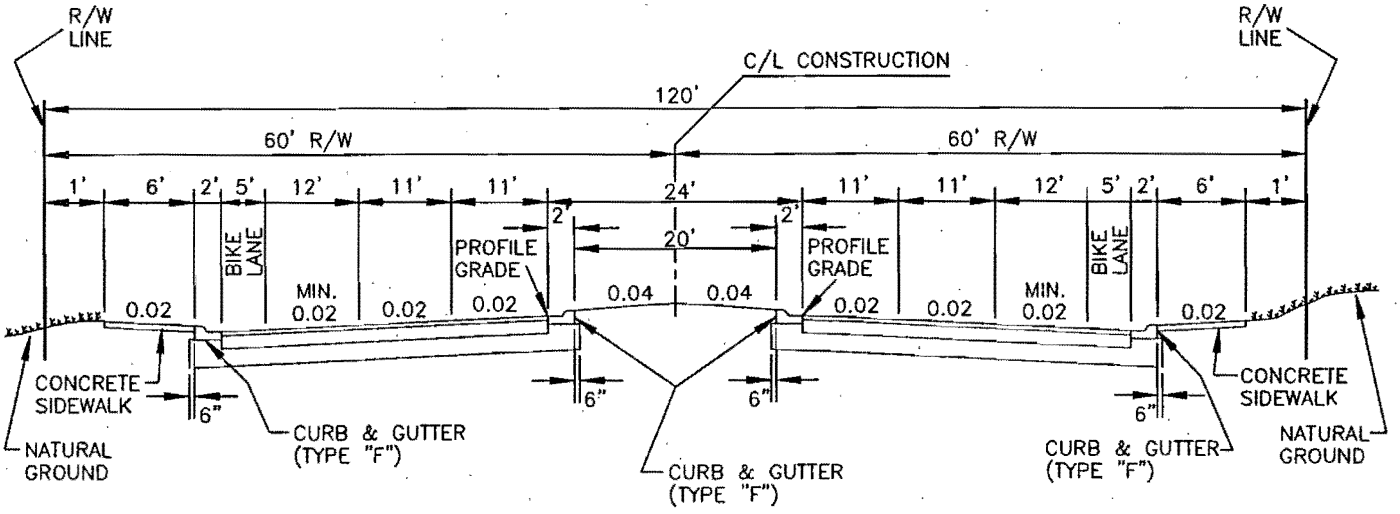
(C) MIN. 12" STABILIZED SUBGRADE – MIN. L.B.R. 40 COMPACTED TO 98% AASHTO T-180.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: TYPICAL SECTION NEW CONSTRUCTION	REVISIONS :	SHEET NO. G-5
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		

120' R.O.W.

6-LANE URBAN SECTION



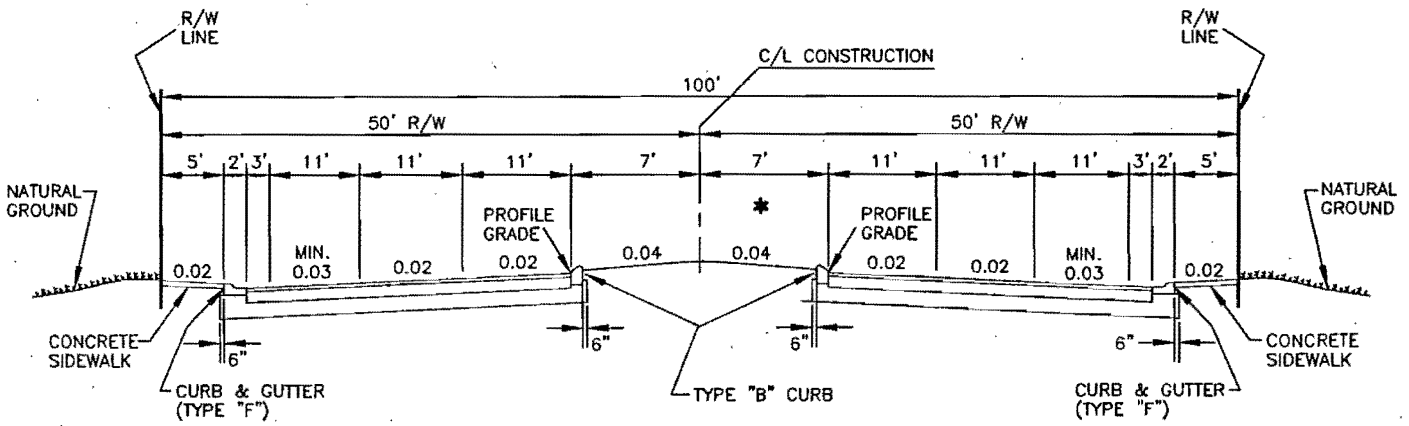
CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: TYPICAL SECTION NEW CONSTRUCTION	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE DATE 03-28-2002		G-6

100' R.O.W.

6-LANE URBAN SECTION

LIMITED



NOTE:

FOR NEW CONSTRUCTION WITHIN EXISTING RIGHT-OF-WAY

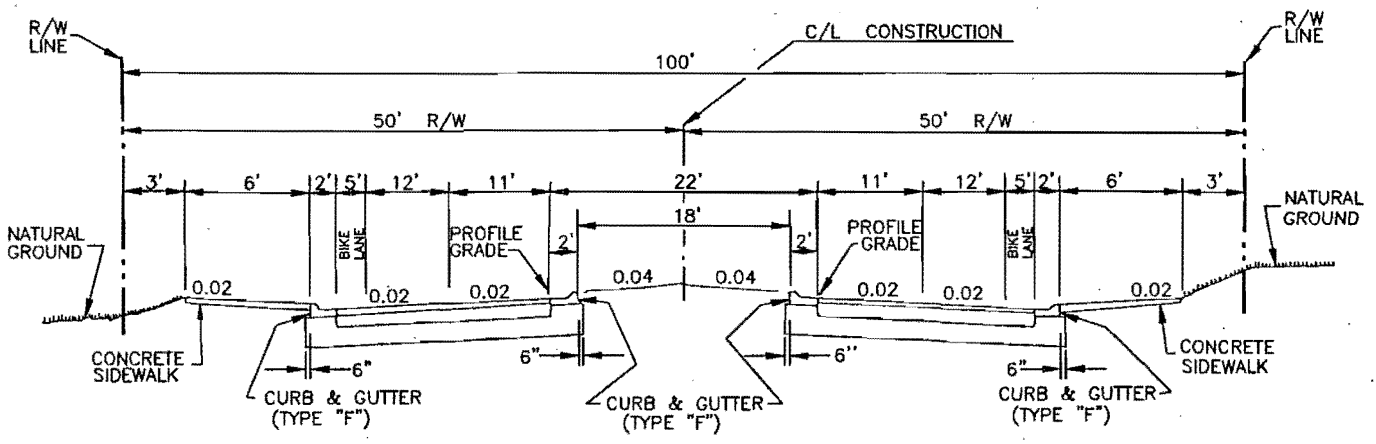
* FOR LEFT TURN LANES USE 11' LANE WIDTH WITH 3' SEPARATOR

CITY OF CAPE CORAL ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: TYPICAL SECTION NEW CONSTRUCTION	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE DATE 03-28-2002		G-7

100' R.O.W.

4-LANE URBAN SECTION



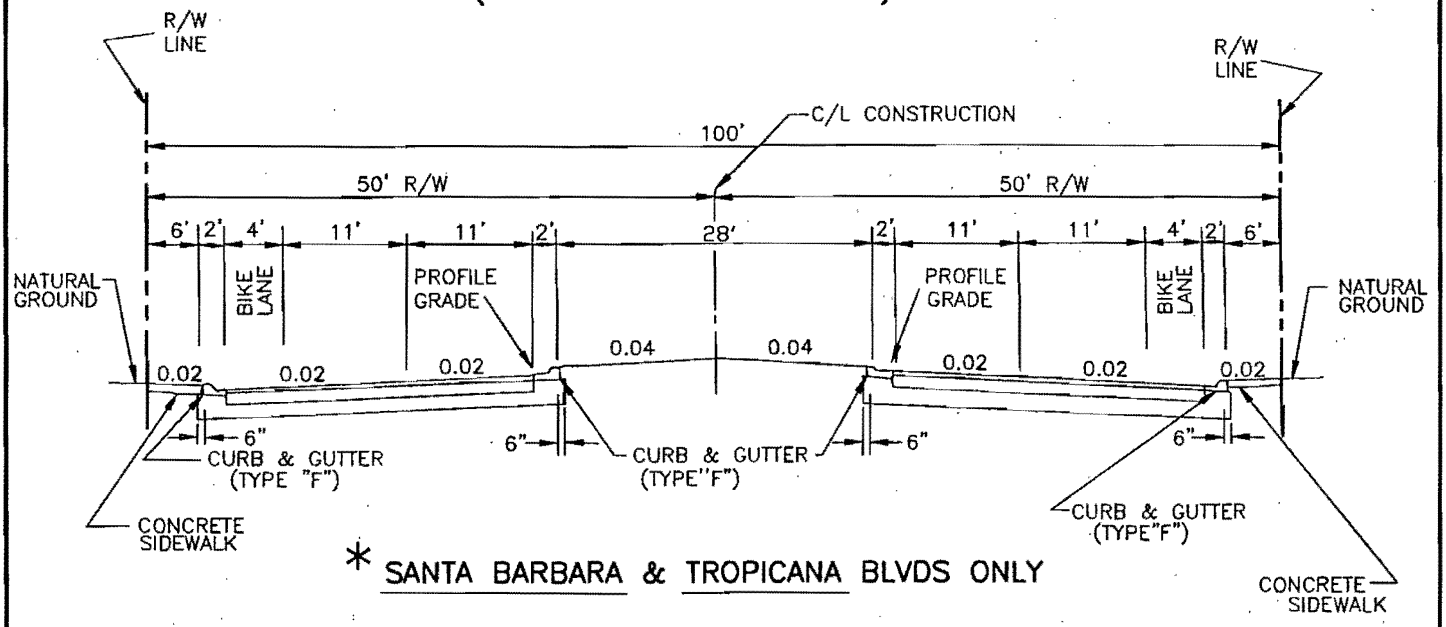
CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: TYPICAL SECTION NEW CONSTRUCTION	REVISIONS :	SHEET NO. G-8
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		

100' R.O.W.

4-LANE URBAN SECTION *

(WITH UTILITY EASEMENT)



* SANTA BARBARA & TROPICANA BLVDS ONLY

NOTE:

FOR NEW CONSTRUCTION WITHIN
EXISTING RIGHT-OF-WAY

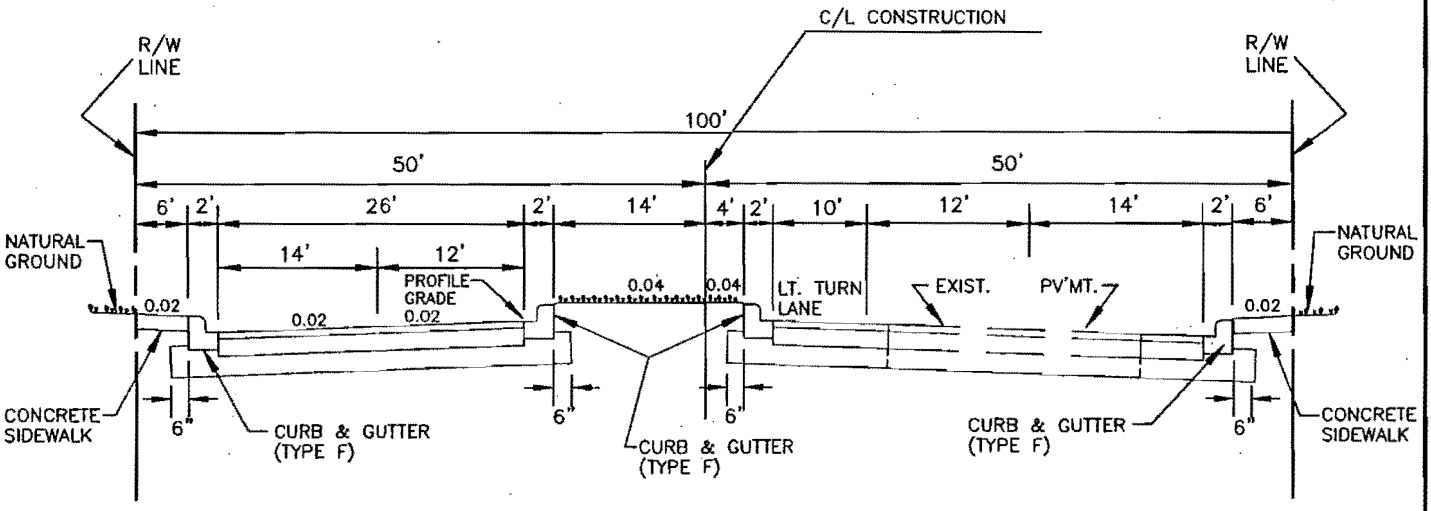
CITY OF CAPE CORAL ENGINEERING DESIGN STANDARD			
APPROVED:	TITLE: TYPICAL SECTION NEW CONSTRUCTION	REVISIONS :	SHEET NO. G-9
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		

100' R.O.W.

4–LANE URBAN SECTION*

(WITH UTILITY EASEMENT)

TYPICAL FOR LEFT TURN LANE ADDITION ONLY.



*SANTA BARBARA & TROPICANA BLVDS. ONLY

NOTE:

FOR NEW CONSTRUCTION WITHIN EXISTING RIGHT–OF–WAY

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

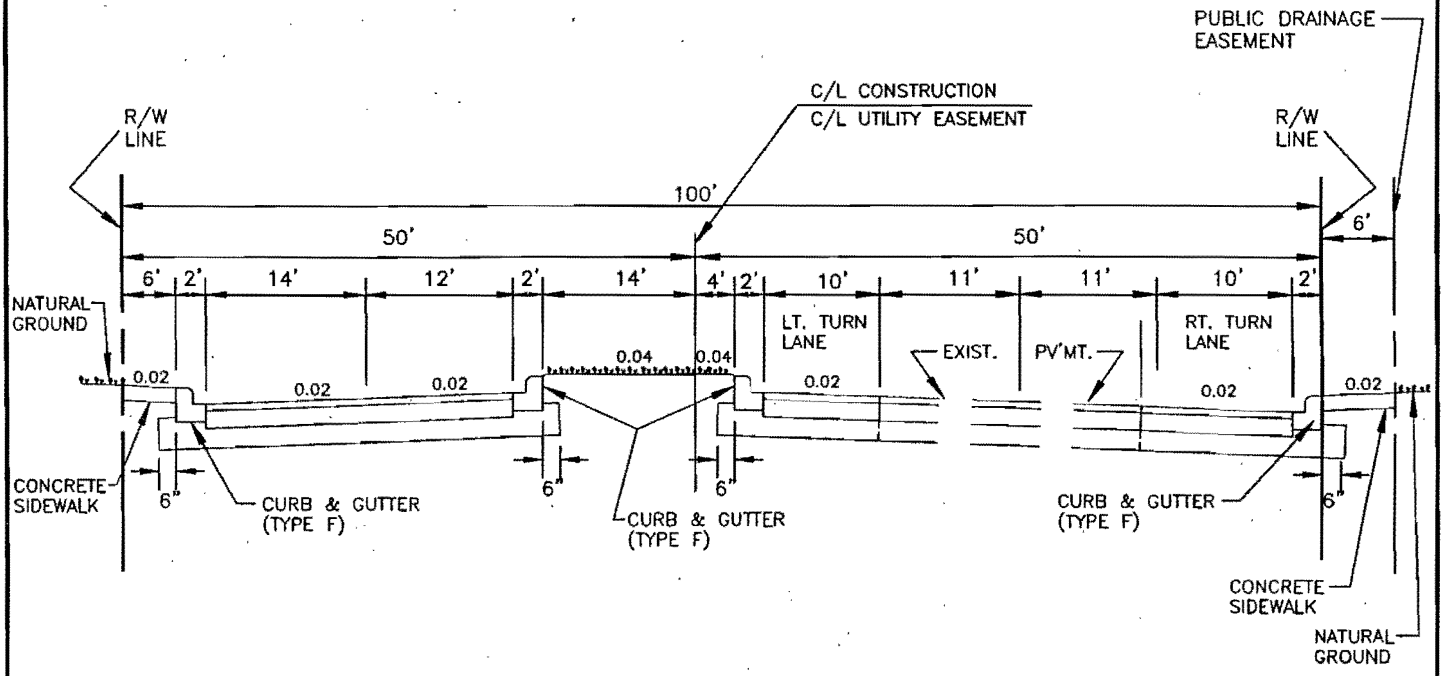
APPROVED:	TITLE: TYPICAL SECTION NEW CONSTRUCTION	REVISIONS :	SHEET NO. G–10
PUBLIC WORKS DIRECTOR	DATE DATE 03–28–2002		

100' R.O.W.

4–LANE URBAN SECTION*

(WITH UTILITY EASEMENT)

TYPICAL FOR LEFT & RIGHT TURN LANE ADDITIONS.



* SANTA BARBARA & TROPICANA BLVDS. ONLY

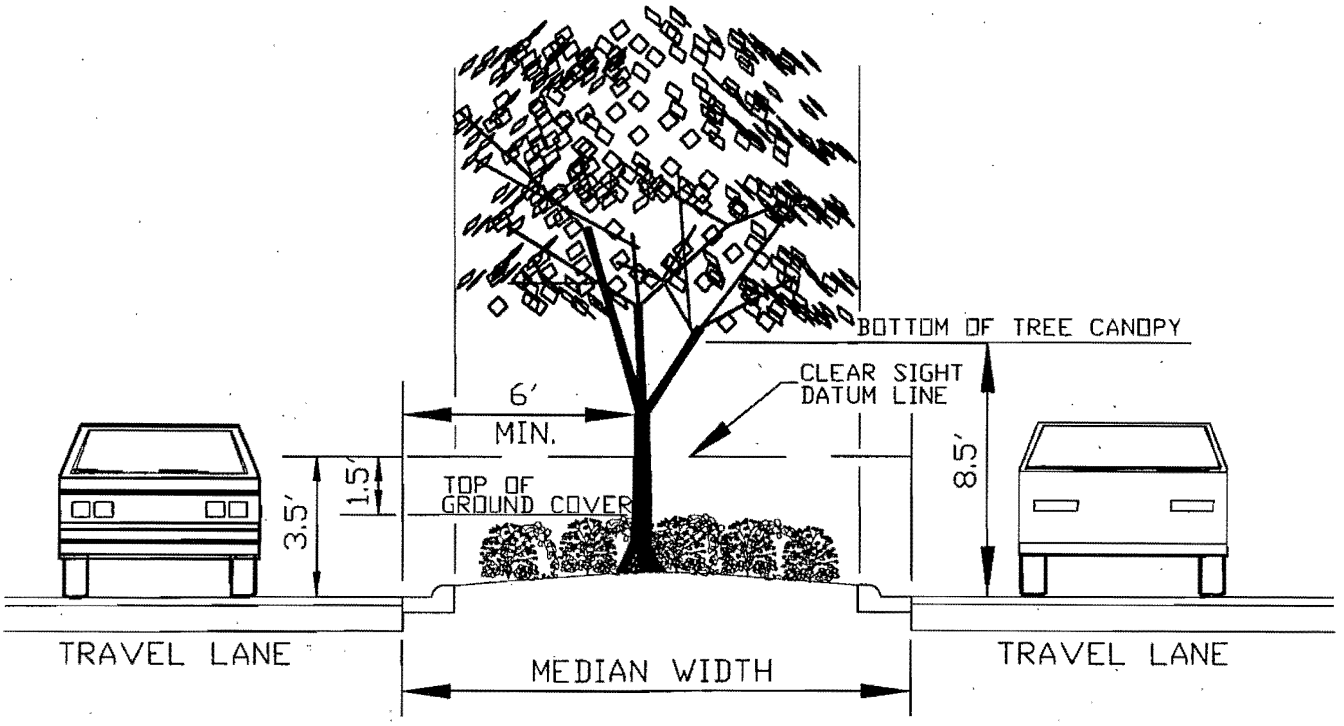
NOTES:

1. FOR NEW CONSTRUCTION WITHIN RIGHT–OF–WAY.

2. ADDITIONAL PUBLIC DRAINAGE & UTILITY EASEMENT WIDTH MAY BE REQUIRED AT TIME OF PARCEL DEVELOPMENT.

CITY OF CAPE CORAL ENGINEERING DESIGN STANDARD

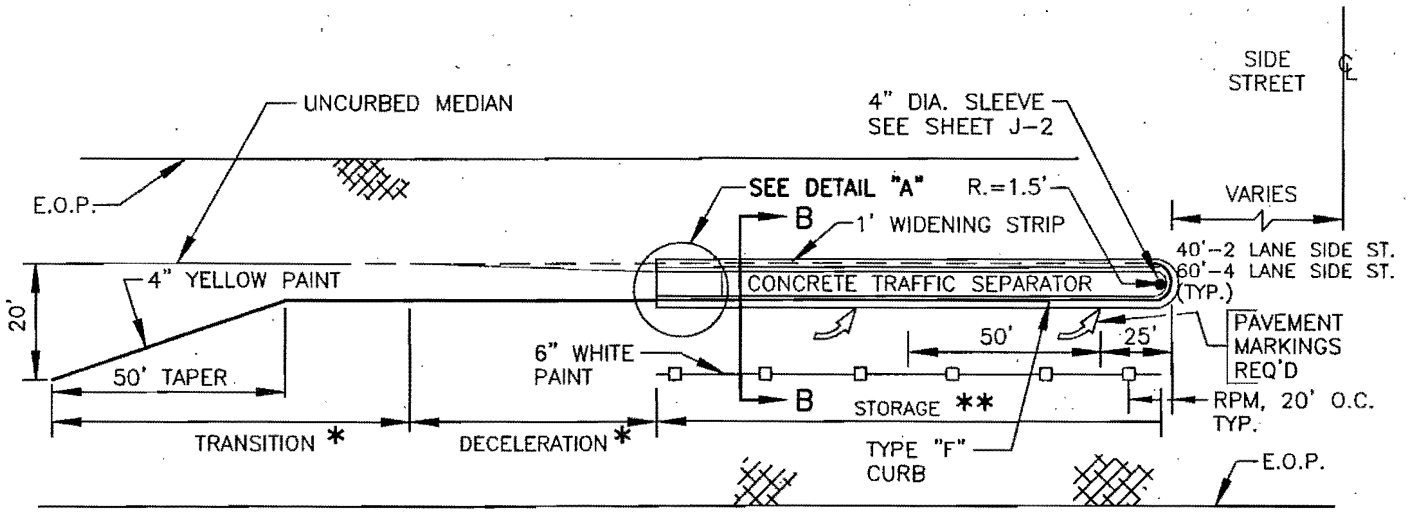
APPROVED:	TITLE: TYPICAL SECTION NEW CONSTRUCTION	REVISIONS :	SHEET NO. G–11
PUBLIC WORKS DIRECTOR	DATE DATE 03–28–2002		



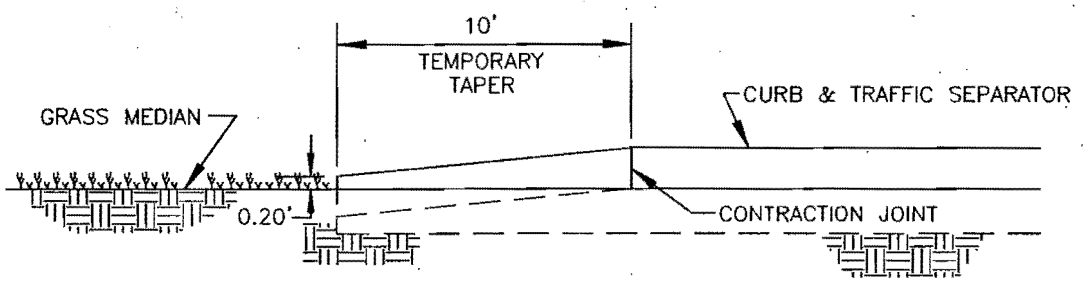
CLEAR–SIGHT WINDOW

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: MEDIAN–CLEAR SIGHTS	REVISIONS :	SHEET NO. G–12
PUBLIC WORKS DIRECTOR	DATE 03–28–2002		



PLAN



DETAIL "A"

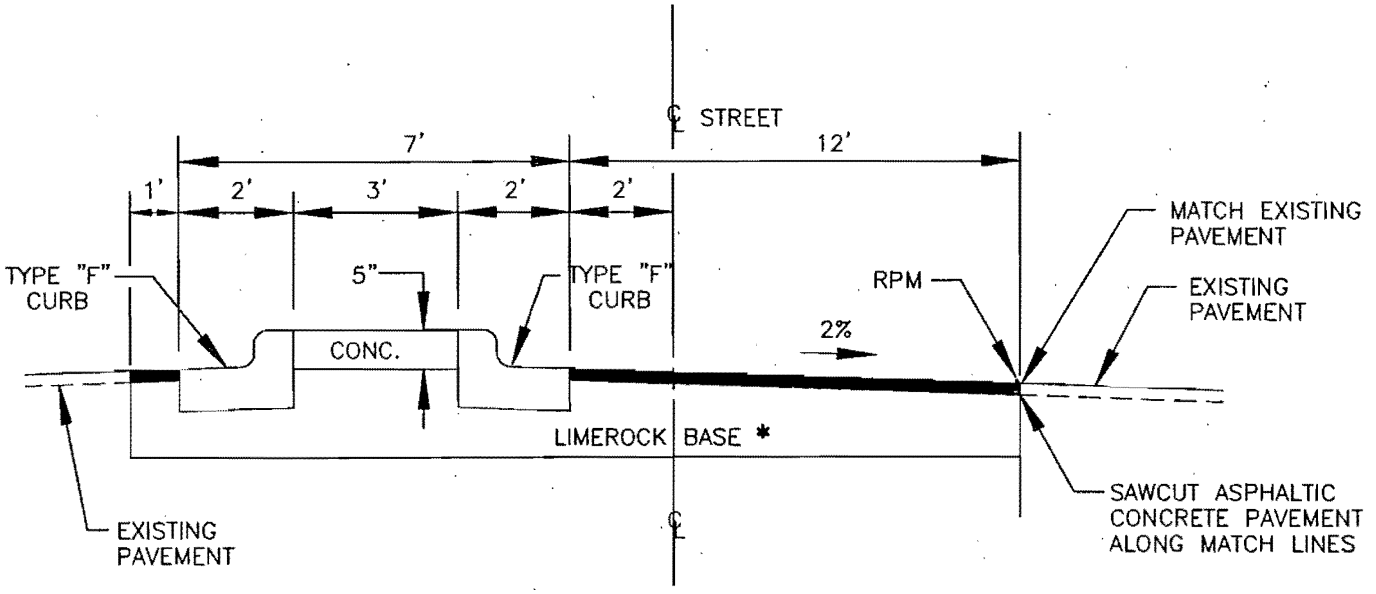
FOR SECTION B-B, SEE SHEET G-14

* USE CHART ON PAGE 7 OF 17 FROM LEE COUNTY TURN LANE POLICY.- SEE APPENDIX NO. 1.

** FOR 30 TURNS OR LESS USE 150 FT. STORAGE
FOR OVER 30 TURNS CONTACT THE CITY TRANSPORTATION SECTION.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: LEFT TURN STORAGE LANE FOR 20' MEDIAN	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		G-13

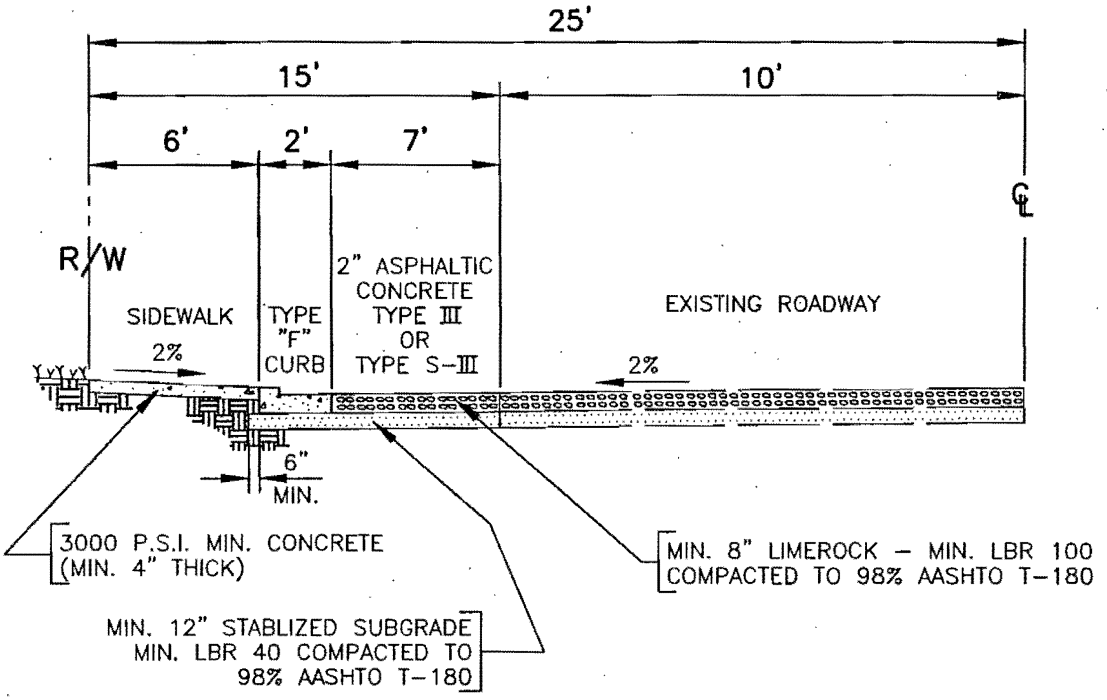


CROSS SECTION B–B

* NOTE: SUBGRADE, BASE AND ASPHALT TYPES AND THICKNESSES MUST MEET CURRENT CITY STANDARDS.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: LEFT TURN STORAGE LANE FOR 20' MEDIAN – SECTION VIEW	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		G–14



NOTES:

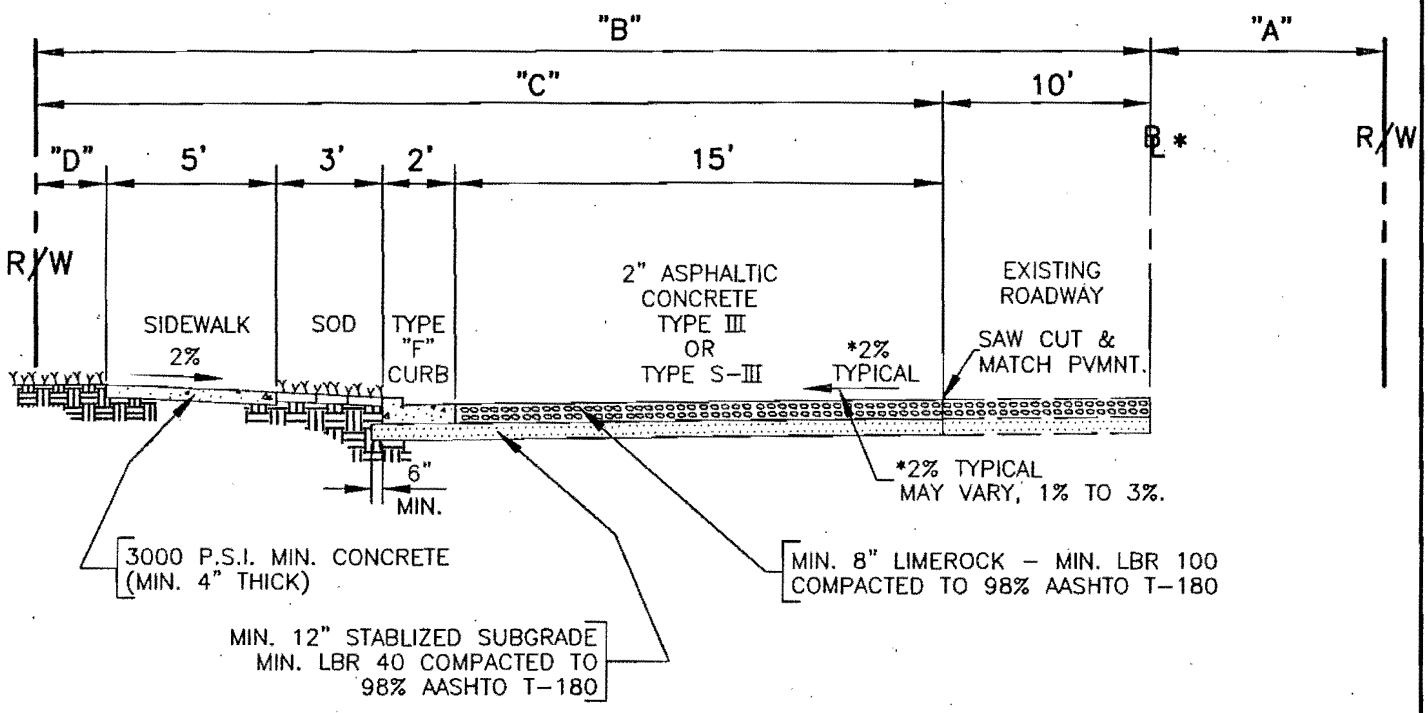
1. THE SIDEWALK FOUNDATION SHALL BE COMPACTED TO A FIRM EVEN SURFACE AND SHALL BE FREE OF SOD AND OTHER ORGANIC MATERIAL. SIDEWALK SAWCUT JOINTS SHALL BE ON 5' CENTERS. MIN. SAWCUT DEPTH IS 1/4 THE DEPTH OF THE SIDEWALK.

2. THESE SPECIFICATIONS ARE FOR ROAD WIDENING ONLY. ALL NEW CONSTRUCTION WILL MEET CURRENT DESIGN CRITERIA.

3. PLEASE CONTACT THE PUBLIC WORKS DEPARTMENT, TRANSPORTATION DIVISION TO VERIFY THE APPROPRIATE LANE WIDENING FOR YOUR SITE DESIGN.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: LANE WIDENING 50' R.O.W.	REVISIONS :	SHEET NO. G-15
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		



NOTES:

1. THE SIDEWALK FOUNDATION SHALL BE COMPACTED TO A FIRM EVEN SURFACE AND SHALL BE FREE OF SOD AND OTHER ORGANIC MATERIAL.
   SIDEWALK SAWCUT JOINTS SHALL BE ON 5' CENTERS.
   MIN. SAWCUT DEPTH IS 1/4 THE DEPTH OF THE SIDEWALK.

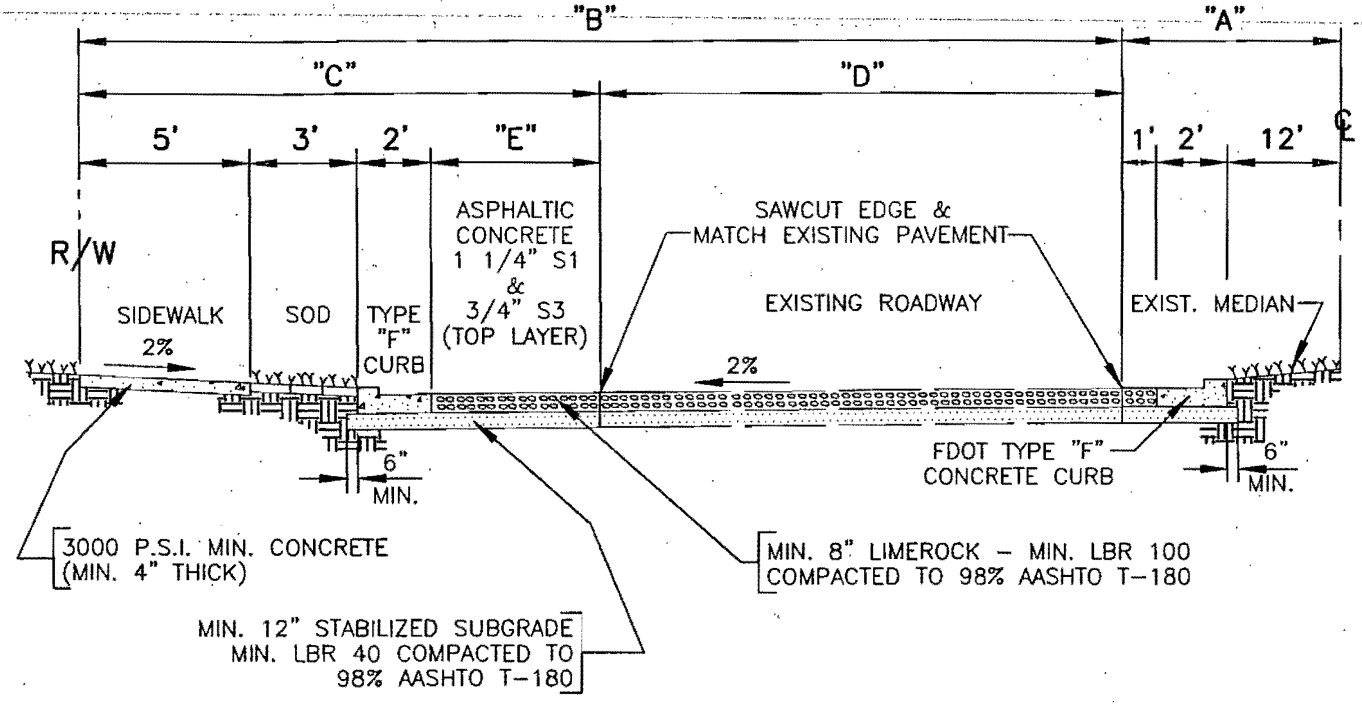
2. THESE SPECIFICATIONS ARE FOR ROAD WIDENING ONLY.
   ALL NEW CONSTRUCTION WILL MEET CURRENT DESIGN CRITERIA.

* BASELINE = ORIGINAL PAVEMENT CENTERLINE.

R/W WIDTH	"A"	"B"	"C"	"D"
66'	30'	36'	26'	1'
66'	25'	41'	31'	6'

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: LANE WIDENING 66' R.O.W.	REVISIONS :	SHEET NO. G-16
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		



NOTES:

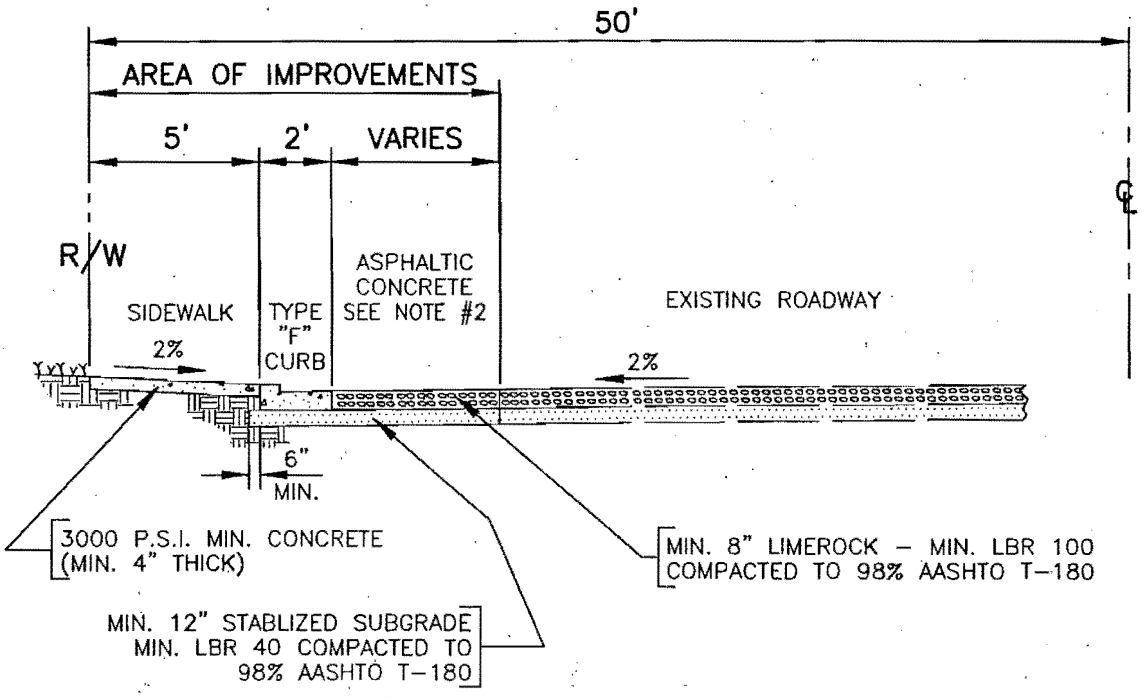
1. THE SIDEWALK FOUNDATION SHALL BE COMPACTED TO A FIRM EVEN SURFACE AND SHALL BE FREE OF SOD AND OTHER ORGANIC MATERIAL. SIDEWALK SAWCUT JOINTS SHALL BE ON 5' CENTERS. MIN. SAWCUT DEPTH IS 1/4 THE DEPTH OF THE SIDEWALK.
2. THESE SPECIFICATIONS ARE FOR ROAD WIDENING ONLY. ALL NEW CONSTRUCTION WILL MEET CURRENT DESIGN CRITERIA.
3. PLEASE CONTACT THE PUBLIC WORKS DEPARTMENT, TRANSPORTATION DIVISION TO VERIFY THE APPROPRIATE LANE WIDENING FOR YOUR SITE DESIGN.

R/W WIDTH	"A"	"B"	"C"	"D"	"E"
60'	—	30'	20'	10'	10'
70'	—	35'	25'	10'	15'
80'	6'	34'	14'	20'	4'

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE:	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	LANE WIDENING 60', 70', & 80'		G-17
	DATE 03-28-2002		

100' R.O.W.



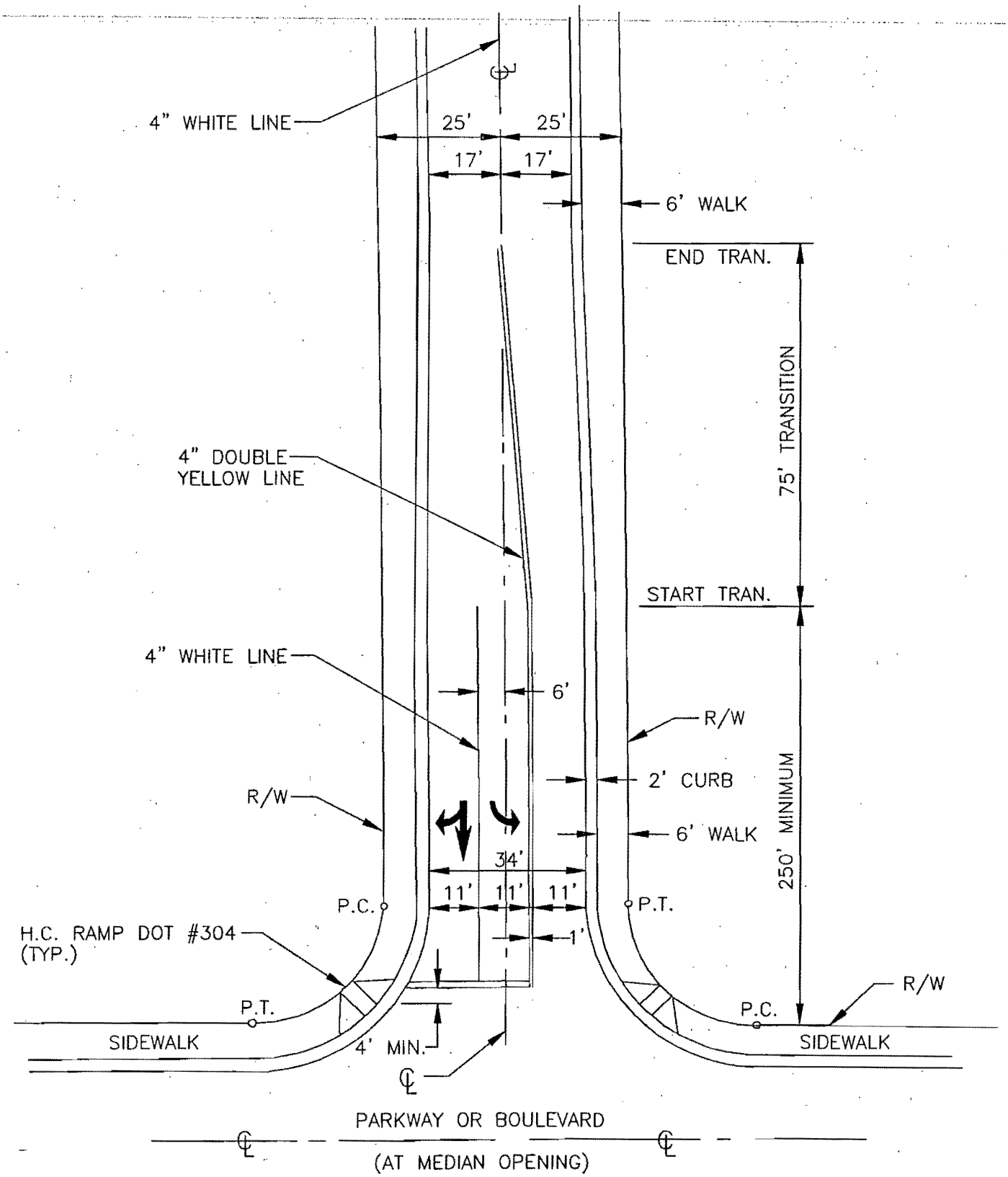
NOTES:

1. THE SIDEWALK FOUNDATION SHALL BE COMPACTED TO A FIRM EVEN SURFACE AND SHALL BE FREE OF SOD AND OTHER ORGANIC MATERIAL. SIDEWALK SAWCUT JOINTS SHALL BE ON 5' CENTERS. MIN. SAWCUT DEPTH IS 1/4 THE DEPTH OF THE SIDEWALK.
2. THESE SPECIFICATIONS ARE FOR ROAD WIDENING ONLY. ALL NEW CONSTRUCTION WILL MEET CURRENT DESIGN CRITERIA.
3. PLEASE CONTACT THE PUBLIC WORKS DEPARTMENT, TRANSPORTATION DIVISION TO VERIFY THE APPROPRIATE LANE WIDENING FOR YOUR SITE DESIGN.

FOR SANTA BARBARA AND TROPICANA BLVDS. REFER TO SHEETS G-9, G-10, G-11

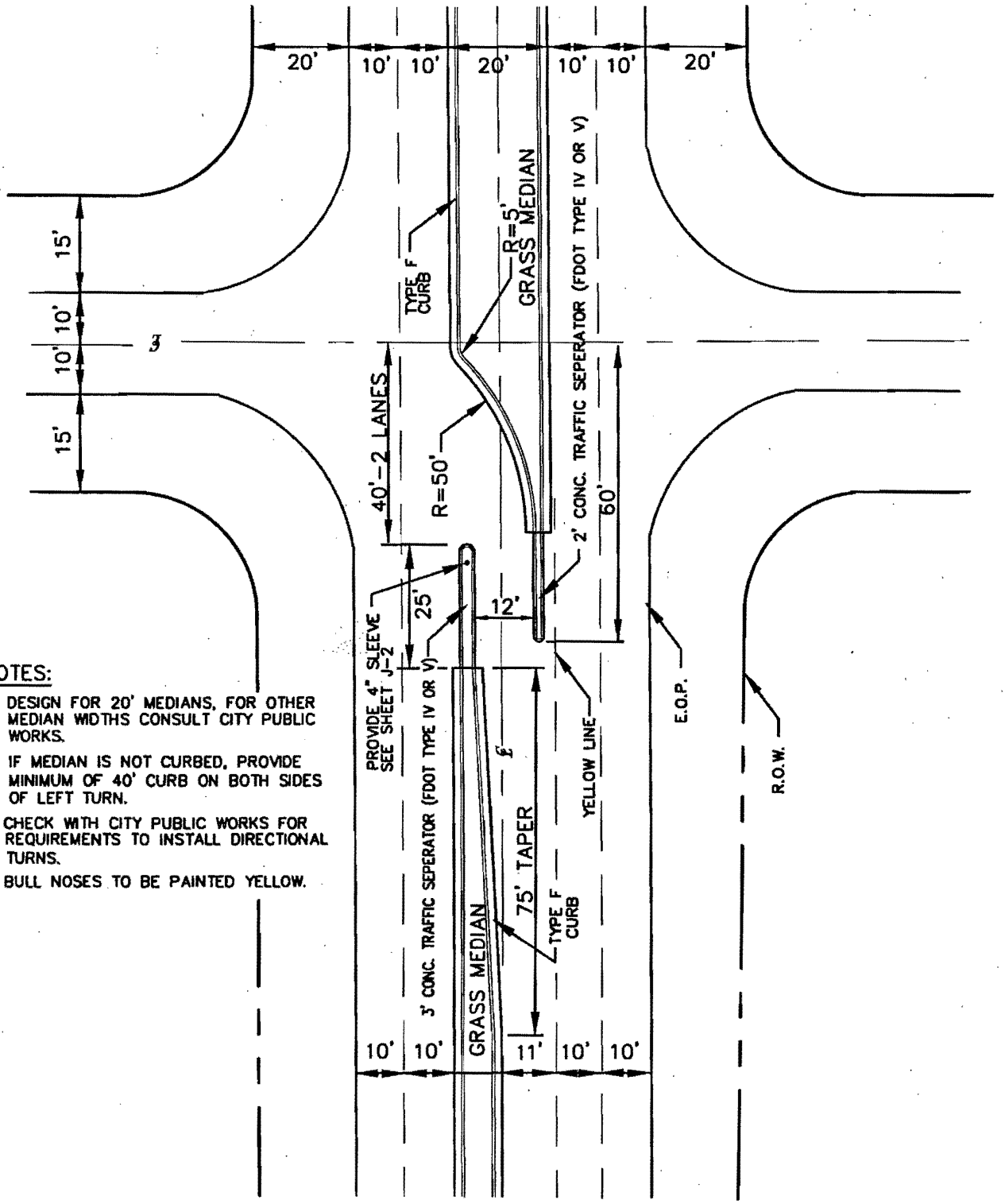
CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: LANE WIDENING 100' R.O.W.	REVISIONS :	SHEET NO. G-17A
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		



CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: LANE WIDENING	REVISIONS :	SHEET NO. G-18
PUBLIC WORKS DIRECTOR	DATE 02-28-2002		



NOTES:

1. DESIGN FOR 20' MEDIANS, FOR OTHER MEDIAN WIDTHS CONSULT CITY PUBLIC WORKS.
2. IF MEDIAN IS NOT CURBED, PROVIDE MINIMUM OF 40' CURB ON BOTH SIDES OF LEFT TURN.
3. CHECK WITH CITY PUBLIC WORKS FOR REQUIREMENTS TO INSTALL DIRECTIONAL TURNS.
4. BULL NOSES TO BE PAINTED YELLOW.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: DIRECTIONAL LEFT TURN DETAIL	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		G-19

INTERSECTIONS

This section on intersections describes the criteria for street spacing, signalization and median openings. For road functional classifications consult with the City Department of Community Development – Division of Growth & Land Management. Arterial roads serve major traffic generators, have the highest traffic and service the longest trips. Collector roads serve traffic travelling between the arterials and the local streets that provide direct access to properties.

Angles Proposed public streets must intersect one another at 90 degrees or as close to 90 degrees as possible. (No less than 80 degrees in any event.)

Spacing along arterials (Principal 4 Lane Parkways and Boulevards) Signalized intersections along arterials will normally be spaced no closer than every half mile unless a traffic signal progression study has established alternate signal spacing. Such studies must conform to City criteria and will generally assume no less than a 40% minimum off peak progression band, 40/45 miles per hour, and no more than a 120-second cycle length. In the event that an existing side street does not conform to these standards, its turning movements will be restricted or its median opening closed.

Non-signalized arterial street intersections and median openings should be spaced a minimum of 660 feet apart. Reductions below this minimum to 360 feet may be permitted if justified by a traffic study. Such openings will be limited to public streets and major traffic generators. All median openings on City arterials are examined to potential impact on signal progression by a special intergovernmental committee of the Metropolitan Planning Organization.

Spacing along Collectors Signalized intersections along collectors will normally be spaced no closer than every quarter mile unless a traffic signal progression study has established an alternate signal spacing. Non signalized, four-way intersections and median openings on collectors and commercial local streets must be spaced 500 feet apart. Three-way intersections must be spaced at least 300 feet apart.

Spacing along Local Streets Four-legged intersections will normally be spaced at least 300 feet apart. Where three-way intersections are used, the centerlines of streets not in alignment must normally be offset a minimum of 150 feet.

Corner Radii At public street intersections the minimum flowline radii will be 35 feet to provide a minimum of 10 feet from the road's edge/curb flowline to the property line. Due to existing conditions along Del Prado Boulevard and Cape Coral Parkway, a 30' radius is to be used in all cases.

Traffic Control Devices Standards for traffic control devices shall be as specified in the Manual on Uniform Traffic Control Devices (MUTCD.) In accordance with

that standard, no traffic signals are to be installed that do not comply with the warrants of the MUTCD.

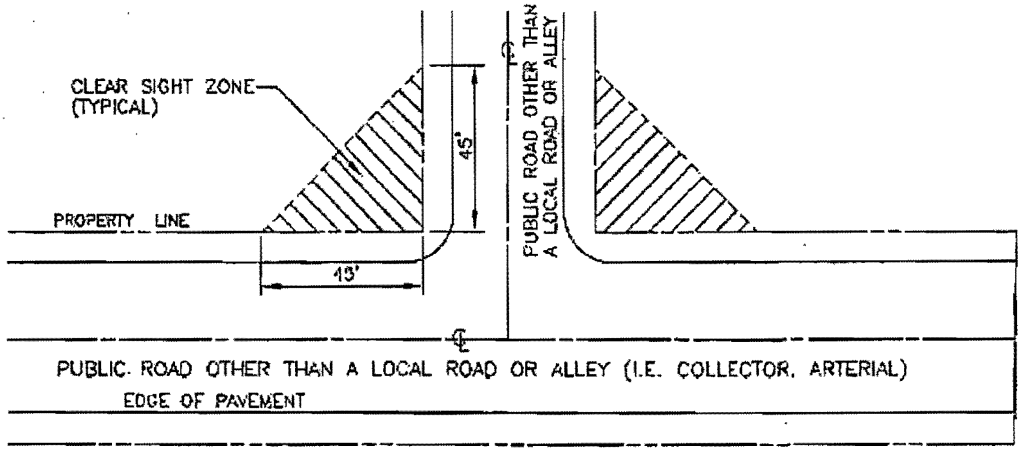
Signals serving exclusively private development shall be paid for by the affected developer. The developer's share in the cost of signals, which also serve public traffic, will generally be paid for on the basis of its share of total left turning traffic served.

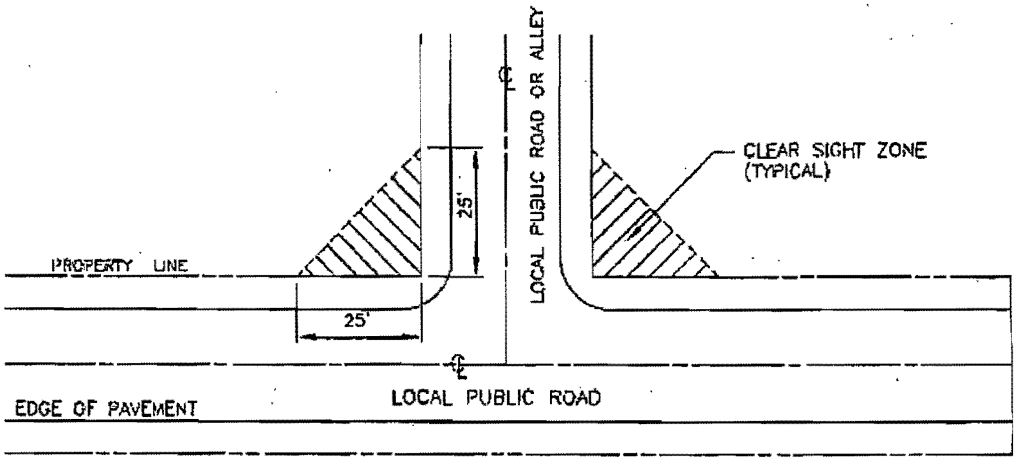
At proposed signalized intersections, the first 50 feet of a private driveway approach must be dedicated as a permanent easement to the City as measured from the flowline of the cross street. This is necessary to provide for traffic signal loop detector placement.

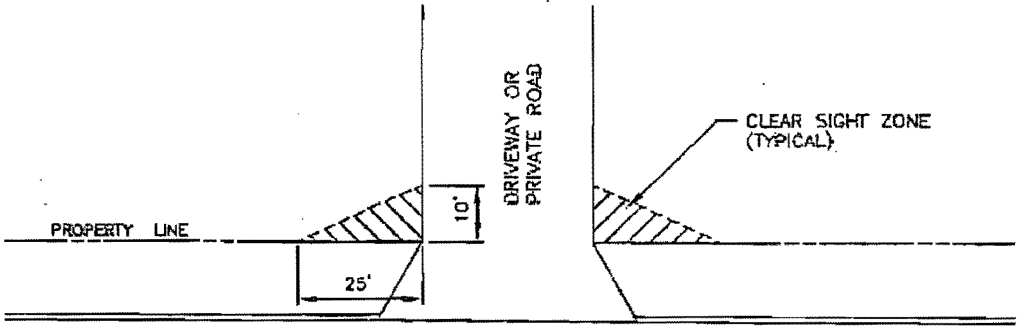
Modification or relocation costs of existing traffic control device equipment such as signals on State highways and City streets, will be the responsibility of the developer.

Sight Triangle for Unobstructed View at Intersections and Driveways At any intersection of a public road right-of-way with an alley, driveway, or other public or private road, a sight triangle must provide for an unobstructed view across the triangle formed by joining points measured along the property line, as illustrated on sheet G-22. Within the area of the triangle no wall, fence, sign, foliage or berms shall obstruct the clear sight window. The clear sight window provides a window for visibility 5' above and 1.5' below the sight line datum. The sight line datum is 3.5' above the surface of intersecting approach grade and is to approximate the driver's eye height. (see sheet G-12 for a graphic representation). In the case of trees, the canopy must be a minimum of 5'-0" above the sight line datum and trunk diameters must be 11" or less. Further, no outdoor display or parking space, except a parking space lawfully existing at the time it was approved, shall be located within the sight triangle. Objects that may be located in the triangular area include, but are not limited to, items necessary for public infrastructure such as hydrants, utility poles, utility junction boxes, traffic control devices, and septic mounds, where required by the Department of Health (DOH). These must be located to minimize visual obstruction. This requirement for sight triangles is in addition to the requirement for compliance with the "Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways for the State of Florida" (MUMSDCM).

Median Landscaping Guidelines As illustrated on sheet G-12 median landscaping needs to be planted so as not to obscure visibility at intersections.





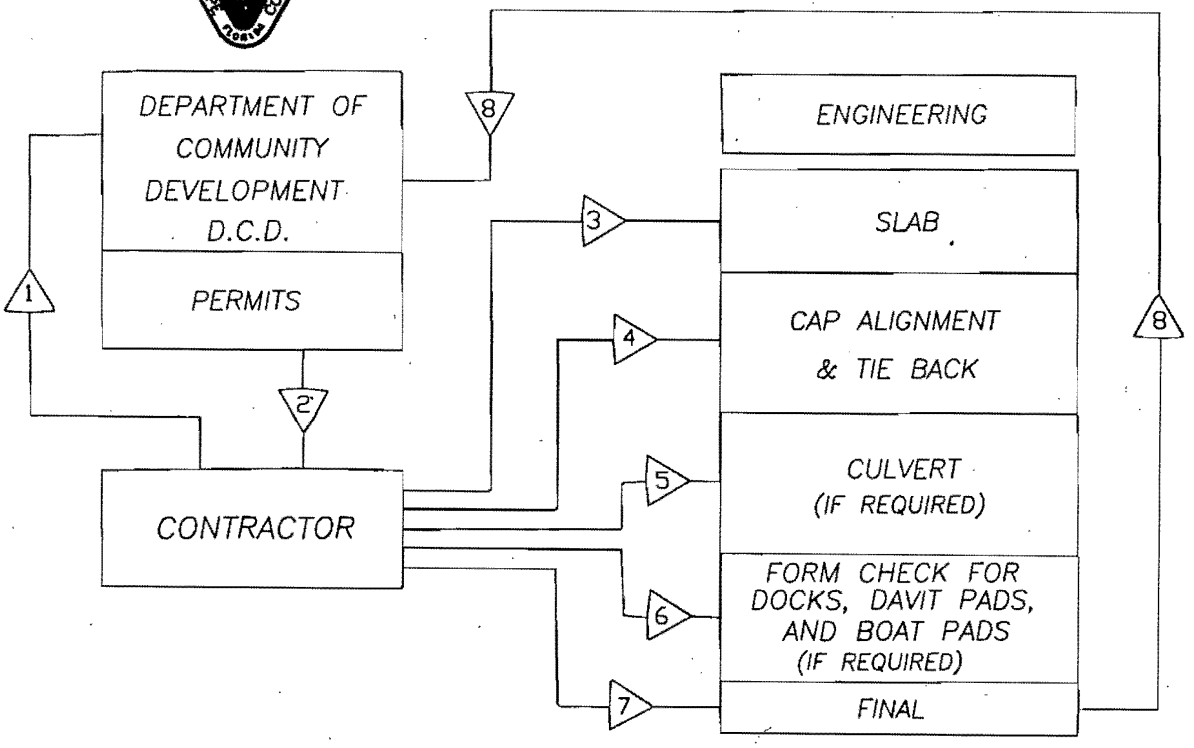


CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: SIGHT TRIANGLES FOR UNOBSTRUCTED VIEW @ INTERSECTIONS & DRIVEWAYS	Revised by ORD. 25-09 Effective 7/20/2009	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		G-22

PROCEDURE FOR THE CONSTRUCTION OF A SEAWALL

CITY of CAPE CORAL PUBLIC WORKS DEPARTMENT

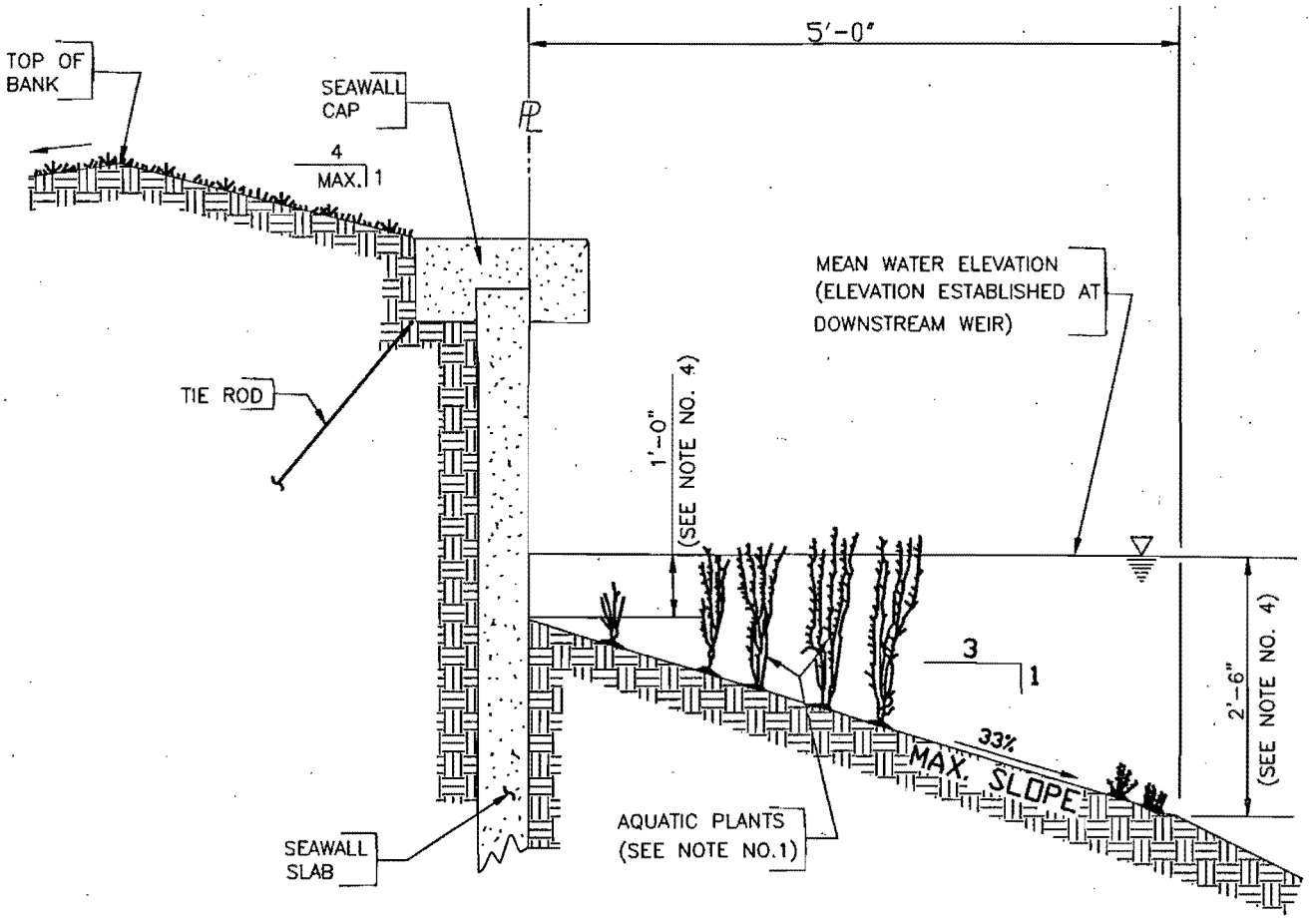


NOTES:

1. CONTRACTOR SUBMITS APPLICATION, SURVEY PLAT AND ENGINEERING INFORMATION TO D.C.D.
2. CONTRACTOR RECEIVES SEAWALL PERMIT. THIS PERMIT SHALL BE POSTED AT JOB SITE.
3. CONTRACTOR CALLS (PWD) FOR A SLAB INSPECTION.
4. CONTRACTOR CALLS (PWD) FOR A CAP ALIGNMENT AND TIE BACK INSPECTION.
5. CONTRACTOR CALLS PWD/STORMWATER FOR A CULVERT INSPECTION IF NEEDED.
6. CONTRACTOR CALLS (PWD) FOR FORM CHECK FOR CONCRETE DOCKS, DAVIT PADS, AND BOAT PADS IF NEEDED.
7. CONTRACTOR CALLS (PWD) FOR FINAL INSPECTION.
8. (PWD) NOTIFIES D.C.D. THAT THE JOB HAS BEEN COMPLETELY INSPECTED BY PWD.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: SEAWALL PERMITTING PROCEDURE	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		H-1



FRESH WATER CANAL SYSTEMS BULKHEAD

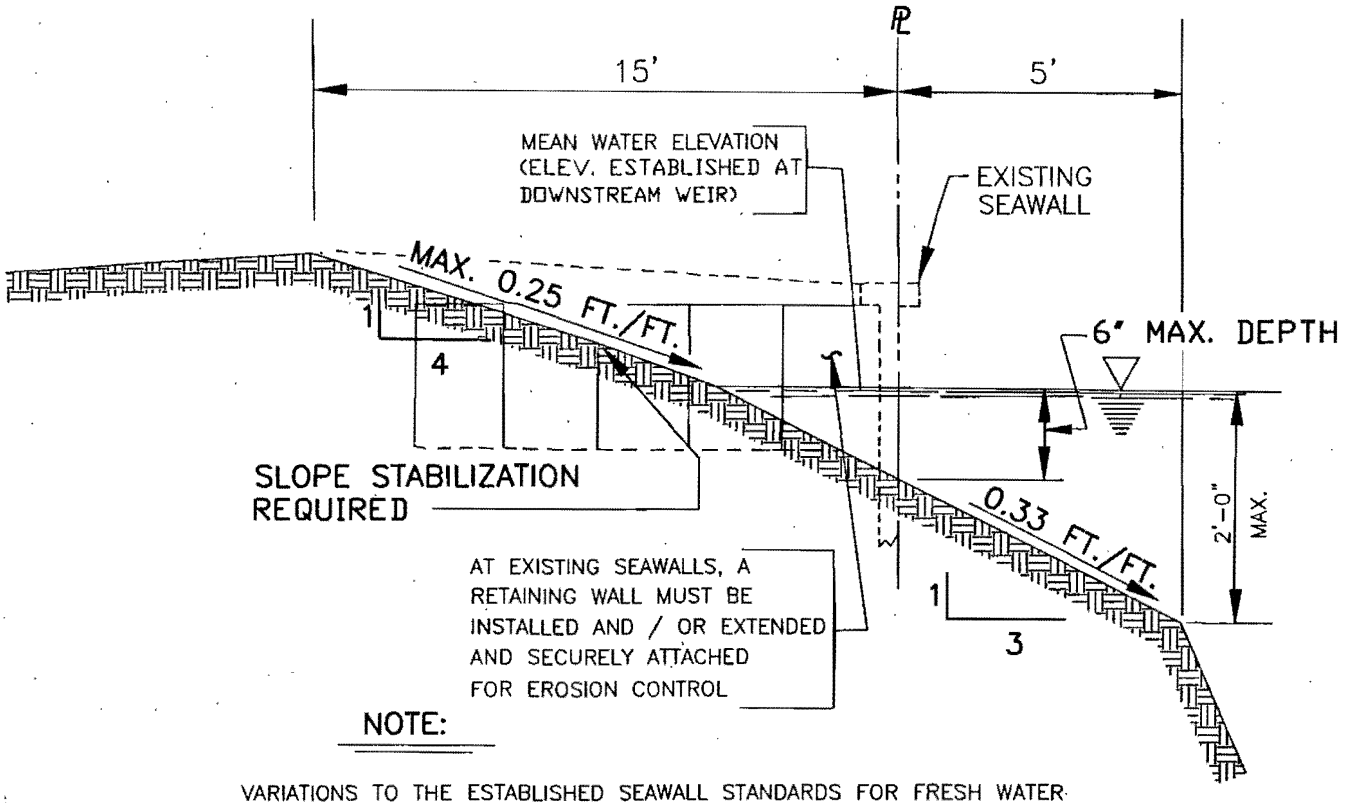
NOTES:

1. THE PLANTING OF EMERGENT AQUATIC PLANTS FOR LANDSCAPING IS OPTIONAL. (ONLY APPROVED VEGETATION WILL BE PERMITTED.)
2. VARIATIONS TO THIS STANDARD MUST BE APPROVED BY THE CITY PUBLIC WORKS DEPARTMENT.
3. CAP ELEVATION TO MATCH EXISTING SEAWALL CAPS OR MATCH EXISTING DOWNSTREAM WEIR WINGWALL CAP ELEVATION.
4. TOLERANCE FOR WATER DEPTH AT SEAWALL AND AT 5'-0" OUT SHALL BE +/- 6".
5. IN CASES WHERE ELEVATIONS OF EXISTING SEAWALL CAP DIFFERS WITH THE NEW SEAWALL CAP ELEVATION THE NEW CAP SLOPE SHOULD NOT EXCEED 4:1.
6. IN FRESHWATER CANAL SYSTEM CONCRETE RAMPS MAY BE CONSTRUCTED AT A MAXIMUM WIDTH OF 20 FEET FOR A DISTANCE NOT EXCEEDING 15 FEET INTO THE WATER FROM THE PROPERTY LINE. ALL PLANS MUST BE SEALED BY A PROFESSIONAL ENGINEER, REGISTERED IN FLORIDA.

CITY OF CAPE CORAL ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: SEAWALLS – FRESHWATER CANALS	REVISIONS :	SHEET NO. H-2
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		

MINIMUM STANDARDS FOR ALTERNATIVES TO VERTICAL BULKHEADS (FRESHWATER SYSTEMS ONLY)



NOTE:

VARIATIONS TO THE ESTABLISHED SEAWALL STANDARDS FOR FRESH WATER SYSTEMS WILL BE CONSIDERED BY THE CITY OF CAPE CORAL PUBLIC WORKS DEPARTMENT.

THE FOLLOWING MINIMAL DESIGN CRITERIA MUST BE INCORPORATED INTO THE PROPOSED DESIGN.

A. MAXIMUM ALLOWABLE SLOPE TO WATERLINE IS 4 HORIZONTAL TO 1 VERTICAL (4:1).

B. SLOPE TO BE STABILIZED WITH APPROVED MATERIALS / METHODS FOR EROSION CONTROL.

C. MAXIMUM WATER DEPTH AT PROPERTY LINE IS TO BE 6 INCHES.

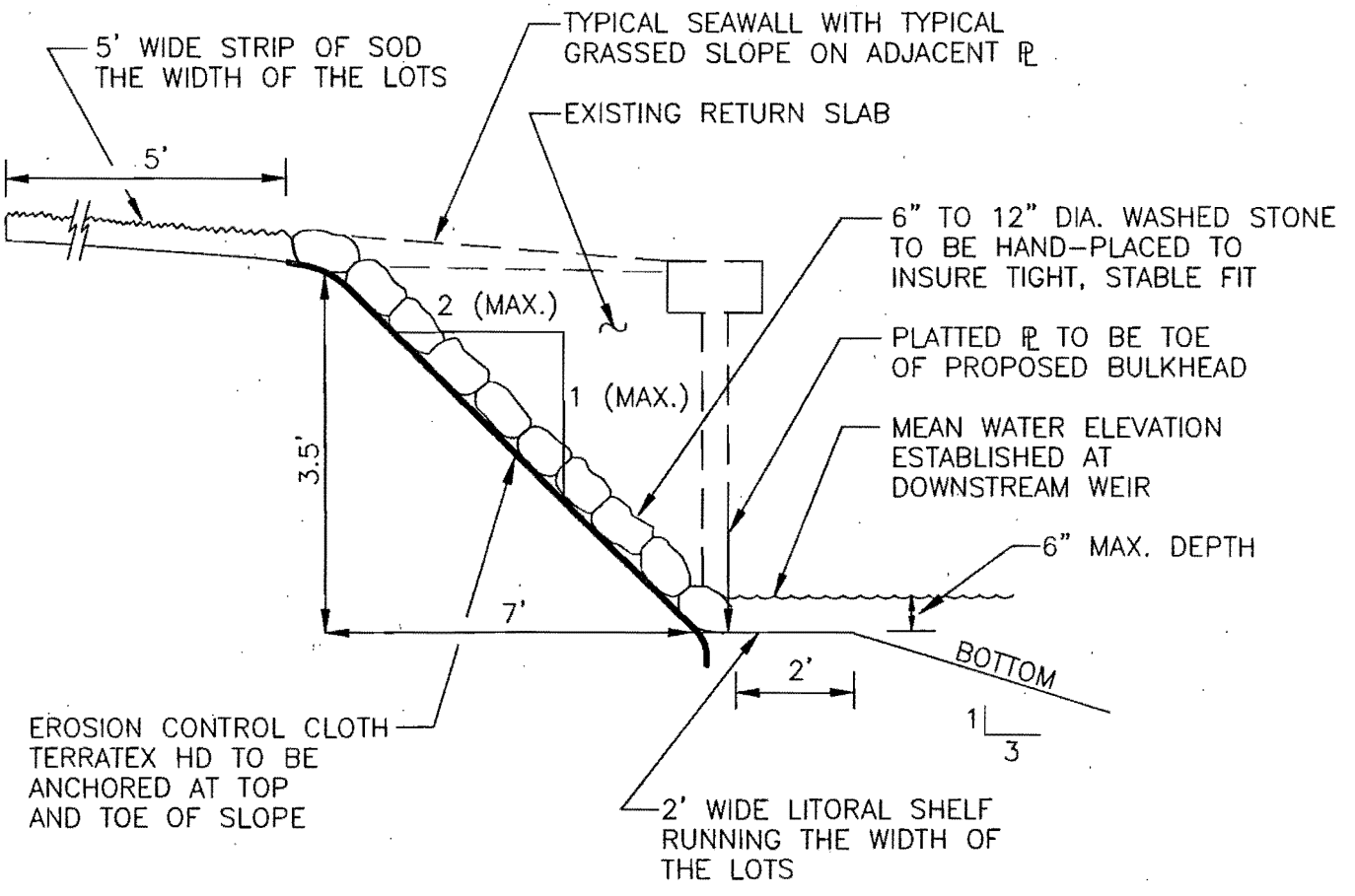
D. TERRACING MAY BE USED TO ESTABLISH PROPER SLOPES.

E. IN FRESHWATER CANAL SYSTEMS CONCRETE RAMPS MAY BE CONSTRUCTED AT A MAXIMUM WIDTH OF 20 FEET FOR A DISTANCE NOT EXCEEDING 15 FEET INTO THE WATER FROM THE PROPERTY LINE.

F. ALL PLANS MUST BE SEALED BY A PROFESSIONAL ENGINEER, REGISTERED IN FLORIDA.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: SEAWALLS – FRESHWATER CANAL ALTERNATE	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		H-3

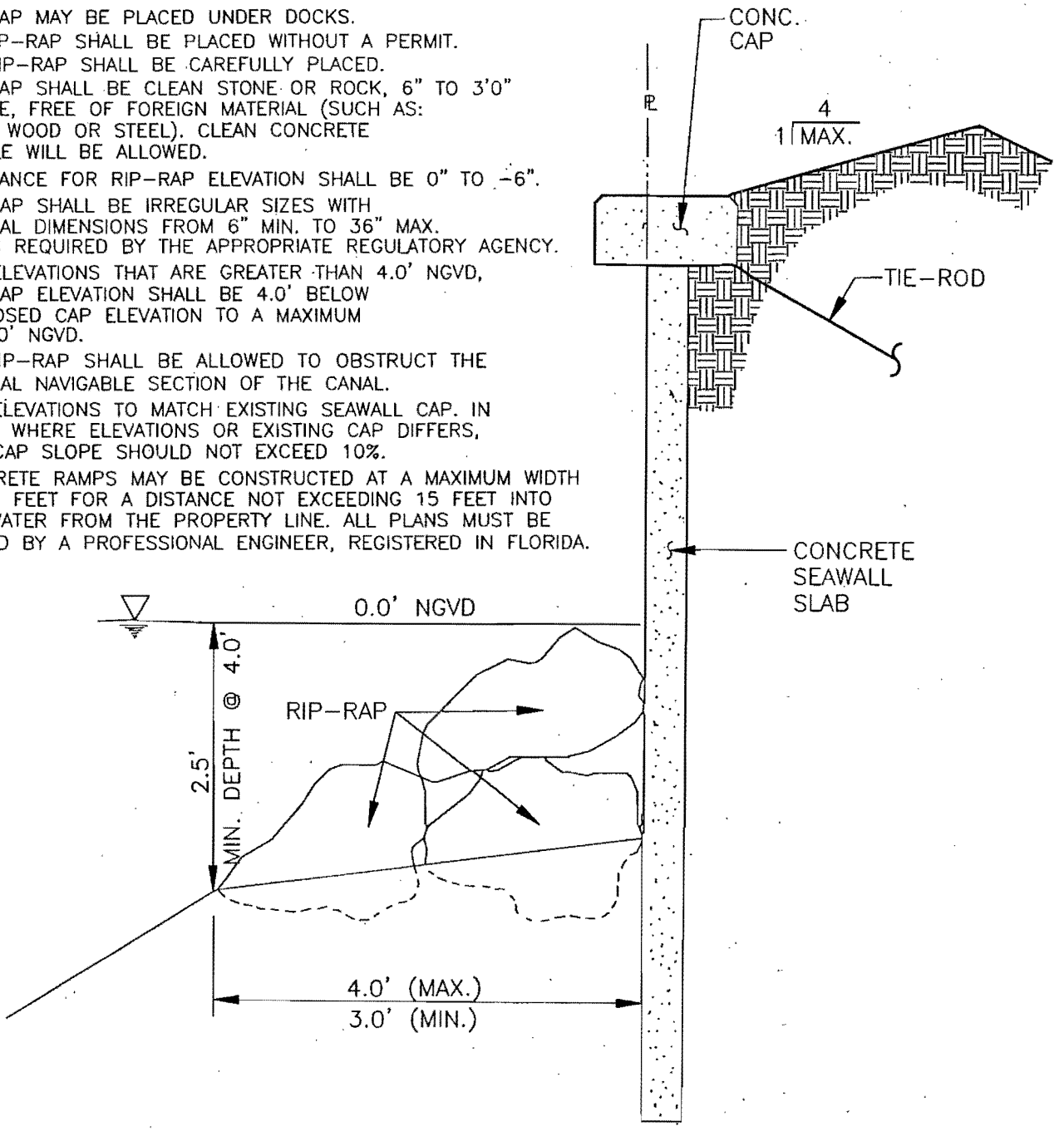


CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: SEAWALLS – FRESHWATER CANAL ALTERNATE 2	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		H-3A

NOTES:

1. MIN. 50% OF SEAWALL LENGTH MUST HAVE RIP-RAP INSTALLED. ON-SITE MATERIAL MAY BE USED IF IT MEETS THE SIZE AND TYPE OF MATERIAL REQUIREMENTS.
2. RIP-RAP MAY BE PLACED UNDER DOCKS.
3. NO RIP-RAP SHALL BE PLACED WITHOUT A PERMIT.
4. ALL RIP-RAP SHALL BE CAREFULLY PLACED.
5. RIP-RAP SHALL BE CLEAN STONE OR ROCK, 6" TO 3'0" IN SIZE, FREE OF FOREIGN MATERIAL (SUCH AS: SAND, WOOD OR STEEL). CLEAN CONCRETE RUBBLE WILL BE ALLOWED.
6. TOLERANCE FOR RIP-RAP ELEVATION SHALL BE 0" TO -6".
7. RIP-RAP SHALL BE IRREGULAR SIZES WITH NOMINAL DIMENSIONS FROM 6" MIN. TO 36" MAX. OR AS REQUIRED BY THE APPROPRIATE REGULATORY AGENCY.
8. CAP ELEVATIONS THAT ARE GREATER THAN 4.0' NGVD, RIP-RAP ELEVATION SHALL BE 4.0' BELOW PROPOSED CAP ELEVATION TO A MAXIMUM OF 1.0' NGVD.
9. NO RIP-RAP SHALL BE ALLOWED TO OBSTRUCT THE CENTRAL NAVIGABLE SECTION OF THE CANAL.
10. CAP ELEVATIONS TO MATCH EXISTING SEAWALL CAP. IN CASES WHERE ELEVATIONS OR EXISTING CAP DIFFERS, NEW CAP SLOPE SHOULD NOT EXCEED 10%.
11. CONCRETE RAMPS MAY BE CONSTRUCTED AT A MAXIMUM WIDTH OF 20 FEET FOR A DISTANCE NOT EXCEEDING 15 FEET INTO THE WATER FROM THE PROPERTY LINE. ALL PLANS MUST BE SEALED BY A PROFESSIONAL ENGINEER, REGISTERED IN FLORIDA.

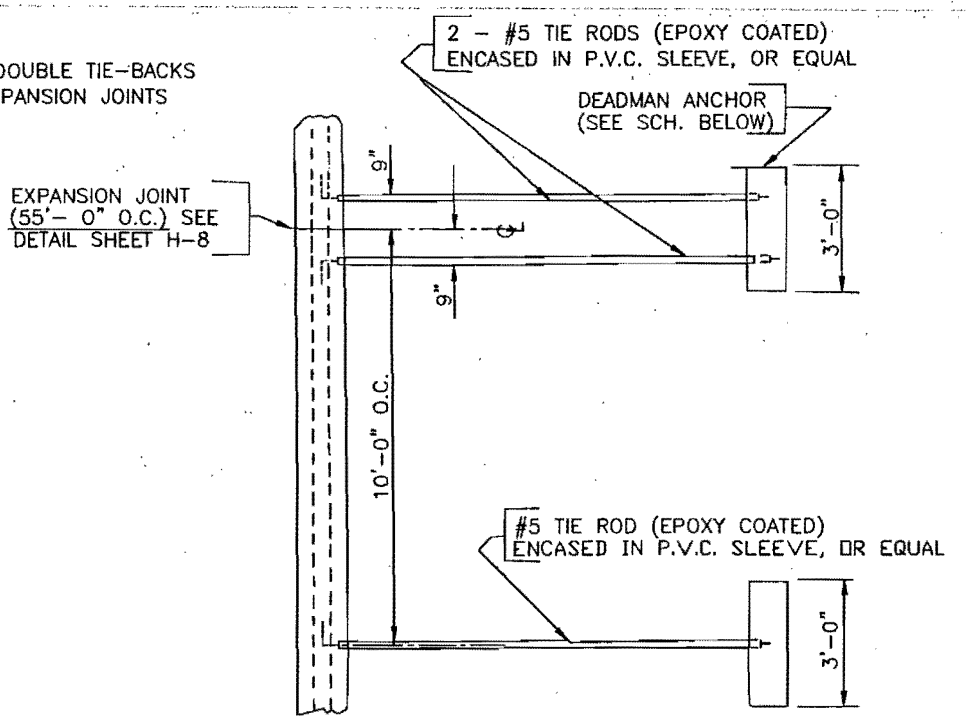


SALT WATER CANAL SYSTEMS BULKHEADS

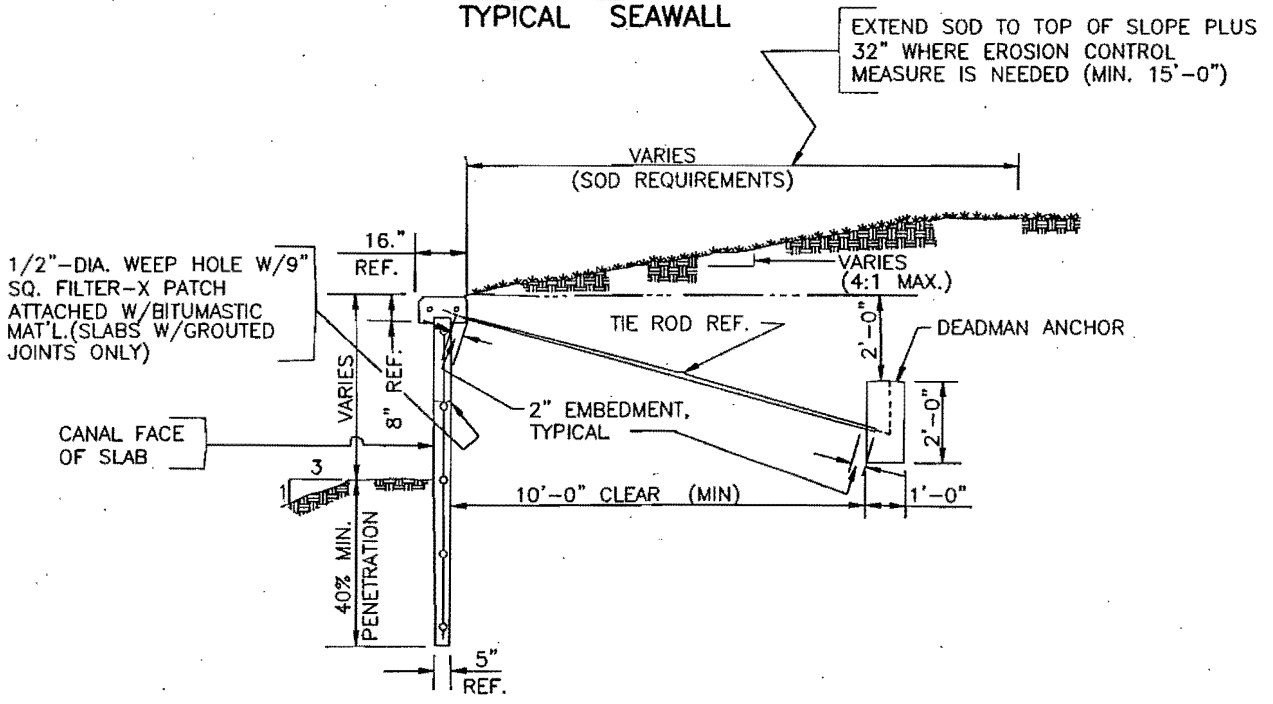
CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: SEAWALLS - SALT WATER CANALS	REVISIONS :	SHEET NO. H-4
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		

NOTE:
USE DOUBLE TIE-BACKS
AT EXPANSION JOINTS



PLAN VIEW
TYPICAL SEAWALL



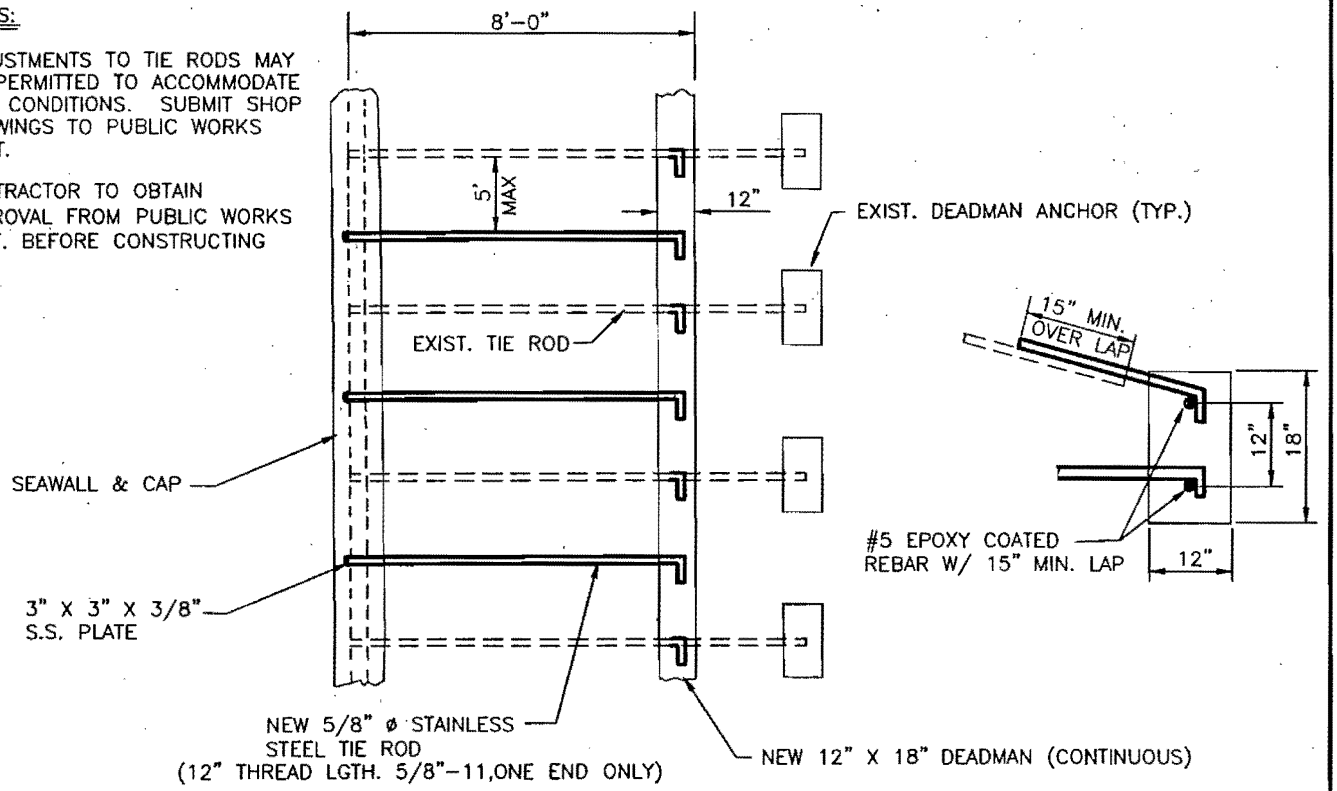
ELEVATION
TYPICAL SEAWALL

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

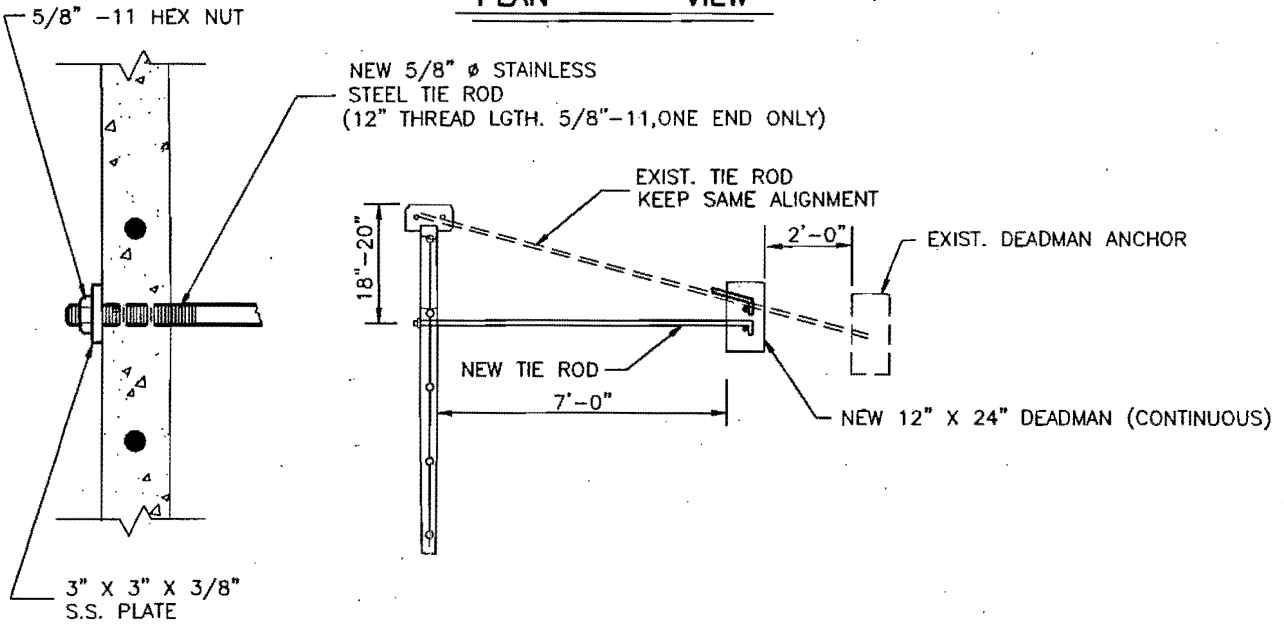
APPROVED:	TITLE: MINIMUM SEAWALL SPECIFICATIONS	REVISIONS :	SHEET NO. H-5
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		

NOTES:

1. ADJUSTMENTS TO TIE RODS MAY BE PERMITTED TO ACCOMMODATE SITE CONDITIONS. SUBMIT SHOP DRAWINGS TO PUBLIC WORKS DEPT.
2. CONTRACTOR TO OBTAIN APPROVAL FROM PUBLIC WORKS DEPT. BEFORE CONSTRUCTING



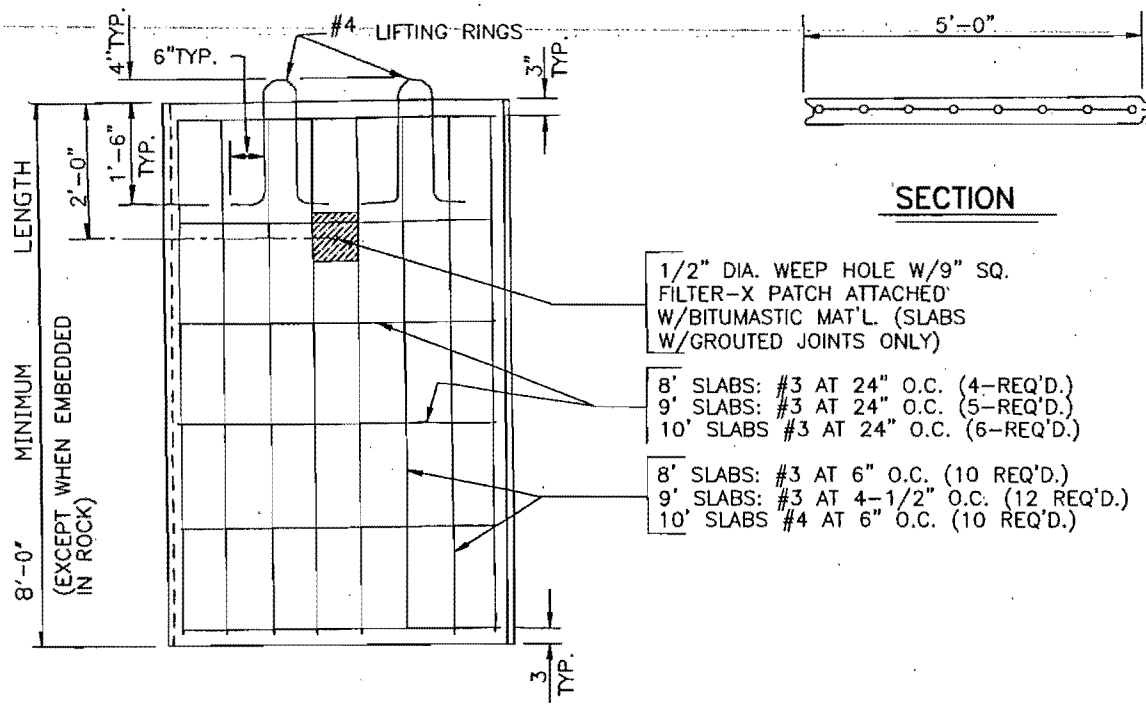
PLAN VIEW



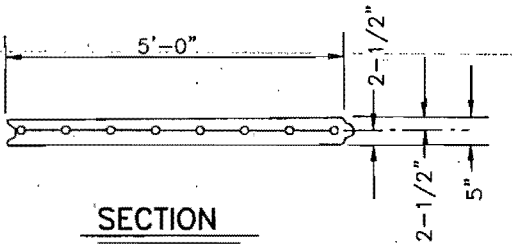
SECTION VIEW

CITY OF CAPE CORAL ENGINEERING DESIGN STANDARD

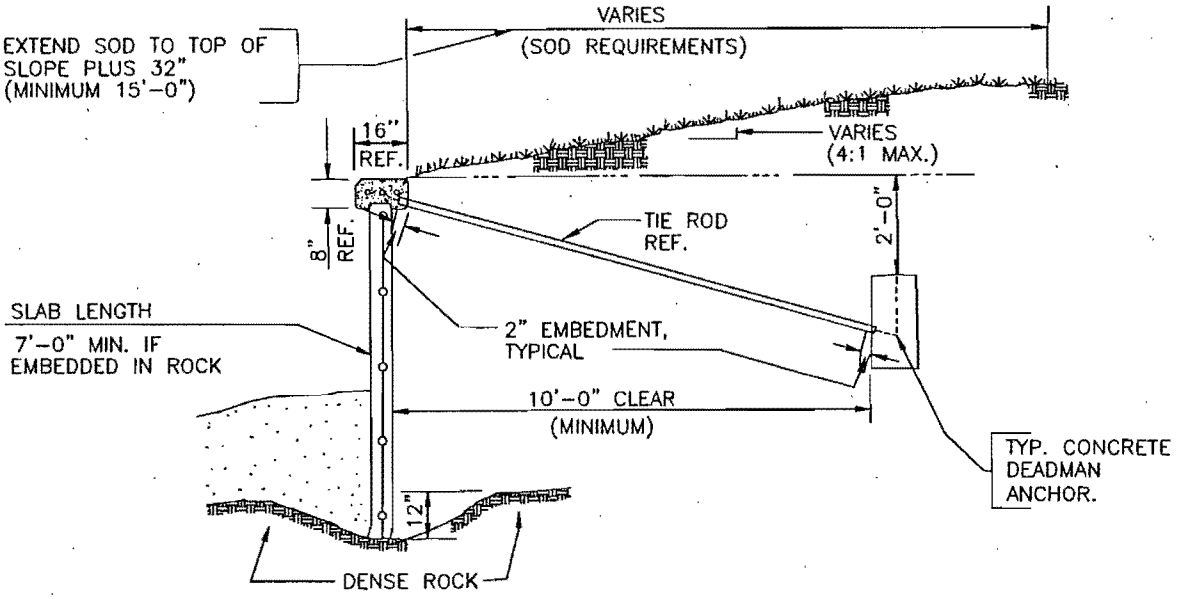
APPROVED:	TITLE: SEAWALL TIE-BACK FOR SPECIAL CONDITIONS	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		H-6



SLAB DETAIL



SECTION

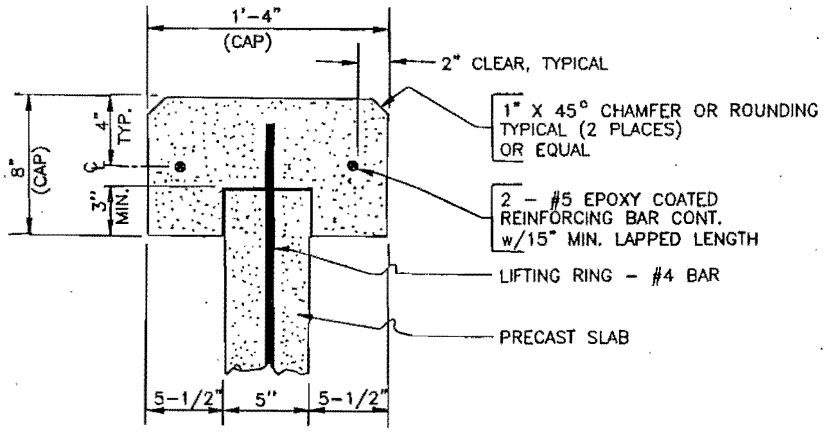


ELEVATION

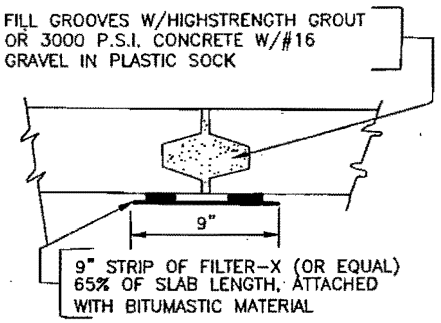
SEAWALL EMBEDDED IN ROCK

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

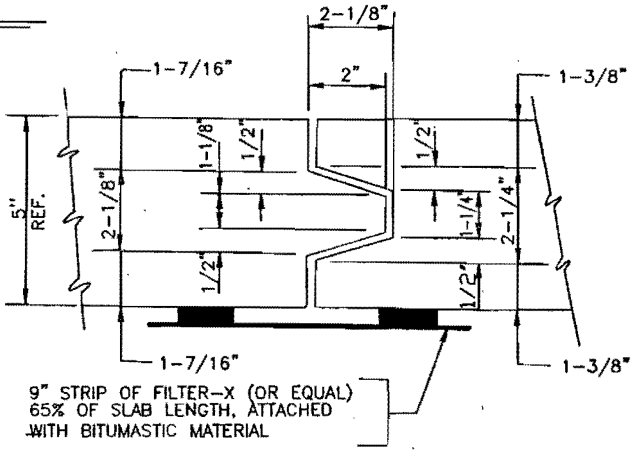
APPROVED:	TITLE: MINIMUM SEAWALL SPECIFICATIONS	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		H-7



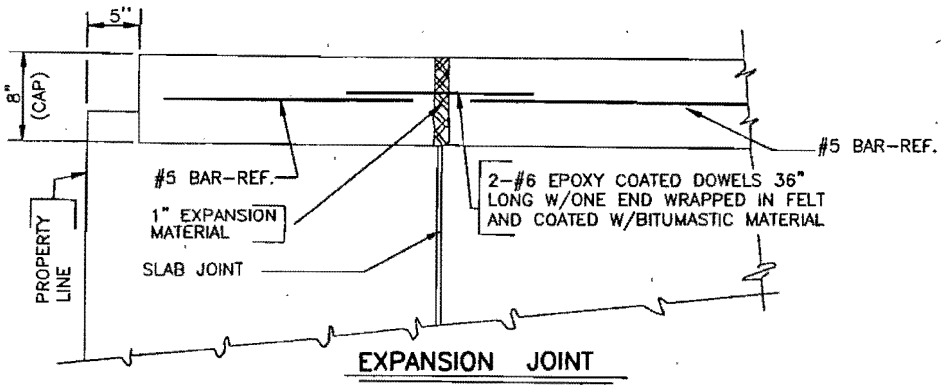
CAP DETAIL



ALTERNATE SLAB JOINT



SLAB JOINT DETAIL



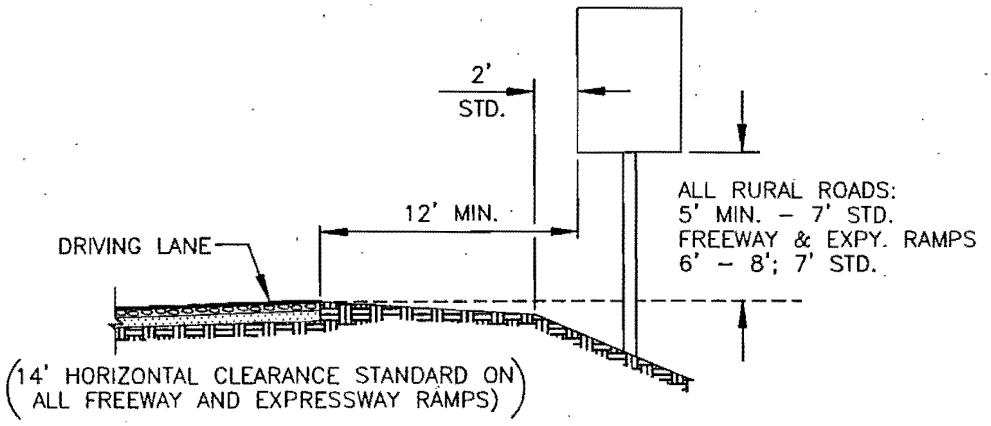
EXPANSION JOINT

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

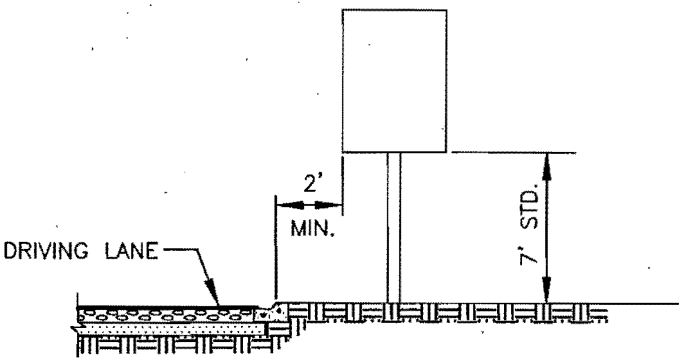
APPROVED:	TITLE: MINIMUM SEAWALL SPECIFICATIONS	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		H-8

GENERAL NOTES:

1. THESE SPECIFICATIONS SHOW MINIMUM REQUIREMENTS FOR SEAWALLS WHICH ARE TO BE CONSTRUCTED IN THE CITY OF CAPE CORAL. INDIVIDUAL SEAWALL DESIGN IS THE RESPONSIBILITY OF THE PERMITEE, BASED ON SPECIFIC SITE CONDITIONS, TYPE OF SEAWALL, METHOD OF CONSTRUCTION, AND ALL OTHER FACTORS AFFECTING THE FUTURE STABILITY OF THE WALL. THESE SPECIFICATIONS ARE MINIMUM REQUIREMENTS ONLY, AND ARE NOT INTENDED TO BE A FINAL SEAWALL DESIGN RELATING TO A SPECIFIC SITE ON ANY OTHER AFFECTING CONDITIONS.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PRESERVATION OF ALL CONSTRUCTION STAKES UNTIL THE SEAWALL IS INSTALLED AND APPROVED.
3. CONSTRUCTION IS TO CONFORM TO CURRENT FLORIDA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION. F.D.O.T. SPECS APPLY WHERE REFERENCE IS MADE TO A SPECIFIC SECTION.
4. CONCRETE IS TO HAVE A MINIMUM CYLINDER STRENGTH OF 3000 PSI AT 28 DAYS AND COMPLY WITH SECTION 345, F.D.O.T. SPECS.
5. REINFORCING STEEL SHALL BE GRADE 40 AND SHALL BE PLACED IN ACCORDANCE WITH F.D.O.T. SPECS., SECTION 415.
6. ALL EXPOSED SURFACES SHALL HAVE A CLASS 3 FINISH IN ACCORDANCE WITH F.D.O.T. SPECS., SECTION 400-15. ALL UNEXPOSED SURFACES ARE TO BE FREE OF HONEYCOMBING AND MAJOR IMPERFECTIONS.
7. BACK FILL IS TO BE COMPACTED TO A STABLE DENSITY SUCH THAT NO APPRECIABLE SETTLEMENT OCCURS AFTER COMPLETION OF WALLS.
8. THE DEAD MAN ANCHORS ARE TO BE CONSTRUCTED BY PLACING CONCRETE INTO THE SPECIFIED SIZE HOLE EXCAVATED IN UNDISTURBED GROUND. IF THE SPECIFIED LENGTH TIE-ROD WILL NOT REACH SUITABLE UNDISTURBED GROUND, THEN A LONGER ROD MUST BE USED TO MEET CONDITIONS OR A 3' X 3' X 1' (THICK) HEADER STYLE DEAD MAN MAY BE USED IN DISTURBED SOILS.
9. THE CANAL FACE OF THE SEAWALL SLABS IS TO BE PLACED ON THE PROPERTY LINE (±6") UNLESS INSTRUCTED OTHERWISE BY PERMIT.
10. ROCK 6" IN NOMINAL DIAMETER AND LESS MAY BE LEFT IN BACKFILL. ALL OTHER ROCK IS TO BE REMOVED AND/OR USED AS RIP RAP ON SITE.
11. THE CONTRACTOR WILL BE RESPONSIBLE TO COMPLETE THE CONSTRUCTION OF THE SEAWALL WITHIN 180 DAYS AFTER COMMENCING WORK.
12. THE CONTRACTOR WILL BE RESPONSIBLE TO PEG THE TOP ROW OF THE SOD IN ACCORDANCE WITH F.D.O.T. SPECS., SECTION 575-3.3. STANDARD SURVEY STAKES AT LEAST 12" LONG, SPACED 24" APART.
13. CONTRACTOR TO SEED ALL DISTURBED AREAS UNLESS A BUILDING PERMIT IS POSTED ON SITE.
14. ALL JOB SITES SHALL HAVE SEAWALL PERMITS POSTED ON AN APPROVED PERMIT BOARD WITH RAIN SHIELD PRIOR TO BEGINNING ANY CONSTRUCTION.
15. THE CONTRACTOR SHALL BE RESPONSIBLE TO HAVE APPROVED TURBIDITY SCREENS IN PLACE DURING ANY AND ALL CLEARING, EXCAVATING, JETTING AND BACK FILLING OPERATIONS WHICH TOTALLY ENCLOSES THE CONSTRUCTION SITE. SCREENS ARE TO REMAIN IN PLACE 24 HOURS MINIMUM AFTER CONSTRUCTION CEASES, OR UNTIL TURBIDITY LEVEL IS 20 OR LESS NTU ABOVE THE PRE-CONSTRUCTION TURBIDITY LEVEL. SCREENS MUST EXTEND FROM THE WATER SURFACES TO THE BOTTOM AND BE ADEQUATELY WEIGHTED TO KEEP THEM IN PLACE DURING ALL OPERATIONS. THERE SHALL BE ADEQUATE FLOATATION AT THE SURFACE TO PREVENT OVERFLOW. THIS FLOATATION MUST BE BRIGHTLY COLORED TO MAXIMIZE VISIBILITY.
16. ANY LOOSE DIRT OR STOCK PILES SHALL BE SURROUNDED BY SILT SCREENS (AT THE EDGE OF THE TOE OF THE SLOPE) TO PREVENT RUNOFF INTO CANAL.
17. CULVERT PIPE SHALL NOT PROJECT MORE THAN 4" FROM THE WATER-FACE OF THE SEAWALL.
18. ANY SEAWALL DESIGN OF NEW OR EXISTING SEAWALLS THAT DOES NOT MEET THIS MINIMUM STANDARD MUST BE DESIGNED AND SEALED BY A FLORIDA REGISTERED P.E.
19. REFER TO THE SECTION ON EROSION CONTROL FOR PROTECTION OF SLOPES.



FREEWAY,EXPRESSWAY, AND RURAL ROADS

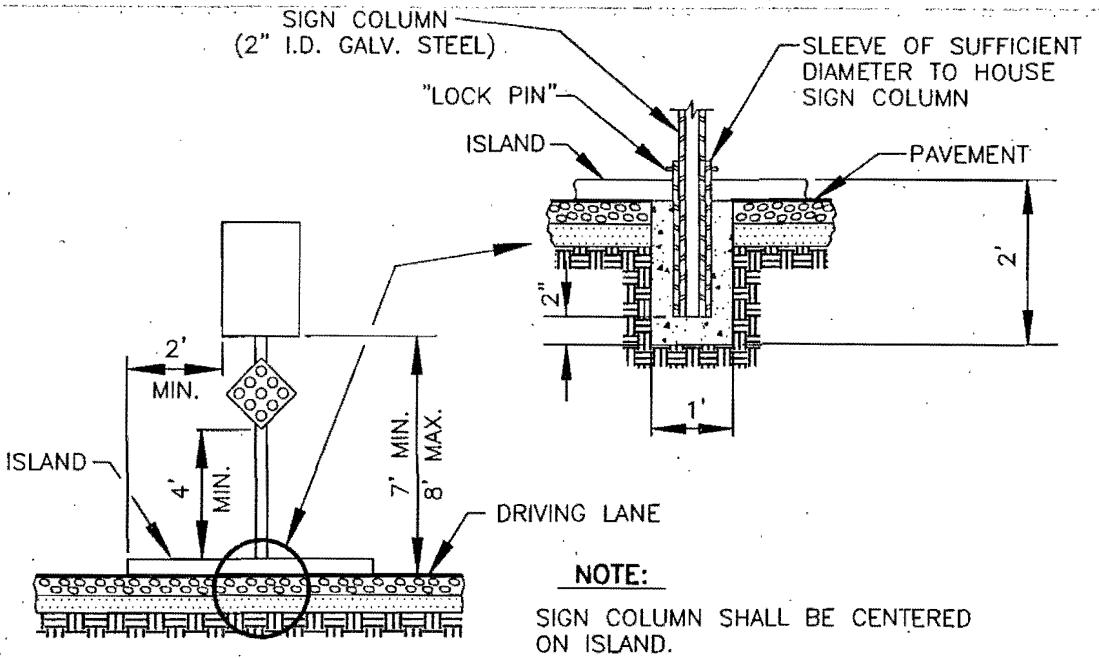


BUSINESS OR RESIDENTIAL AREAS ONLY

REFERENCE – F.D.O.T. INDEX 17302 FOR ADDITIONAL DETAILS

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: ROADWAY SIGNS	REVISIONS :	SHEET NO. J–1
PUBLIC WORKS DIRECTOR	DATE 03–28–2002		



NOTE:

SIGN COLUMN SHALL BE CENTERED ON ISLAND.

SIGN ON ISLAND

SIGN INSTALLATION

IN BUSINESS, COMMERCIAL, OR RESIDENTIAL DISTRICTS WHERE PARKING AND / OR PEDESTRIAN MOVEMENT IS LIKELY, THE CLEARANCE TO THE BOTTOM OF A SIGN SHALL BE AT LEAST 7 FEET ABOVE THE EDGE OF PAVEMENT. IN RURAL AREAS, THE CLEARANCE TO THE BOTTOM OF A SIGN SHALL BE AT LEAST 5 FEET ABOVE THE EDGE OF PAVEMENT. (Sec. 2A.20). REF. MUTCD "MILLENIUM EDITION".

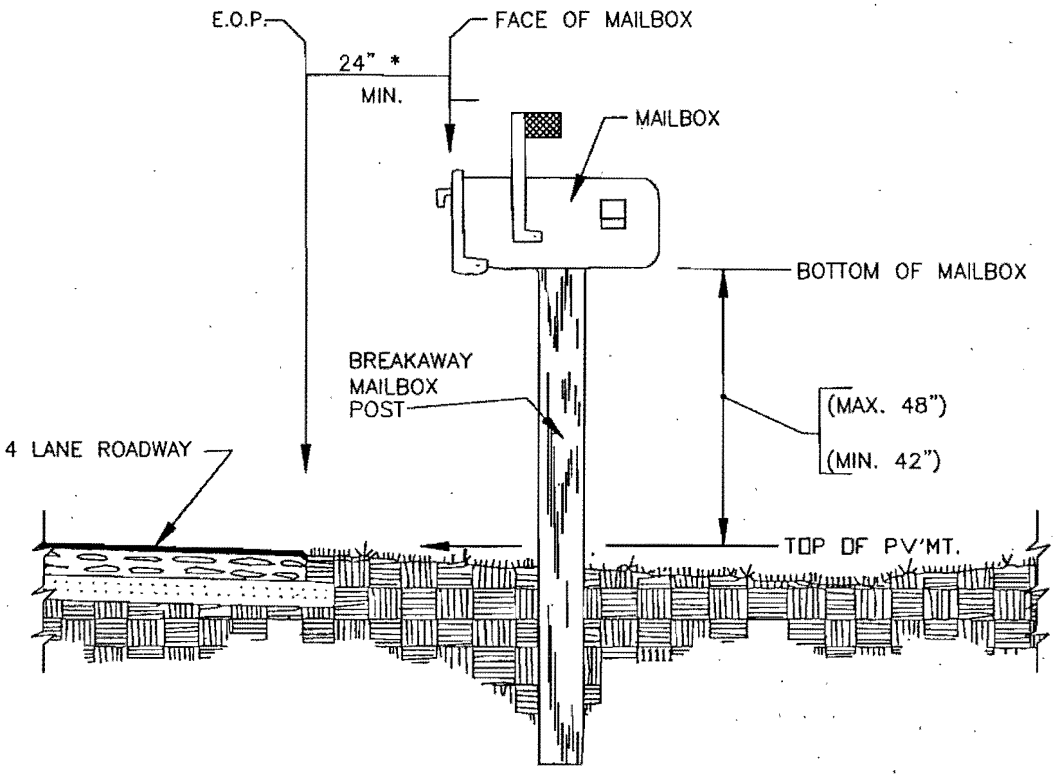
LATERAL CLEARANCE FOR REGULATORY AND WARNING SIGNS OR SMALL DIRECTIONAL SIGNS SHOULD BE 6 TO 12 FEET FROM THE EDGE OF THE PAVEMENT OR TRAVELED WAY IN RURAL AREAS. IN URBAN AREAS, SIGNS GENERALLY ARE MOUNTED ALONGSIDE THE ROADWAY IN THE SPACE BETWEEN THE CURB AND THE SIDEWALK, ALTHOUGH 2 FEET IS RECOMMENDED AS A WORKING URBAN MINIMUM, A CLEARANCE OF 1 FOOT FROM THE SIGN FACE IS PERMISSIBLE WHERE SIDEWALK WIDTH IS LIMITED. (Sec. 2A.19). REF. MUTCD "MILLENIUM EDITION".

STANDARD SIZES OF SIGNS:

STOP: 30" (OCTAGON)
YIELD: 36" (EQUILATERAL TRIANGLE)
NO TURN (SYMBOL): 24" x 24" (SQUARE)
DO NOT ENTER: 30" x 30" (SQUARE)
REGULATORY (SPEED LIMIT, KEEP RIGHT): 24" x 30" (RECTANGLE)
WARNING (RIGHT OR LEFT CURVE, NO OUTLET...) 30" x 30" OR 36" x 36" (DIAMOND)
STREET NAME: 6" HIGH WITH 4" HIGH LETTERING (RECTANGLE)
HANDICAPPED PARKING: 12" x 18" (RECTANGLE)
ONE WAY: 12" x 36" OR 18" x 24" (RECTANGLE)

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: ROADWAY SIGNS	REVISIONS :	SHEET NO. J-2
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		



* = 18" MINIMUM ON ALL LOCAL STREETS.

NOTES:

1. CONSULT U.S. POST OFFICE FOR DETERMINING PROPER SIDE OF ROAD FOR PLACEMENT.
2. FOR DESIGNS WHICH DIFFER FROM THIS STANDARD, CONSULT THE LOCAL U.S. POST OFFICE.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: MAILBOX DETAIL	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 03-28-2002		J-3

TRAFFIC IMPACT STUDY (TIS)

WHY IS A TIS REQUIRED?

The purpose of the TIS study is to determine site access needs and handle any adverse effects that the development traffic would have on the road way system. The Institute of Transportation Engineers (ITE) recommends such a study be conducted for any land development project that is expected to generate over a certain driveway traffic volume, or when a project might impact already congested or high accident locations, or when specific site access and safety issues are of concern.

WHAT INFORMATION SHOULD A TIS STUDY CONTAIN?

At a minimum such a study should describe:

- The size, type, location and staging of the proposed land use.
- A description of the physical site and the surrounding area.
- A determination of the area of influence of the new land use.
- A description of existing conditions including traffic volumes, accidents, traffic signals and overall traffic operations and circulation.
- Identification of traffic congestion, accident areas and other deficiencies to the existing roads and to nearby lands now being developed and the overall traffic growth trends in the area. The identification of congestion is based on official adopted "level of traffic service standards, which are defined in the City's Comprehensive Plan.

The City has adopted the following peak hour, peak season Level of service standards for the following facilities:

a-	Del Prado Boulevard (Cape Coral Parkway to SR 78)	LOS E
	Del Prado Boulevard (SR 78 to US 41)	LOS C
b-	State Road 78 (Pine Island)	LOS C
c-	Pondella Road	LOS E
d-	Hancock Bridge Pkwy. (City limits to Del Prado Blvd.)	LOS E
e-	Cape Coral Pkwy. (Cape Coral Bridge to Pelican Blvd.)	LOS E
f-	Veterans Parkway	LOS C
g-	All other local, collector, arterial roadways	LOS D
h-	All limited access facilities	LOS D
i-	All other roads within City jurisdiction	LOS D

- The projected traffic volumes and the anticipated distribution of traffic on the area street system. The analysis must use the latest edition of the ITE Trip Generation Manual and provide the AM, PM and peak hour for each proposed use and the entire project.

- An identification of traffic congestion, safety problems and/or other deficiencies for the future roadway network with the proposed development in place. The analysis must determine the level of service provided during the peak season of the year following the year in which the project is expected to be completely constructed and occupied (build out year). The determination must be based on the methods described in the latest edition of the Highway Capacity Manual, Special Report 209, Transportation Research Board, 1985.

- The identification of improvement measures needed to offset increased congestion due to the additional traffic generated by the new development. Improvements can include roadway widening, turn lanes and signals at intersections and other measures.

- On-site issues including the location of all driveways as well as parking needs, circulation, safety including pedestrians/transit users and truck access and operations.

The outline for the complete Traffic Impact Study (TIS) that is to be followed is found on sheet K-4. Sufficient detail should be included so that reviewers can follow the methodology and associated findings and recommendations.

WHEN IS A TIS STUDY REQUIRED?

The City of Cape Coral requires that a TIS be prepared for any land development project that is expected to generate 300 or more peak hour vehicles in the development's driveways. A TIS is also required for all rezoning applications including special exceptions.

Any change in the use of an existing non-residential building that would result in reaching the above mentioned peak hour threshold, is also subject to the requirement. An exception would be instances where trip generation would increase by less than 15%.

A TIS will expire in two years from the date that it was approved. A new TIS will be required if revised traffic conditions will result in an increase in the traffic generation of over 15%, or an increase of 20% in the directional distribution of traffic.

WHAT IS THE TIS APPROVAL PROCESS?

The TIS is an integral part of the development review process and no building permit is to be issued until the report has been approved by the City Public Works and the Community Development Departments.

It should be noted that Traffic consultants must meet with City staff to complete a Traffic Study Requirements Form. Any TIS submitted without a prior meeting or this form being submitted and approved will not be accepted. At this preliminary meeting the available traffic data, City plans for street improvements in the vicinity of the site, intersections to be analyzed and projected volumes when the area becomes fully developed will be considered.

WHO SHOULD PREPARE A TRAFFIC IMPACT STATEMENT?

The report shall meet departmental specifications and good standard traffic engineering & planning practice. The individual preparing the document shall be a licensed professional Engineer with expertise in Traffic Engineering.

TRAFFIC IMPACT STUDY CONTENTS

1- INTRODUCTION
   a. Land Use, Site and Study Area Boundaries (provide map).
   b. Existing and proposed site uses.
   c. Existing and proposed uses in vicinity of site (provide map).
   d. Existing and proposed roadways and intersections (provide map).

2- TRIP GENERATION AND DESIGN HOUR VOLUMES (provide table).

3- TRIP DISTRIBUTION (provide figure).

4- TRIP ASSIGNMENT (provide figure)

5- EXISTING AND PROJECTED TRAFFIC VOLUMES (provide figure for each item).
   a. A.M. Peak hour site traffic (including turning movements)
   b. P.M. Peak hour site traffic (including turning movements)
   c. A.M. Peak hour total traffic, including site generated traffic and projected traffic.
   d. P.M. Peak hour total traffic including site generated traffic and projected traffic.
   e. Any other Peak hour necessary for complete analysis.
   f. Total daily existing traffic for street system in study area.
   g. Total daily existing traffic for street system in study area and new site traffic.
   h. Total daily existing traffic for street system in study area plus new traffic and projected traffic from build-out of study area land uses.

6- CAPACITY ANALYSIS (provide Analysis Sheets in appendices)

7- TRAFFIC SIGNALS (provide Analysis Sheets in appendices)

7- TRAFFIC ACCIDENTS (OPTIONAL) (provide Collision Diagrams and Accident Rates)

9- CONCLUSIONS

10- RECOMMENDATIONS.
   a. Proposed recommended improvements (provide sketches of improvements).
   b. Volume/capacity Analysis at critical points (provide analysis sheets in appendices).
   c. Traffic volume proportions.

TRAFFIC STUDY REQUIREMENTS FORM

DATE: _____

PROJECT NAME: _____ LOCATION: _____

DEVELOPER	TRAFFIC CONSULTANT	CITY	APPROVAL PROCESS
Company _____	Company _____	Project Engineer _____	City ☐
Contact _____	Project Engineer _____	Project Planner _____	CDOH ☐
Phone _____	Phone _____	Phone _____	Other ☐

TRAFFIC STUDY FOR:		CONTENT OF REPORT TO INCLUDE			METHOD
Zoning		Lan Use Description	Site Impacts	Study Area Impacts	
Platting		Trip Generation (+ Reduction Factors)			
Building Permit		Trip Distribution / Trip Assignment			
Access Permit		Parking Analysis (+ Shared Parking)			
Annexation		Accident Analysis			
		Traffic Signal Progression			

INTERSECTION CAPACITIES TO BE ANALYZED*	PEAK PERIODS				STREET A.D.T.S. TO BE PROVIDED		PROJECTION	
	A.M.	Noon	P.M.	Other		Existing	Build Out	20 Yr

Existing and Build Out Conditions.

Traffic Consultants must meet with City staff to complete form. Traffic studies submitted without form being completed prior to study may not be accepted. All studies must conform to City Ordinance.

Study Area Definition (see map if attached): _____

North: _____ South: _____

DRAINAGE DESIGN STANDARDS

The Drainage Design Standards are intended to provide a standardized method of design and to assist the design professionals and the construction industry in applying the rules and regulations required by the following:

1. The City of Cape Coral
2. The South Florida Water Management District
3. The State of Florida Department of Transportation
4. The Florida State Statutes
5. The United States Environmental Protection Agency in conjunction with the NPDES Permit FLS000035
6. The Clean Water Act of 1973 or as currently updated.
7. Florida Building Code (latest edition)

The Drainage Design Standards, as adopted by the City of Cape Coral, are intended to be applied to all new and retro-fit development within the jurisdictional boundaries of the City of Cape Coral.

The City of Cape Coral has adopted and incorporated into the Drainage Design Standards the rules and regulations specified in the above mentioned governing agencies.

Revised by Ord. 163-05
Effective 04-01-2006

REQUIREMENTS FOR RESIDENTIAL DRIVEWAYS

The design and subsequent elevation stake-out of all driveways, to include ramps, swales, culverts, and full culverts for residential, multi-residential and places of worship will be the responsibility of the Surface Water Right of Way Control Division of the Public Works Department. Refer to the applicable sections of this Engineering Design Standard for design criteria.

All full culverts must be constructed with perforated pipe, bedded over a rock filled trench (#57 drainage rock) or comparable, the pipe and rock must be wrapped in permeable filter fabric to provide exfiltration and percolation of stormwater runoff into the soil for water treatment. In cases where full culverts are approvable, it may be necessary for the developer to install and/or construct one or more catch basins.

INLETS & JUNCTION BOXES

Inlets and junction boxes must comply with City of Cape Coral Engineering Design Standards and FDOT Design Standards.

RE-LOCATION OF EXISTING STORM DRAINAGE

When the relocation or replacement of an existing storm drainage pipe becomes necessary due to a conflict resulting from accumulation of lots and/or new construction design, then the owner/developer shall be responsible for the expense and construction of relocation or replacement of an existing storm drainage pipe, and will be responsible for the procurement of the necessary permits. All pipe relocations must first be referred through the City's Registered Surveyor to ensure proper placement and alignment of pipes.

City will not maintain private storm drain pipes or outfalls.

All newly constructed pipes must be inspected and approved by the Public Works Department prior to the removal of existing system.

STANDARD FOR ABANDONED PIPE

All abandoned pipe must be completely removed, or at City's option may be filled with flowable fill.

examples. The contractor may use the appropriate Engineering Design Standard in conjunction with the drainage plan or, if required by site conditions as determined by contractor, submit an alternate design reviewed and certified by a Licensed Engineer or Surveyor. All drainage plans shall include elevations of the adjoining properties and identify any affect, positive or negative, the proposed work will have on existing drainage conditions (see Sheets L-5 through L-10 for locations of elevations). The completed grading and drainage work shall be documented by the Engineer or Surveyor and submitted on the final survey to the City as record information prior to issuance of the Certificate of Occupancy. The maintenance of these drainage improvements will be the property owner's responsibility.

B. Design

The garage floor slab shall be a minimum of 12" above the crown of the road. Exceptions may be made by the City for special circumstances.

The critical swale grade shown on the detail drawing is the minimum slope to obtain positive drainage from the rear of the property to the road. All new home construction shall use culvert pipes under driveways unless determined by the City to be impractical.

Typical examples of residential design standards and/or acceptable solutions are found on sheets L5 through L10A.

Water Discharge

No gutter downspout or other water discharge device, including without limitation any extensions thereof such as coiled flexible tubing with perforations or by any other means, shall discharge water, measured from the actual point of discharge, less than four and one-half (4 ½) feet from the property line. Further, the water discharge from any downspout or water discharge device shall be directed only towards the front or rear property lines, and not towards the side lot lines of the property on which the discharge is located. (Ord. 15-04, 2/9/04)

All gutters shall be sized per the International Plumbing Code 2004 Edition, Section 1106.6 and Table 1106.2.

COMMERCIAL/PROFESSIONAL REQUIREMENTS

All commercial development consisting of two acres or more of impervious area, and/or lesser projects consisting of ten acres or more are required to obtain a SFWMD general permit. All lesser projects fall under the guideline of the "No Notice" SFWMD permit. The Surface Water Management Section of Public Works Department performs the review and approval of all drainage for compliance. The criteria for review of the subject plans are addressed under the SFWMD "Basis of Review" requirements for water quality, and water quantity. All commercial, professional, industrial, development is required to provide stormwater retention/detention prior to discharge from the site. All dry retention/detention area side slopes shall be designed and constructed no steeper than at a 3:1 ratio. All dry retention/detention areas will be stabilized with sod on tops, sides and bottom.

It will be the developer's responsibility to provide a "Wet Season" water table, percolation factors, and drainage calculations for all development projects submitted to the City for review and approval.

For all construction projects containing one or more acres, the developer will be required to file an NPDES Letter of Intent with the U.S. Environmental Protection Agency. It will also be necessary to provide the City with a copy of the Letter of Intent prior to the release of a construction permit. An Army Corps of Engineers permit may also be necessary if the site contains "Wetlands."

PIPE MATERIAL AND SIZING

For pipe material refer FDOT Standards. Pipe sizing shall be determined by the volume and capacity needed for the conveyance of stormwater runoff in relation to the design storm event as determined by the engineer of record. All materials used must specify the design roughness. The use of galvanized steel will not be permitted.

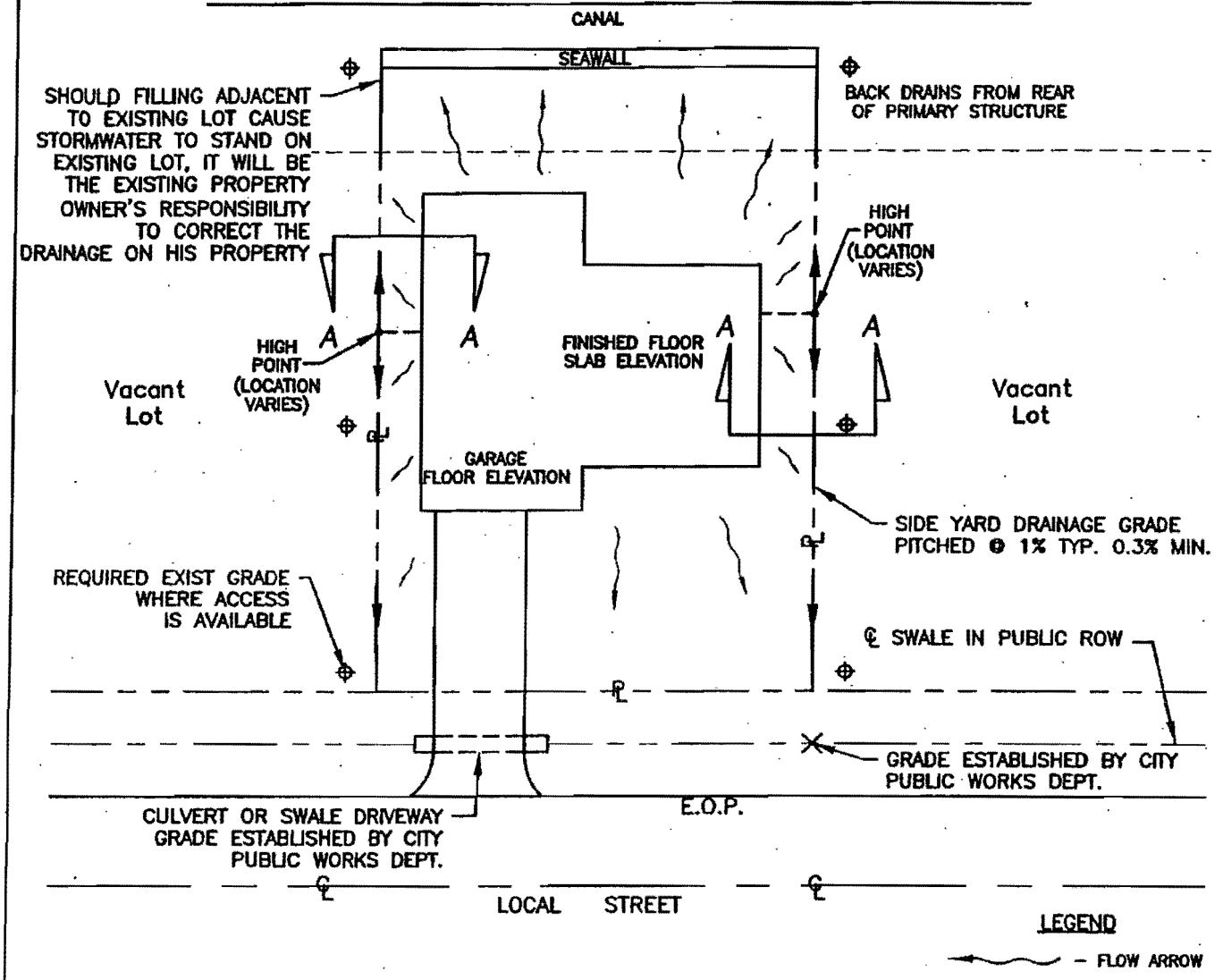
Mitered end sections will not be permitted in front swales unless required by City. All swales within the ROW will be subject to the standards for residential, multi-residential, and places of worship, and must be permitted and inspected.

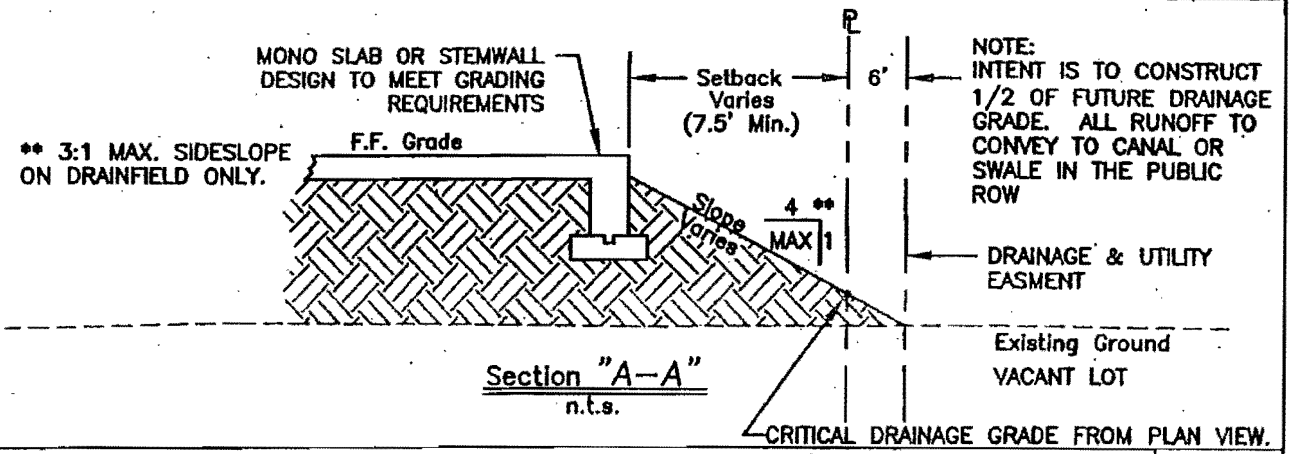
RESIDENTIAL REQUIREMENTS

A. Submittals

As part of the Engineering Design Standards, DCD will require a conceptual drainage plan to be submitted and reviewed with the Permit Application. Failure to submit a Drainage Plan shall delay permit review and approval. This drainage plan will document the intent of the contractor to comply with the Engineering Design Standards. The chosen method to meet this intent shall be at the sole discretion of the General Contractor. See sheets L-5 thru L-11 for typical

RESIDENTIAL WATERFRONT LOT DRAINAGE PATTERN





CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

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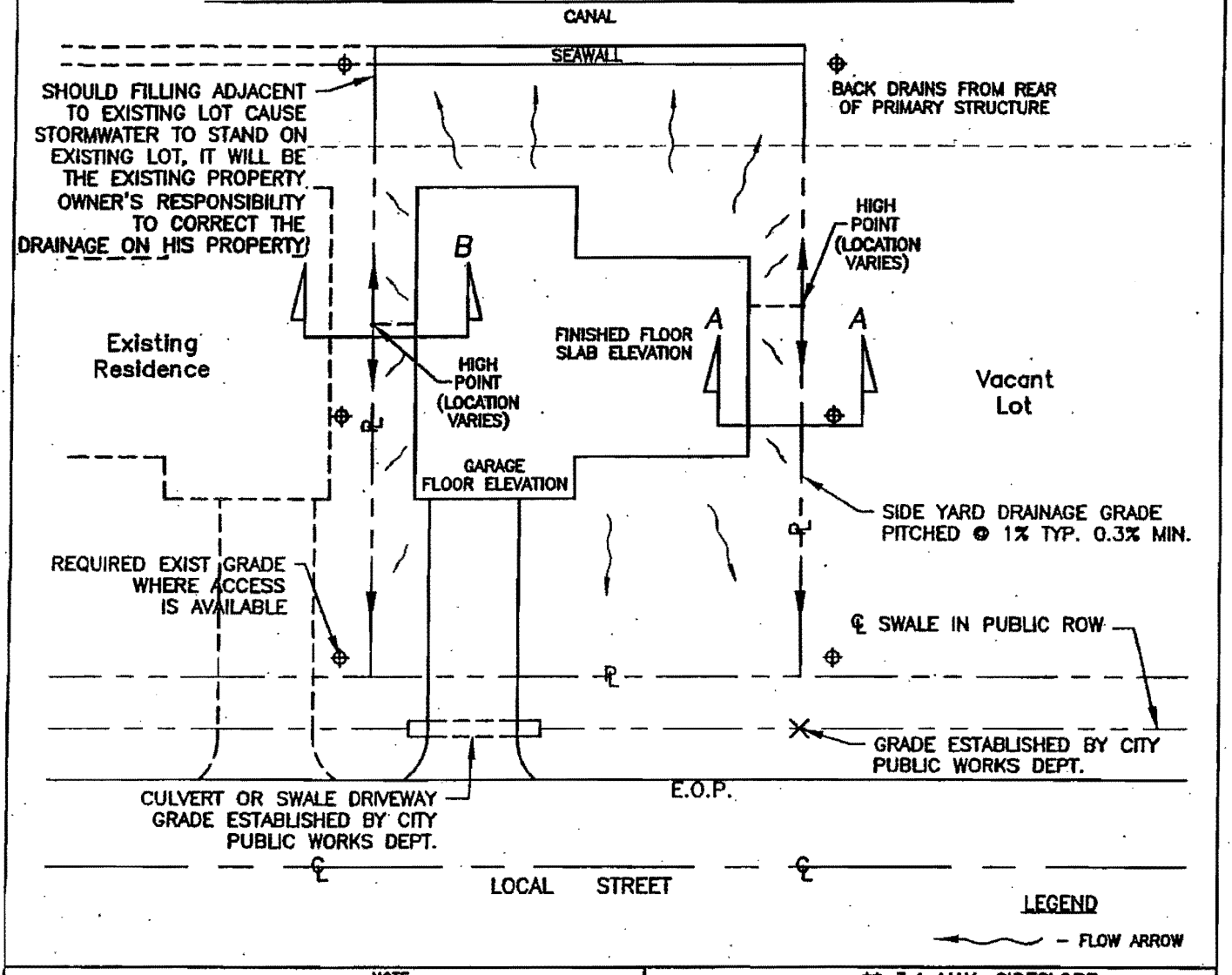
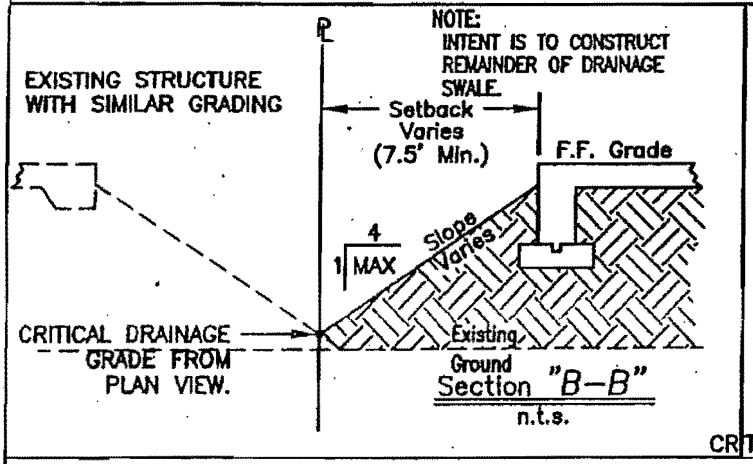
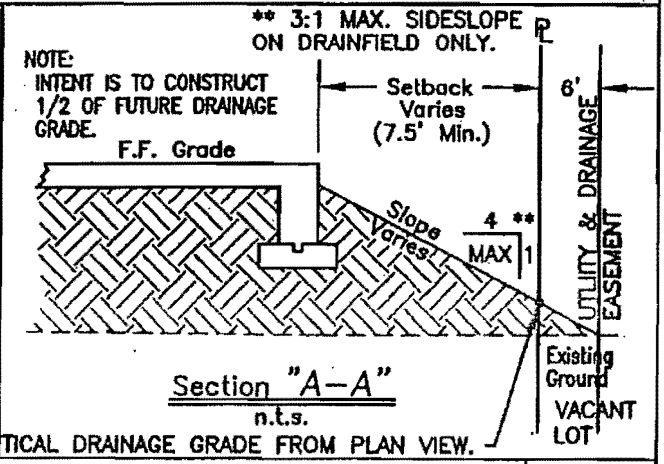
D.C.D. DIRECTOR	DATE Rev. 08-24-2005	Revised By ORD. 163-05 Effective 04/01/2006	L-5

RESIDENTIAL WATERFRONT LOT DRAINAGE PATTERN







CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

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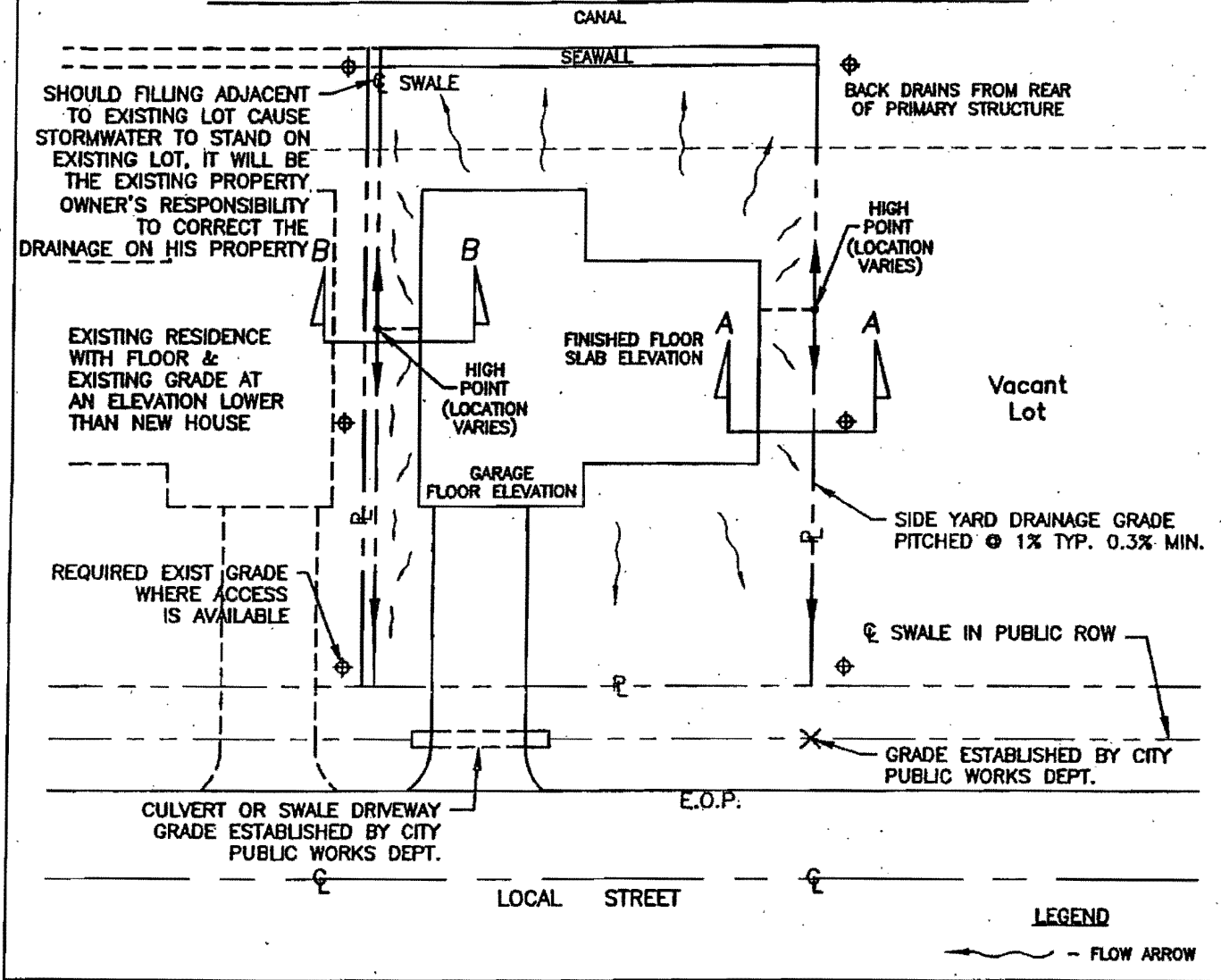
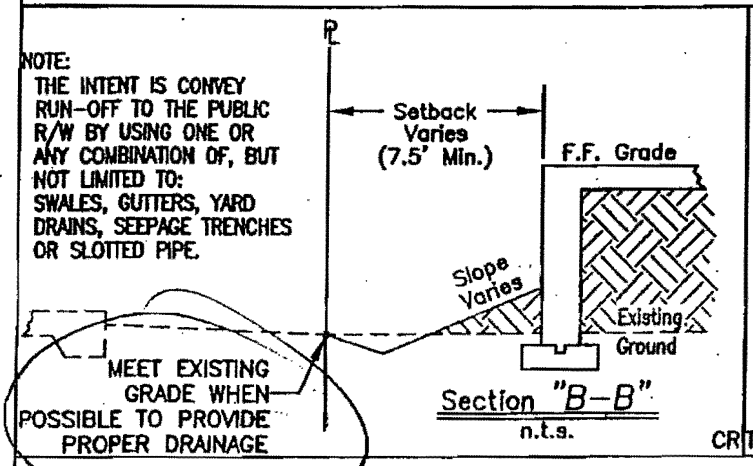
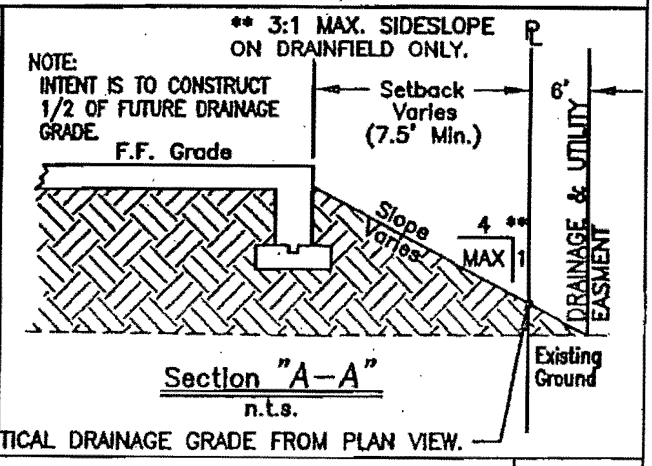
D.C.D. DIRECTOR	DATE Rev. 06-24-2005	Revised By ORD. 163-05 Effective 04/01/2006	L-6

RESIDENTIAL WATERFRONT LOT DRAINAGE PATTERN







CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

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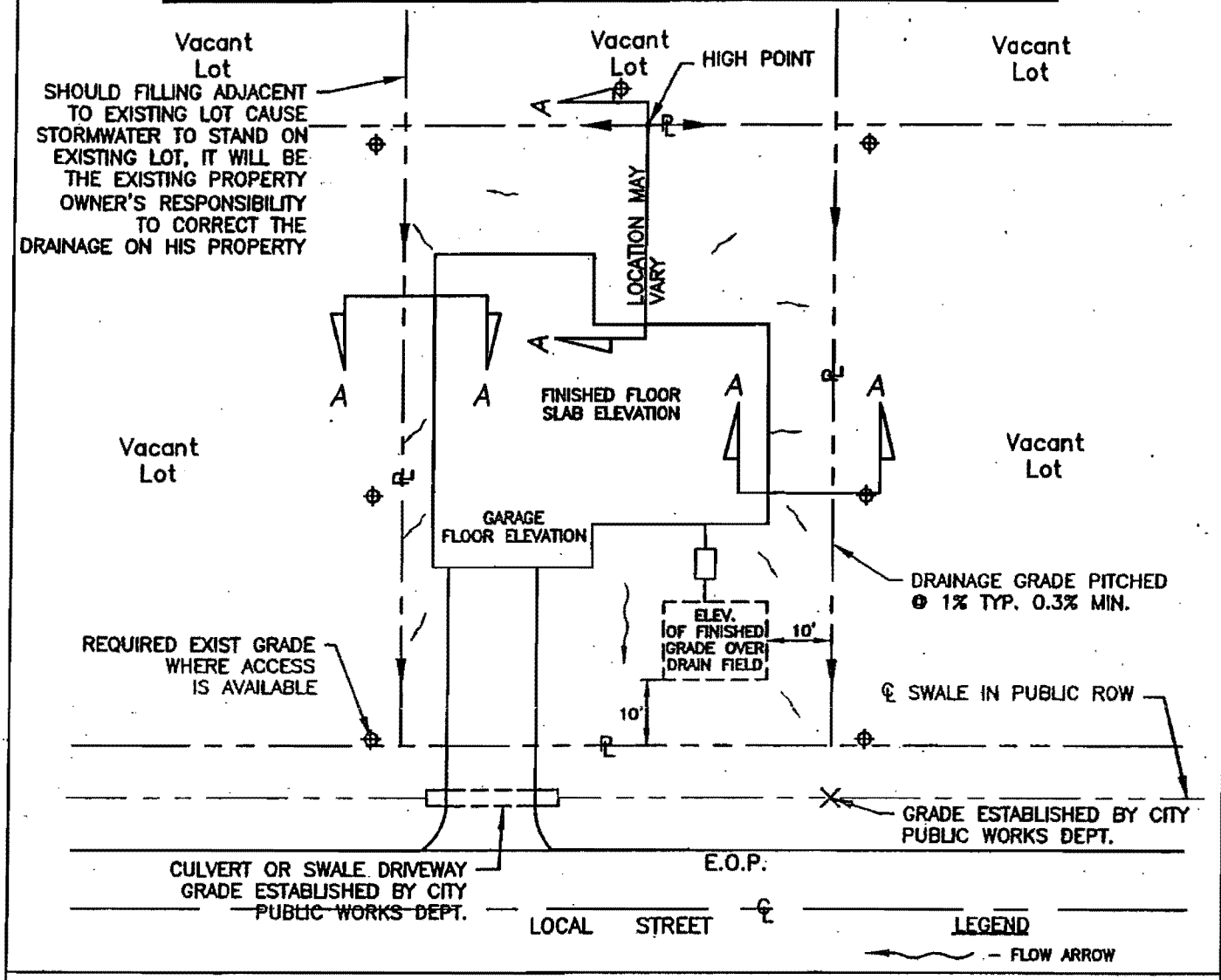
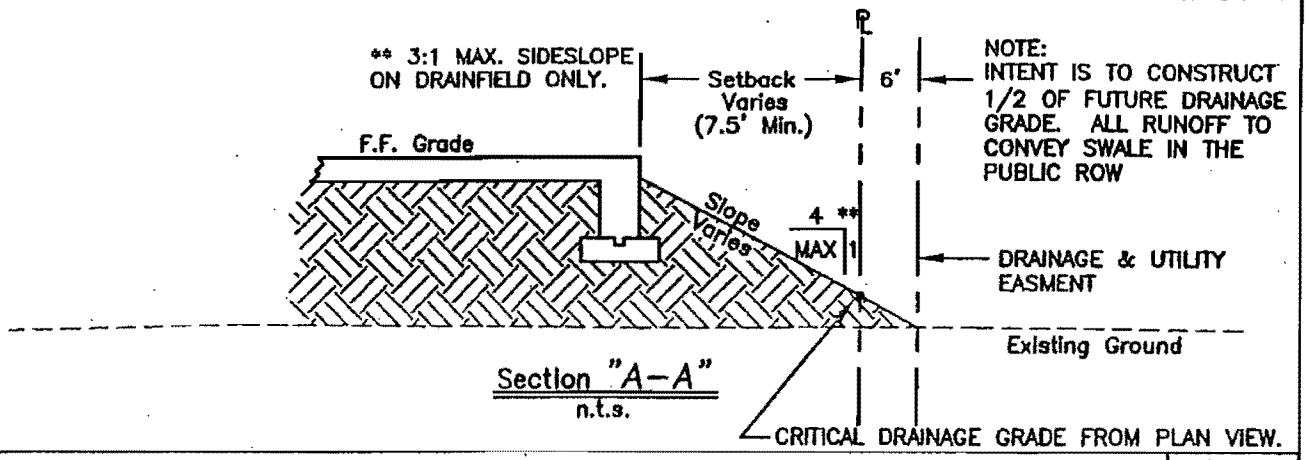
D.C.D. DIRECTOR	DATE Rev. 06-24-2005	Revised By ORD. 163-05 Effective 04/01/2006	L-7

RESIDENTIAL NON-WATERFRONT LOT DRAINAGE PATTERN





CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

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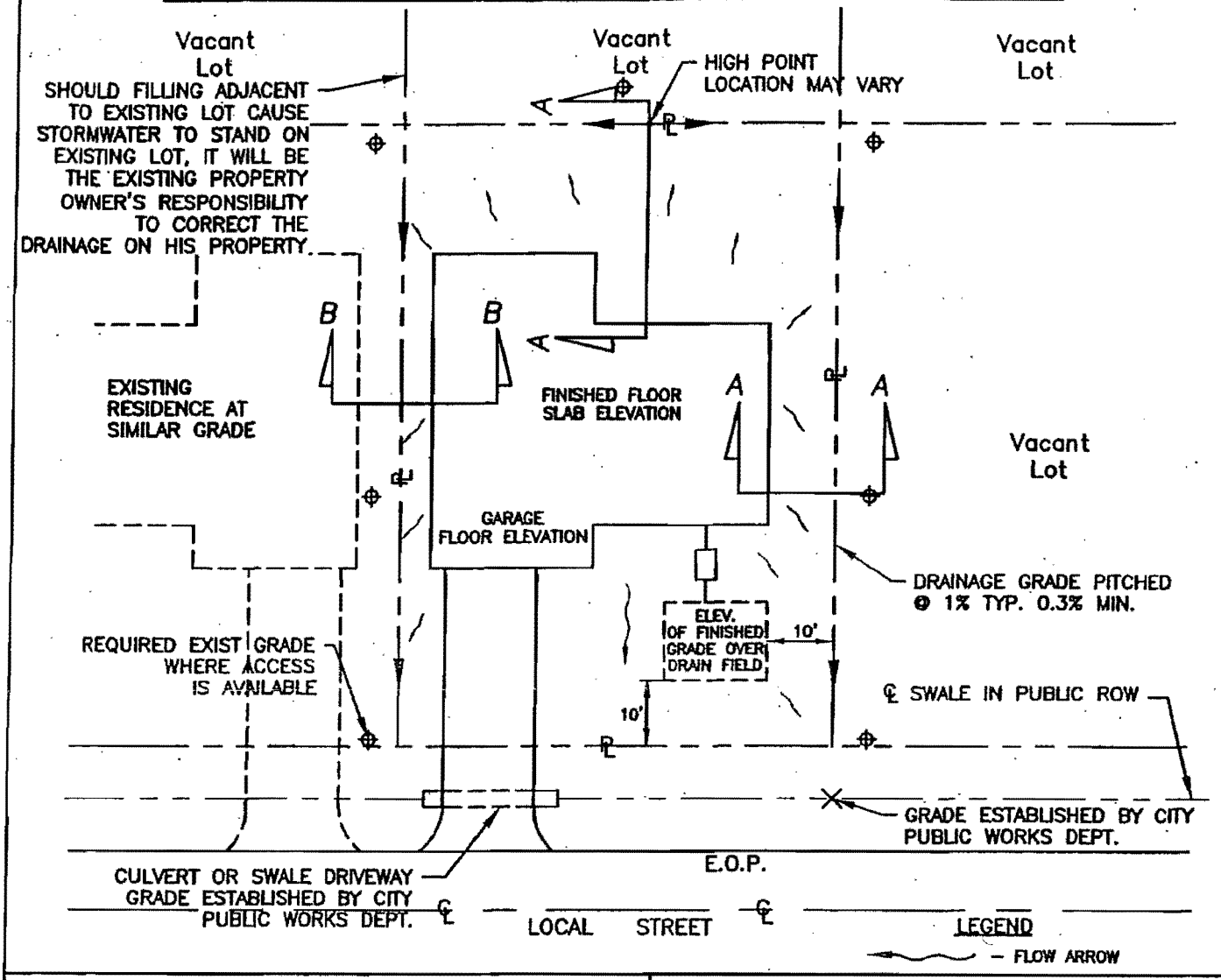
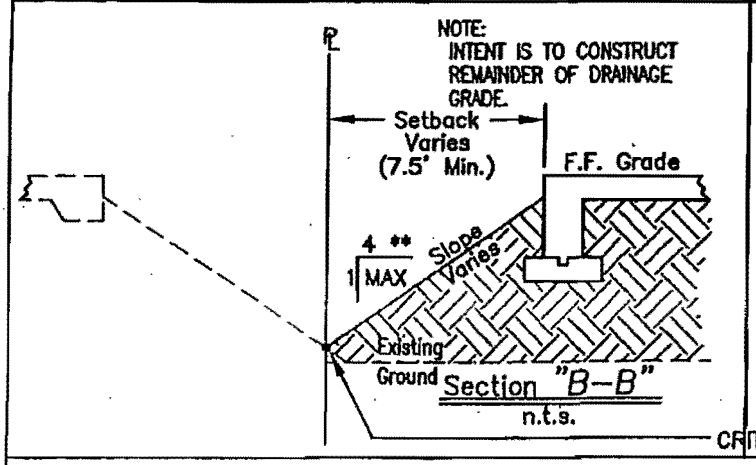
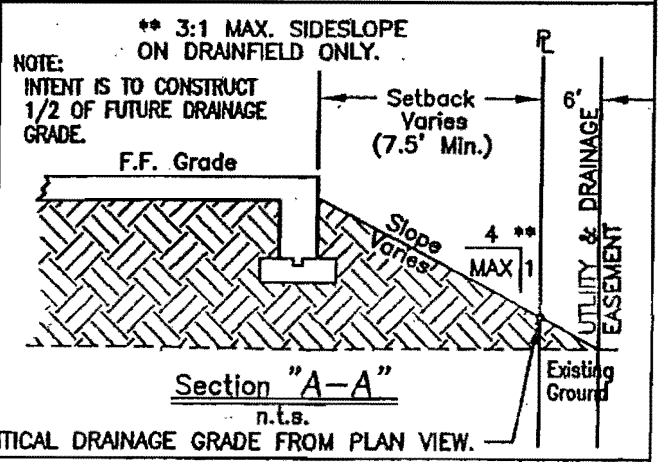
D.C.D. DIRECTOR	DATE Rev. 06-24-2005	Revised By ORD. 163-05 Effective 04/01/2006	L-8

RESIDENTIAL NON-WATERFRONT LOT DRAINAGE PATTERN



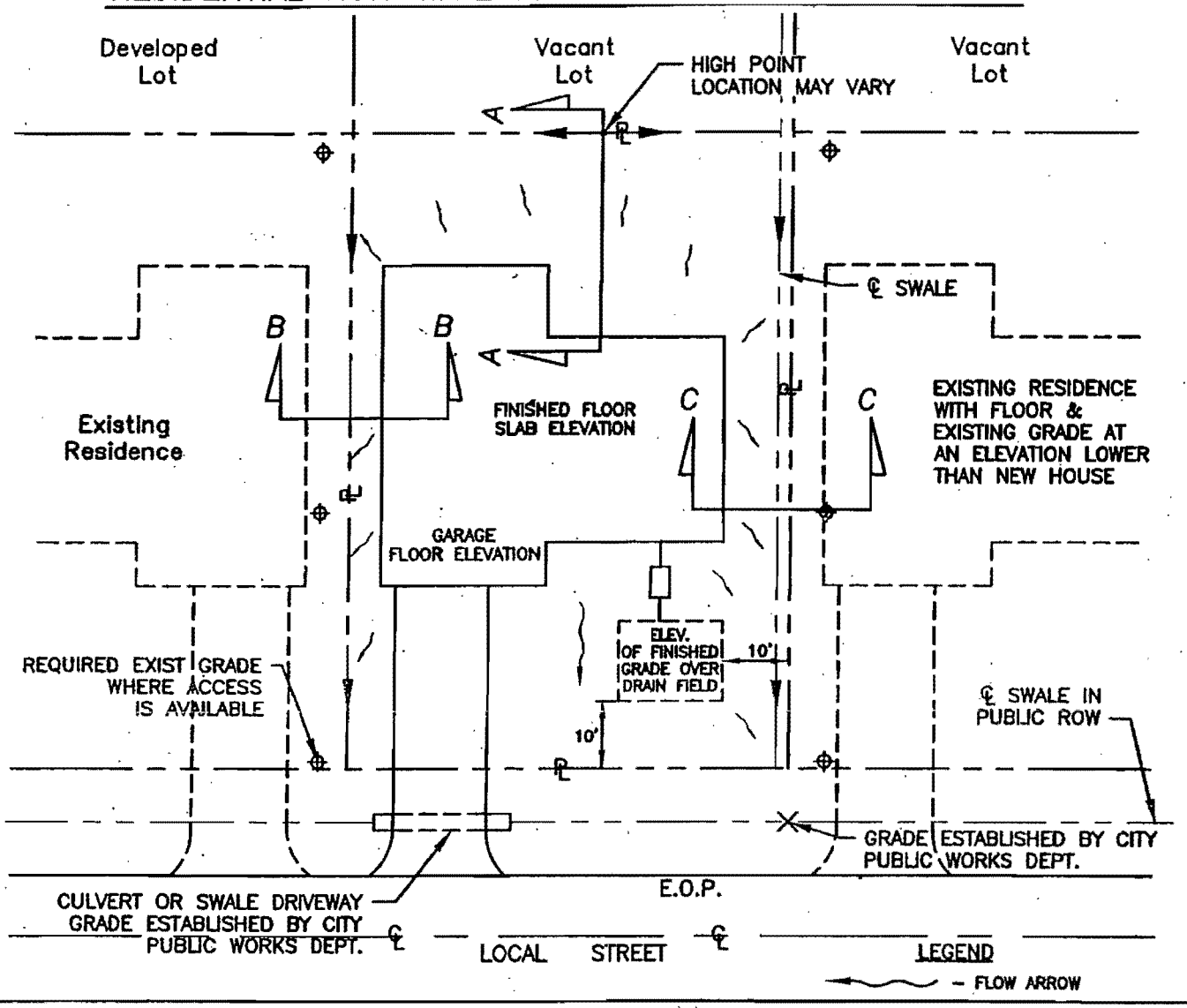




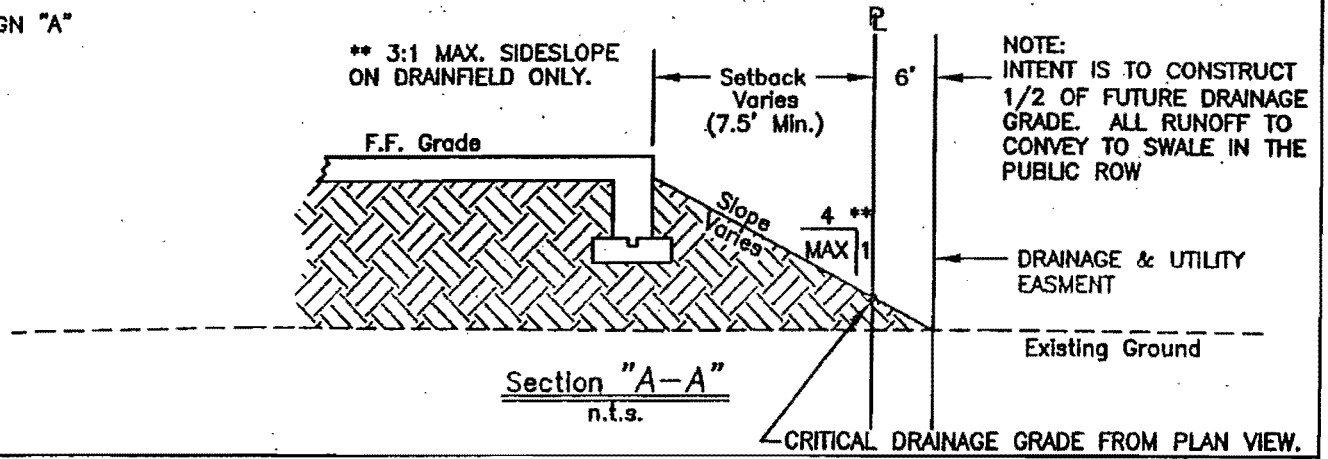
CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: LOT DRAINAGE PATTERN NON-WATERFRONT	REVISIONS :	SHEET NO.
D.C.D. DIRECTOR	DATE Rev. 06-24-2005	Revised By ORD. 163-05 Effective 04/01/2006	L-9

RESIDENTIAL NON-WATERFRONT LOT DRAINAGE PATTERN



DESIGN "A"



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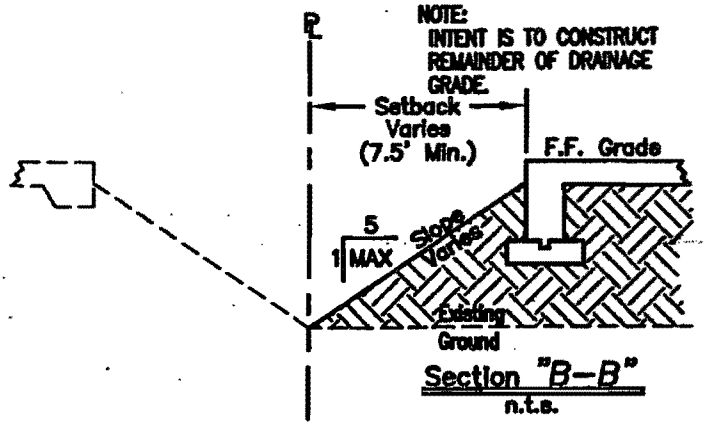
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: LOT DRAINAGE PATTERN NON-WATERFRONT	REVISIONS :	SHEET NO.
D.C.D. DIRECTOR	DATE Rev. 06-24-2005	OPTION "A" Revised By ORD. 163-05 Effective 04/01/2006	L-10



Section "B–B"
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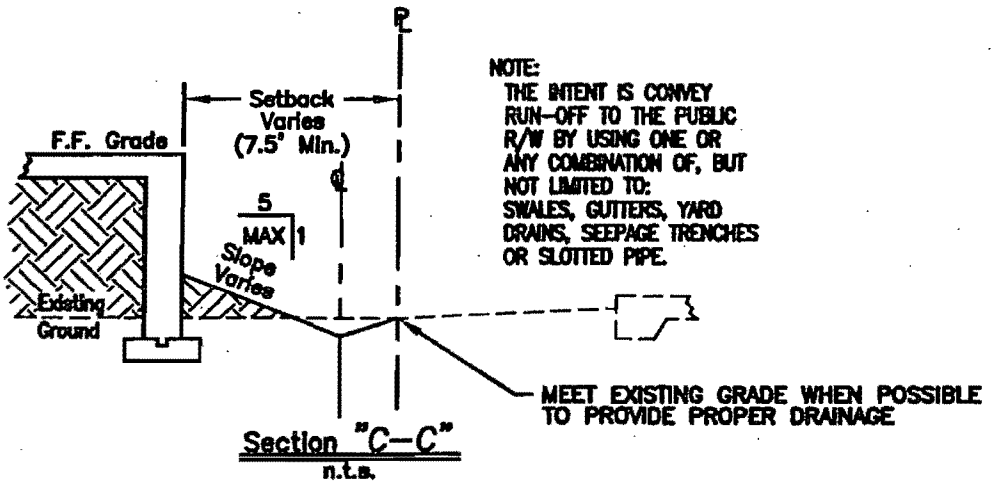
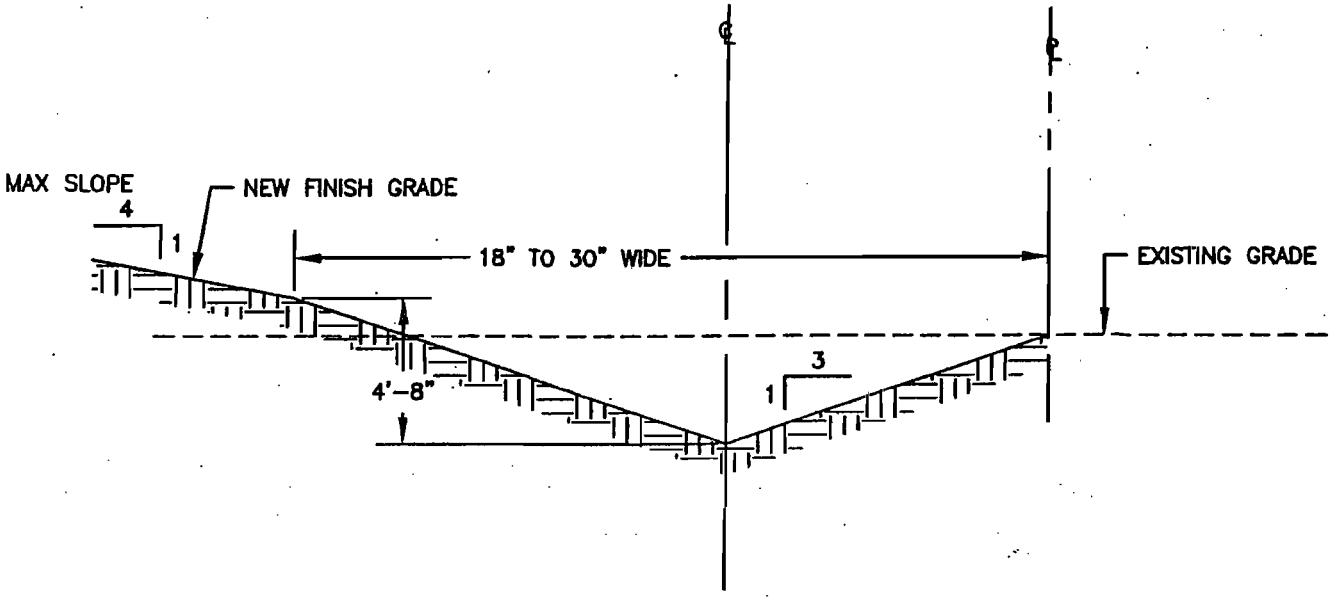


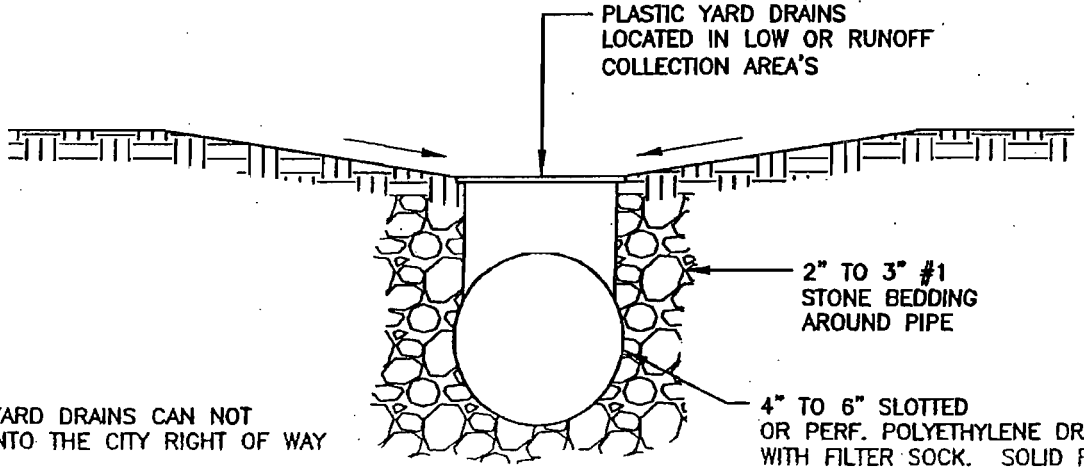
Section "C–C"
n.t.s.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: LOT DRAINAGE PATTERN NON-WATERFRONT	REVISIONS : Revised By ORD. 163-05 Effective 04/01/2006	SHEET NO. L-10A
D.C.D. DIRECTOR	DATE Rev. 06-24-2005		



TYPICAL DRAINAGE DETAIL
n.t.s.



NOTE:
PLASTIC YARD DRAINS CAN NOT EXTEND INTO THE CITY RIGHT OF WAY

TYPICAL DRAIN & PIPE DETIAL
n.t.s.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: LOT DRAINAGE PATTERN WATERFRONT	REVISIONS : Revised By ORD. 163-05 Effective 04/01/2006	SHEET NO. L-11
D.C.D. DIRECTOR	DATE Rev. 06-24-2005		

STANDARDS AND SPECIFICATIONS FOR EROSION CONTROL

The City of Cape Coral, as a permittee covered by the National Pollution Discharge Elimination System (NPDES) permit, has established a surface water management program which requires pollution prevention measures, treatment or removal techniques, storm water monitoring, use of legal authority, and other appropriate means to control the quality of storm water discharges from the Municipal Separate Storm Sewer System.

In addition to the city of Cape Coral Code of Ordinances Land Use Regulations, Section 3.25 Maintenance of City Right-of-Way, that requires erosion control devices in the City's right-of-way during construction, an Engineering Standards for temporary erosion control for construction of residential driveways, the City of Cape Coral is also required to comply with Regulations for Stormwater Discharge as stated in the Florida Administrative Code, Chapter 62-25, Section 62-25.025, Design and Performance Standards; and South Florida Water Management District criteria for erosion control measures Chapter 40E-400.215(11).

Best Management Practices (BMPs) are schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMPs also include treatment requirements, operating procedures, and practices to control facility site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

These standards shall be made a part of the effort to comply with the NPDES permit, FAC, FDEP, and SFWMD. Any other BMPs that are not a part of these standards that will prevent or reduce the runoff into the waterways of eroded soil will be considered, such as: the Florida Department of Environmental Protection's Stormwater, Erosion, and Sedimentation Control Manual; FDOT Design Standards.

STRAW BALE BARRIER

Definition

A temporary sediment barrier consisting of a row of entrenched and anchored straw bales.

Purposes

1. To intercept and detain small amounts of sediment from disturbed areas of limited extent.

2. To decrease the velocity of sheet flows and low-to-moderate level channel flows.

Conditions Where Practice Applies

1. Below disturbed areas subject to sheet and rill erosion.

2. Where the size of the drainage area is no greater than ¼ acre per 100 feet of barrier length; the maximum slope length behind the barrier is 100 feet; and the maximum slope gradient behind the barrier is 50 percent (2:1).

3. In minor swales or ditch lines where the maximum contributing drainage area is no greater than 2 acres.

4. Where effectiveness is required for less than 3 months.

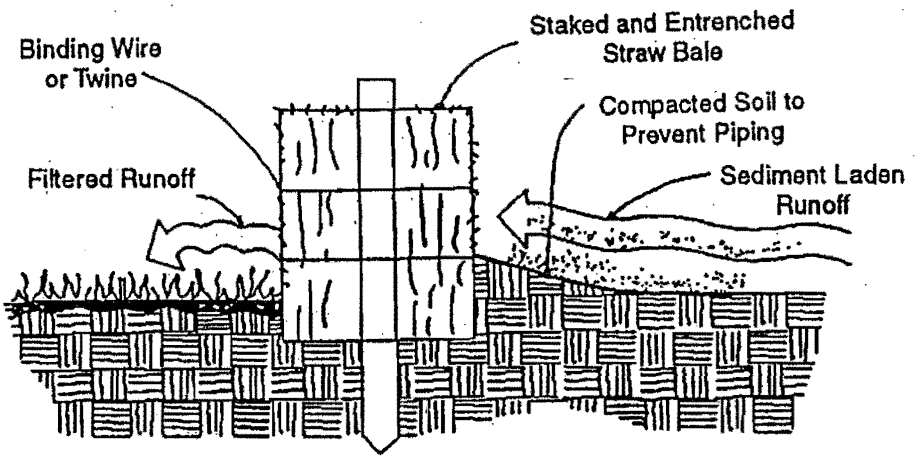
5. Under no circumstances should straw bale barriers be constructed in streams or in swales where there is a possibility of a washout.

Construction Specifications

1. Bales shall be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting each other.

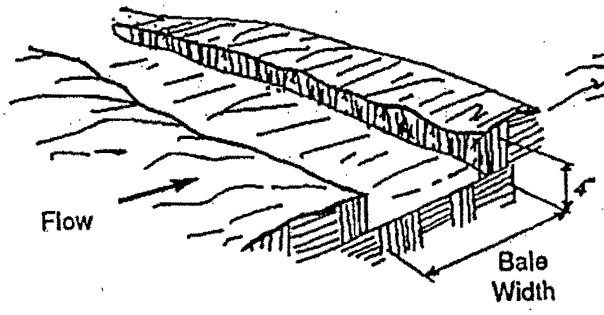
2. All bales shall be either wire-bound or string-tied. Straw bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales (in order to prevent deterioration of the binds). See Sheet M-3.

3. The barrier shall be entrenched and backfilled. A trench shall be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. After the bales are staked and chinked, the excavated soil shall be backfilled against the barrier. Backfill soil shall conform to the ground level on the downhill side and shall be built up to 4 inches against the up hill side of the barrier. See Sheet M-4.

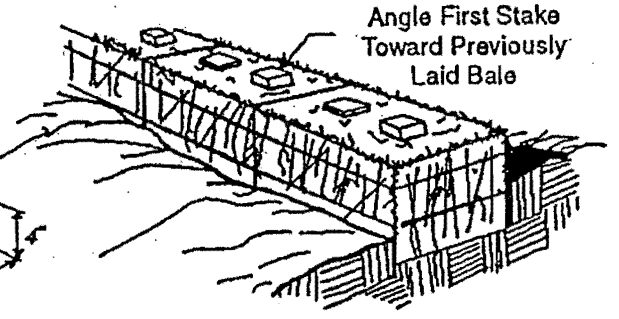


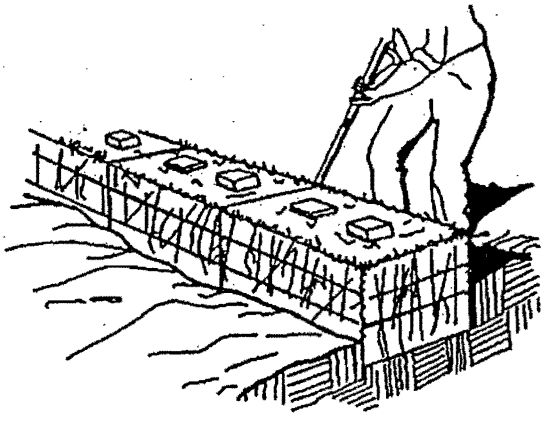
Properly Installed Straw Bale
(Cross-Section)

1. Excavate the Trench

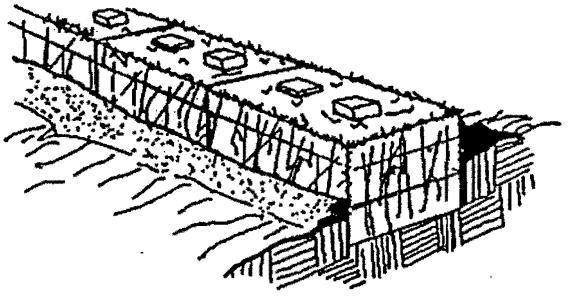


2. Place and Stake Straw Bales





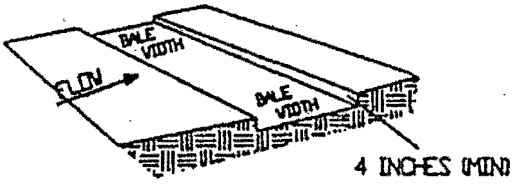
3. Wedge Loose Straw Between Between Bales



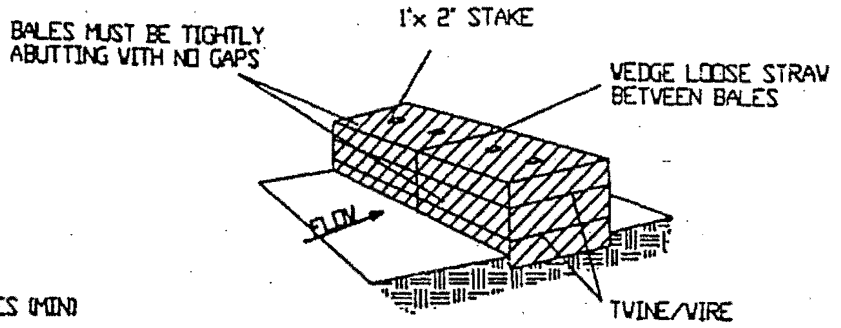
4. Backfill and Compact the
Excavated Soil

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

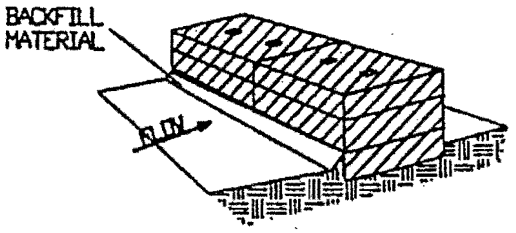
APPROVED:	TITLE: STRAW BALE BARRIER	REVISIONS :	SHEET NO. M-3
PUBLIC WORKS DIRECTOR	DATE 1-2-2000		



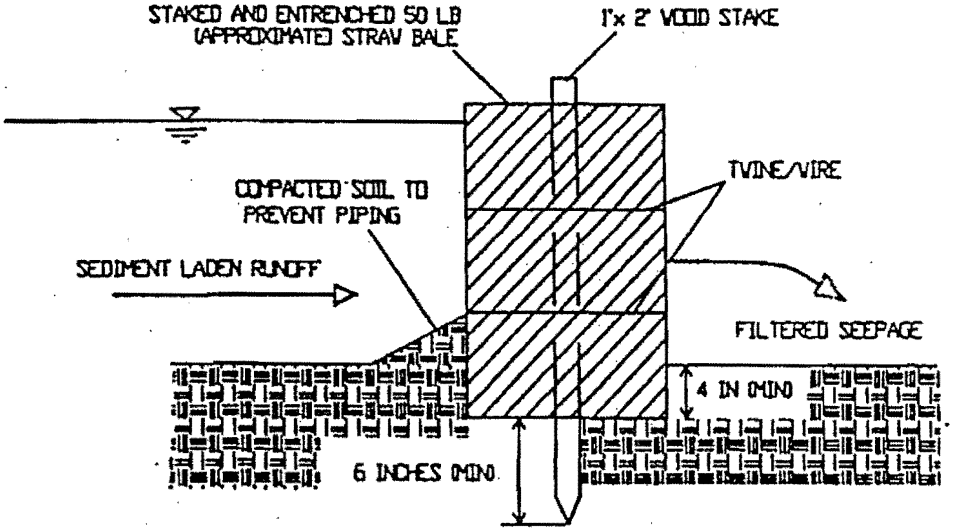
1. EXCAVATE THE TRENCH



2. PLACE AND STAKE STRAW BALES



3. BACKFILL AND COMPACT EXCAVATED SOIL



CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: INSTALLATION OF STRAW BALE	REVISIONS :	SHEET NO. M-4
PUBLIC WORKS DIRECTOR	DATE 1-2-2000		

4. Each bale shall be securely anchored by at least two 1"x2" minimum wooden stakes or two #5 minimum rebars at least 3 feet driven through the bales. The first stake in each bale shall be driven toward the previously laid bale to force the bales together. Stakes or rebars shall be driven deep enough into the ground to securely anchor the bales. Straw bale barriers placed on paved surfaces may be secured by placing heavy sand bags on top, and/or by bracing with 2x4's.

5. The gaps between bales shall be chinked (filled by wedging) with straw to prevent water from escaping between the bales. Loose straw scattered over the area immediately uphill from a straw bale barrier tends to increase barrier efficiency.

6. When bales are installed at the toe of a slope, they should be placed away from the slope for increased storage capacity.

7. Inspection shall be frequent and repair or replacement shall be made promptly as needed.

8. Straw bale barriers shall be removed when they have served their usefulness, but not before the up slope areas have been permanently stabilized.

Maintenance

1. Straw bale barriers shall be inspected immediately after each rainfall and at least daily during prolonged rainfall.

2. Close attention shall be paid to the repair of damaged bales, end runs and undercutting beneath bales.

3. Necessary repairs to barriers or replacement of bales shall be accomplished promptly.

4. Sediment deposits should be removed after each rainfall. They must be removed when the level of deposition reaches approximately one-half the height of the barrier.

5. Any sediment deposits remaining in place after the straw bale barrier is no longer required shall be dressed to conform to the existing grade, prepared, and seeded.

SILT FENCE

Definition

A temporary sediment barrier consisting of a geotextile fabric stretched across and attached to supporting posts and entrenched. There are two types, silt fence and filter barrier. The silt fence is a temporary linear filter barrier constructed of synthetic filter fabric, posts, and, depending upon the strength of the fabric used, wire fence for support. The filter barrier is constructed of stakes and burlap or synthetic filter fabric.

Purposes

1. To intercept and detain small amounts of sediment from disturbed areas during construction operations.

2. To decrease the velocity of sheet flows and low-to-moderate level channel flows.

Conditions When Practice Applies

1. Below disturbed areas where erosion would occur in the form of sheet and rill erosion.

2. Where the size of the drainage area is no more than ¼ acre per 100 feet of silt fence length; the maximum slope length behind the barrier is 100 feet; and the maximum gradient behind the barrier is 50 percent (2:1).

3. In minor swales or ditch lines where the maximum contributing drainage area is no greater than 2 acres.

4. Under no circumstances should silt fences be constructed in live streams or in swales or ditch lines where flows are likely to exceed one cubic foot per second (cfs).

5. Silt fences should not pond water. Water should be able to filter through fabric.

Planning Considerations

The most effective application is to install two parallel silt fences spaced a minimum of three feet apart. The installation and maintenance methods outlined here can improve performance.

Construction Specifications

Materials

1. Synthetic filter fabric shall be a geotextile per FDOT Section 985 and FDOT Index 199. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of 6 months of expected usable construction life at a temperature range of 0°F to 120°F.

2. Posts for silt fences shall be either 4 inch diameter wood, or 1.33 pounds per linear foot steel with a minimum length of 5 feet. Steel posts shall have projections for fastening wire to them.

3. Stakes for filter barriers shall be 1"x2" wood (preferred), or equivalent metal with a minimum length of 3 feet.

4. See Sheet M-8 for construction of a Silt Fence and Sheet M-9 for installation details.

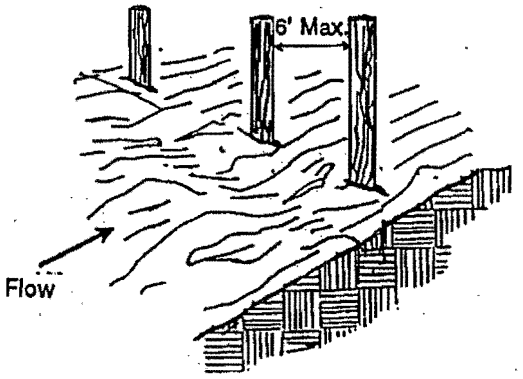
Maintenance

1. Silt fences and filter barriers shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.

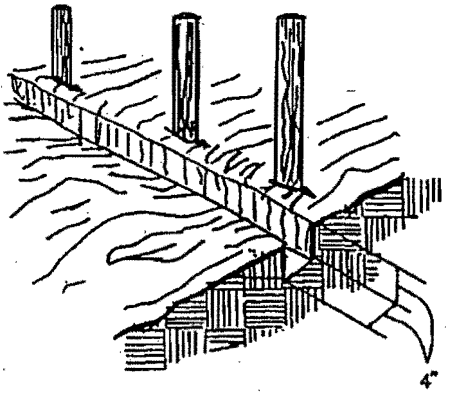
2. Should the fabric on a silt fence or filter barrier decompose or become ineffective before the end of the expected usable life and the barrier still be necessary, the fabric shall be replaced promptly.

3. Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.

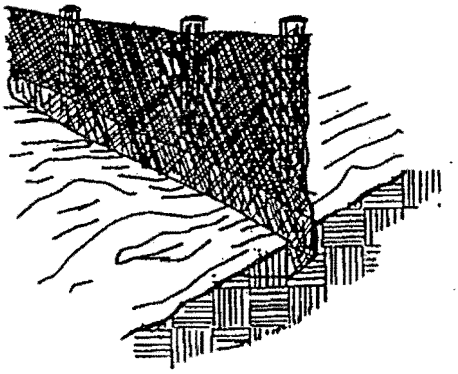
1. Set Stakes



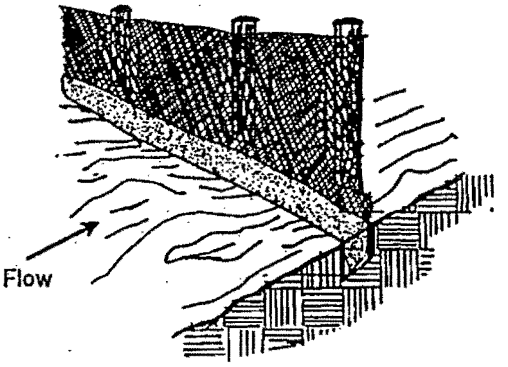
2. Excavate a 4" x 4" Trench Upslope Along the Line of Stakes



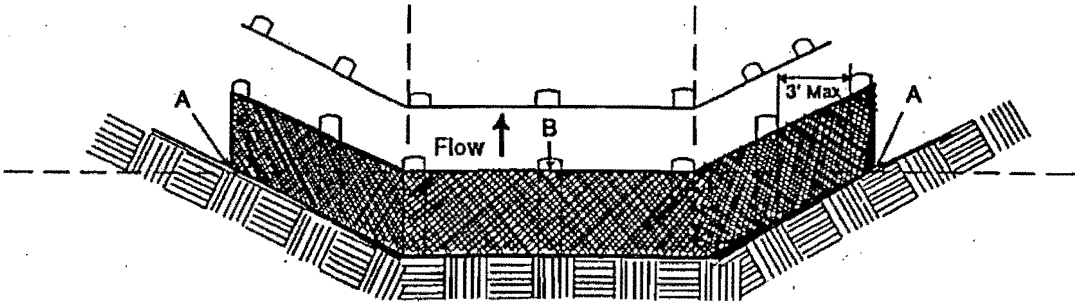
3. Staple Filter Material to Stakes and Extend it into the Trench



4. Backfill and Compact the Excavated Soil



Sheet Flow Installation
(Perspective View)

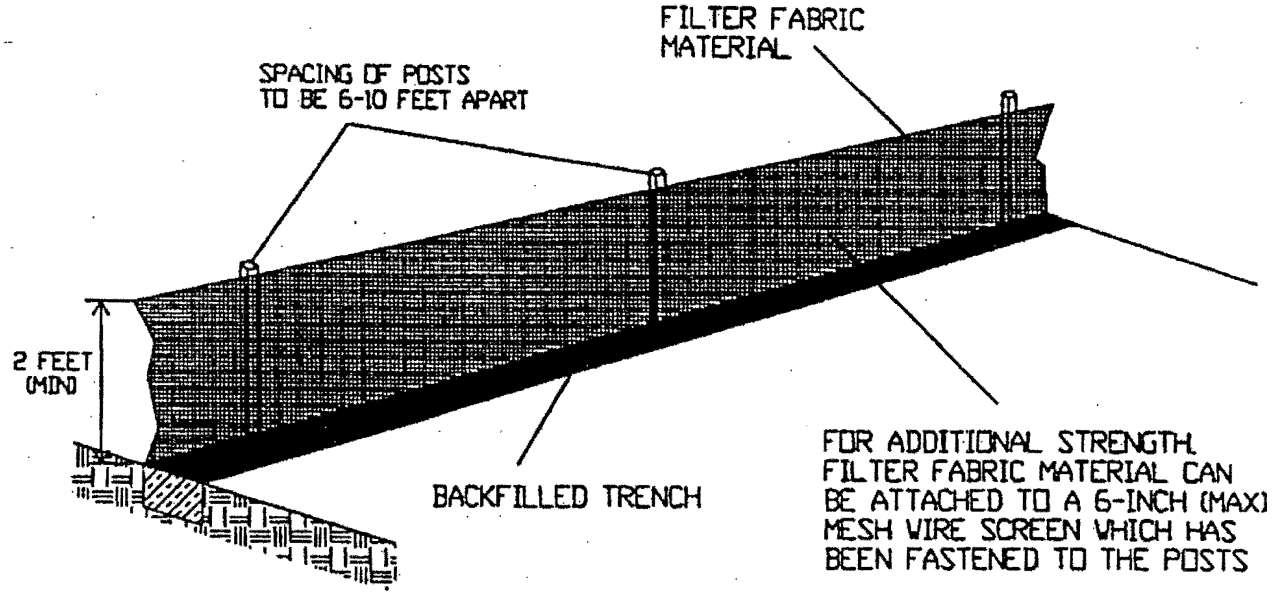


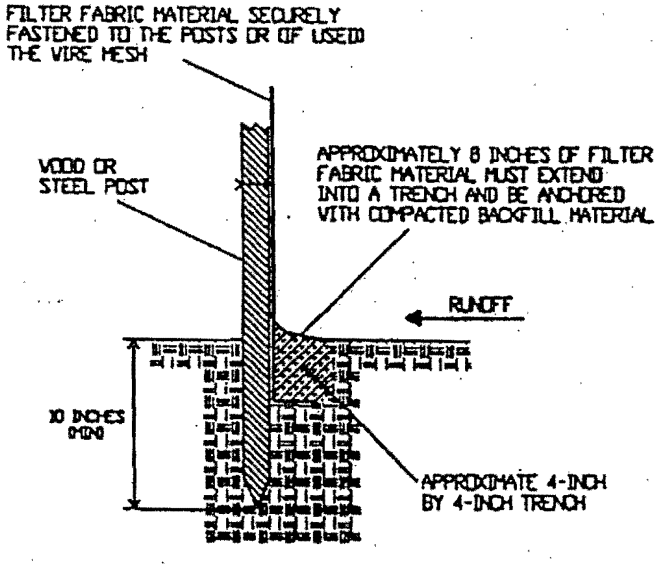
Points A Should be Higher than Point B

Drainageway Installation
(Front Elevation)

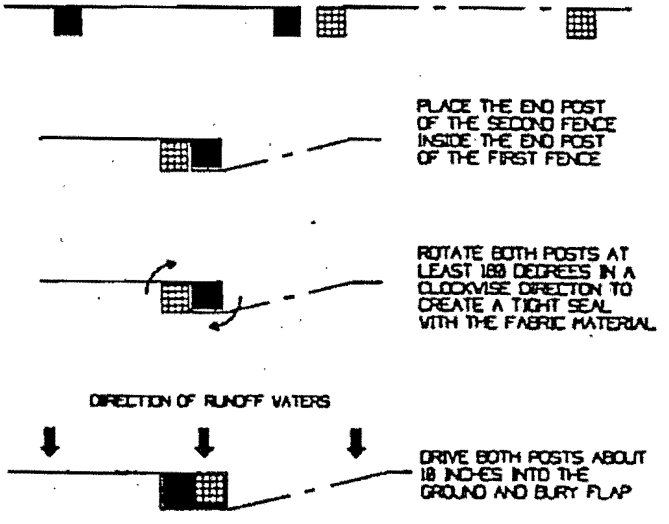
CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: FILTER BARRIER	REVISIONS :	SHEET NO. M-8
PUBLIC WORKS DIRECTOR	DATE 1-2-2000		





ATTACHING TWO SILT FENCES



CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: INSTALLATION OF FILTER BARRIER	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 1-2-2000		M-9

STABILIZED CONSTRUCTION ROAD

Definition

A stabilized pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right-of-way, street, alley, sidewalk or parking area.

Purpose

The purpose of a stabilized construction road is to reduce or eliminate the tracking of sediment onto public rights-of-way or streets.

Conditions Where Practice Applies

A stabilized construction road shall be used at all points of construction ingress and egress.

Design Criteria

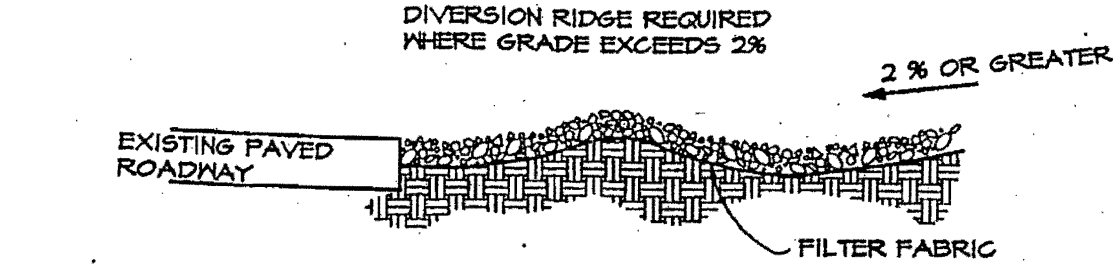
Aggregate Size –	Use 2" stone, or reclaimed or recycled concrete equivalent.
Thickness –	Not less than six (6) inches.
Width –	10 foot minimum but not less than the full width of points where ingress or egress occurs.
Length –	As required, but not less than 50 feet (except on a single-family lot where a 30 foot minimum would apply).
Filter cloth –	To be placed over the entire area to be covered with aggregate. Filter cloth will not be required on a single family residence lot.

Piping of surface water under road shall be provided as required. If piping is impossible, a mountable berm with 5:1 slopes will be permitted. See Sheet M-11.

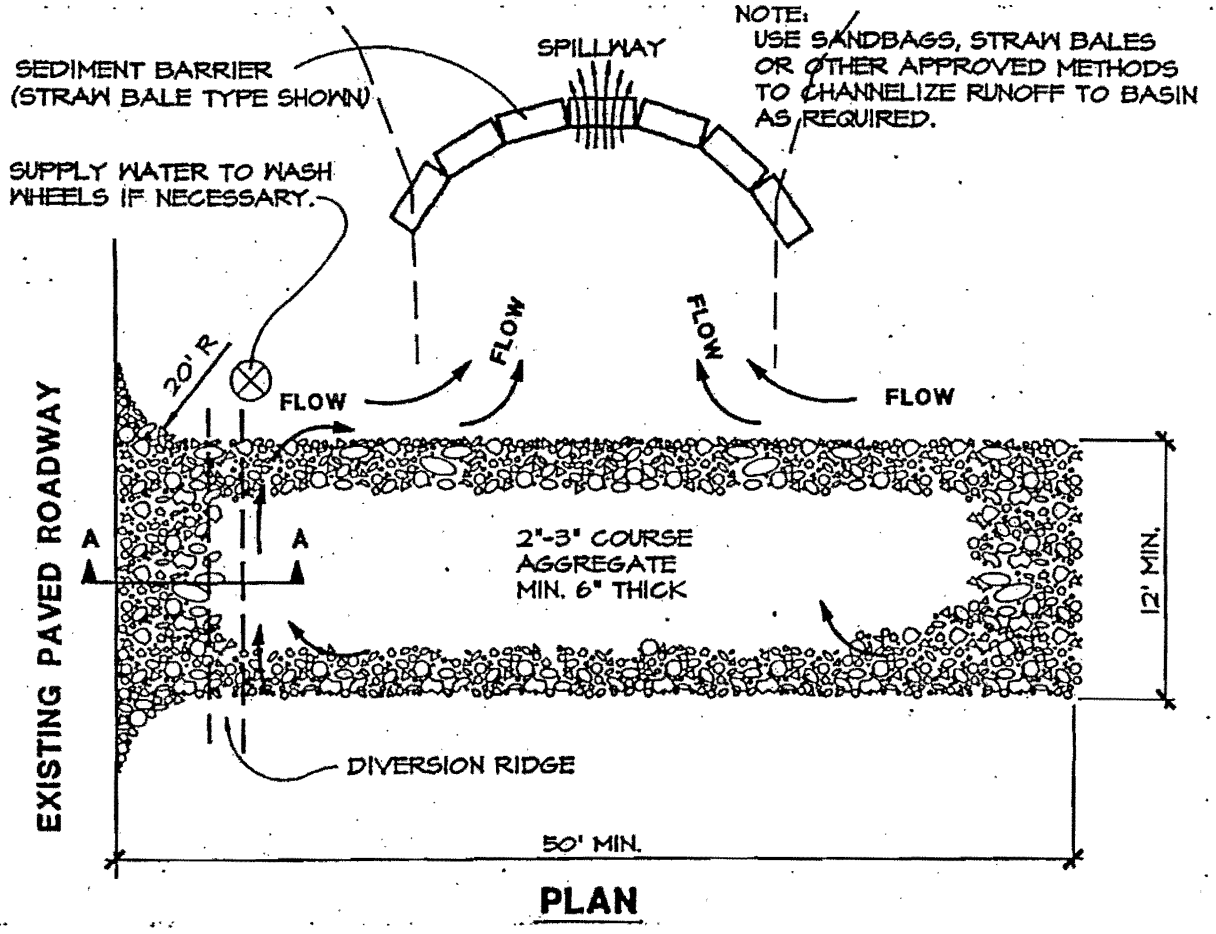
Maintenance

The road shall be maintained in a condition which will prevent tracking of sediment onto public right-of-way or streets. This may require periodic top dressing with additional aggregate. All sediment spilled, dropped, or washed onto public rights-of-way must be removed immediately.

When necessary, wheels must be cleaned to remove sediment prior to entrance onto public rights-of-way. When washing is required, it shall be done on an area stabilized with aggregate which drains into an approved sediment trapping device. All sediment shall be prevented from entering storm drains, ditches, or watercourses.



SECTION A - A



PLAN

NOTES:

1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
2. WHEN NECESSARY, WHEELS SHALL BE CLEANED PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY.
3. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABLIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: CONSTRUCTION ROAD STABILIZATION	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 1-2-2000		M-11

STORM DRAIN INLET PROTECTION

Definition

A sediment filter or an excavated impounding area around a storm drain drop inlet or curb inlet.

Purpose

To prevent sediment from entering storm drainage systems prior to permanent stabilization of the disturbed area.

Conditions Where Practice Applies

Where storm drain inlets are to be made operational before permanent stabilization of the disturbed drainage area. Different types of structures are applicable to different conditions.

Planning Considerations

Storm sewers, which are made operational before their drainage area is stabilized, can convey large amounts of sediment to natural drainage ways. In case of extreme sediment loading, the storm sewer itself may clog and lose a major portion of its capacity. To avoid these problems, it is necessary to prevent sediment from entering the system at the inlets.

This practice contains several types of inlet filters and traps which have different applications dependent upon site conditions and type of inlet. Other innovative techniques of accomplishing the same purpose are encouraged, but only after specific plans and details are subrnitted to and approved by the City.

Note that these various inlet protection devices are for drainage areas of less than one acre. Runoff from large disturbed areas should be routed through a TEMPORARY SEDIMENT TRAP.

The best way to prevent sediment from entering the storm sewer system is to stabilize the site as quickly as possible, preventing erosion and stopping sediment at its source.

Design Criteria

1. The drainage area shall be no greater than 1 acre.

2. The inlet protection device shall be constructed in a manner that will facilitate cleanout and disposal of trapped sediment and minimize interference with construction activities.

3. The inlet protection devices shall be constructed in such a manner that any resultant ponding of stormwater will not cause excessive inconvenience or damage to adjacent areas or structures.

4. Design criteria more specific to each particular inlet protection device will be found on Sheets M-14, M-15, M-17, M-18, M-19, M-21 and M-22.

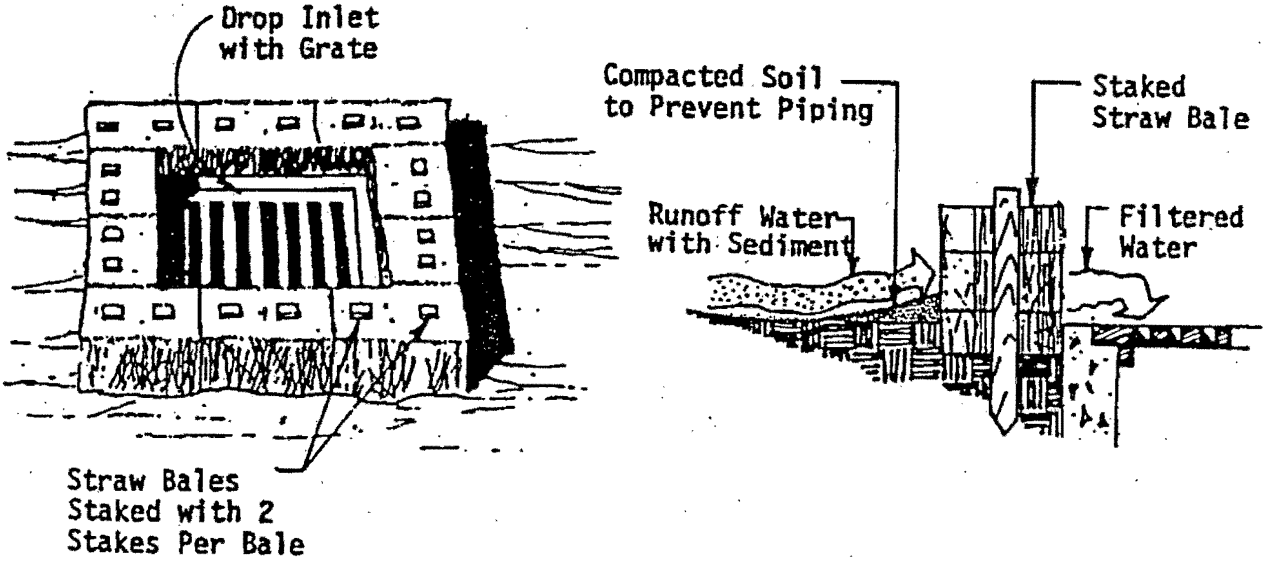
Construction Specifications

1. STRAW BALE DROP INLET STRUCTURE

   a. Bales shall be either wire-bound or string-tied with the bindings oriented around the sides rather than over and under the bales.
   b. Bales shall be placed lengthwise in a single row surrounding the inlet, with the ends of adjacent bales pressed together. (Sheet M-14)
   c. The filter barrier shall be entrenched and backfilled. A trench shall be excavated around the inlet the width of a bale to a minimum depth of 4 inches. After the bales are staked, the excavated soil shall be backfilled and compacted against the filter barrier.
   d. Each bale shall be securely anchored and held in place by at least two stakes or rebars driven through the bale.
   e. Loose straw shall be wedged between bales to prevent water from entering between bales.

2. FABRIC DROP INLET SEDIMENT FILTER

   a. Geotextile shall be cut from a continuous roll to avoid joints.
   b. Stakes shall be 1"x2" wood (preferred) or equivalent metal with a minimum length of 3 feet.
   c. Staples shall be of heavy-duty wire at least ½-inch long.
   d. Stakes shall be spaced around the perimeter of the inlet a maximum of 3 feet apart and securely driven into the ground (minimum of 12 inches).
   e. A trench shall be excavated approximately 4 inches wide and 4 inches deep around the outside perimeter of the stakes.
   f. The geotextile shall be stapled to the wooden stakes, and 8 inches of the fabric shall be extended into the trench. The height of the filter barrier shall be a minimum of 15 inches and shall not exceed 18 inches (Sheet M-15).
   g. The trench shall be backfilled and the soil compacted over the geotextile.

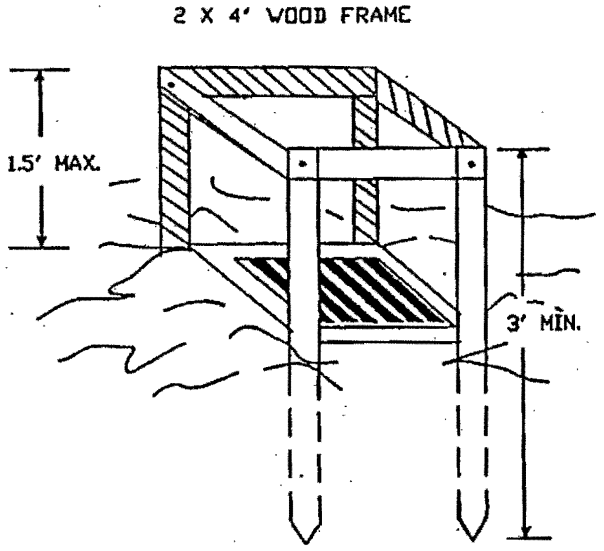


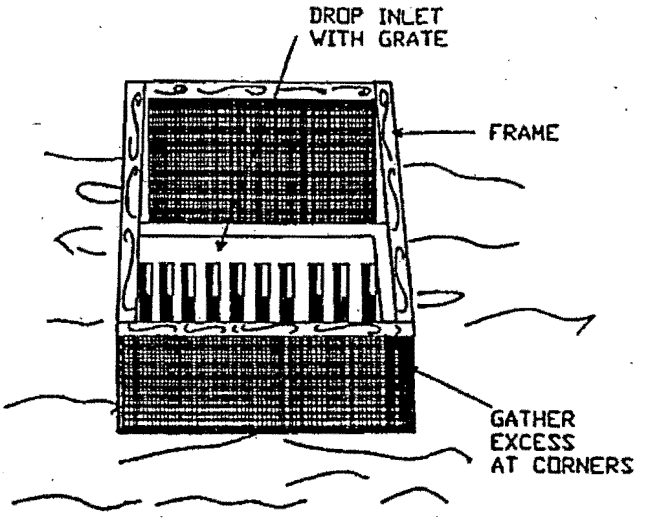
Specific Application

This method of inlet protection is applicable where the inlet drains a relatively flat area (slopes no greater than 5 percent) where sheet or overland flows (not exceeding 0.5 cfs) are typical. The method shall not apply to inlets receiving concentrated flows, such as in street or highway medians.

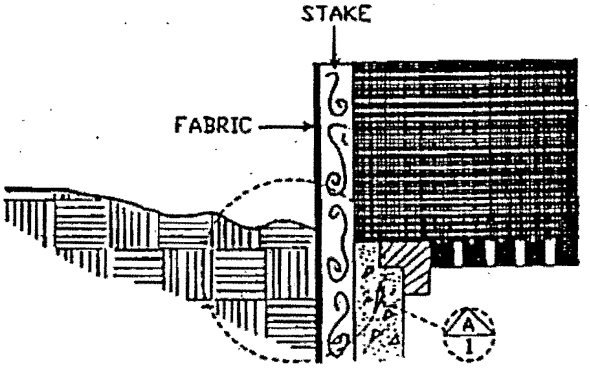
CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: STRAW BALE BARRIER STORMWATER DROP INLET	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 1-2-2000		M-14

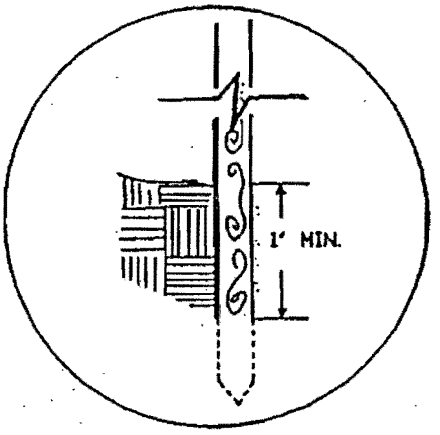




Perspective Views



Elevation of Stake and
Fabric Orientaion



Detail A

Specific Application

This method of inlet protection is applicable where the inlet drains a relatively flat area (slope no greater than 5%) where the inlet sheet or overland flows (not exceeding 1 c.f.s.) are typical. The method shall not apply to inlets receiving concentrated flows, such as in street or highway medians.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: FILTER FABRIC FENCE STORMWATER DROP INLET	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 1-2-2000		M-15

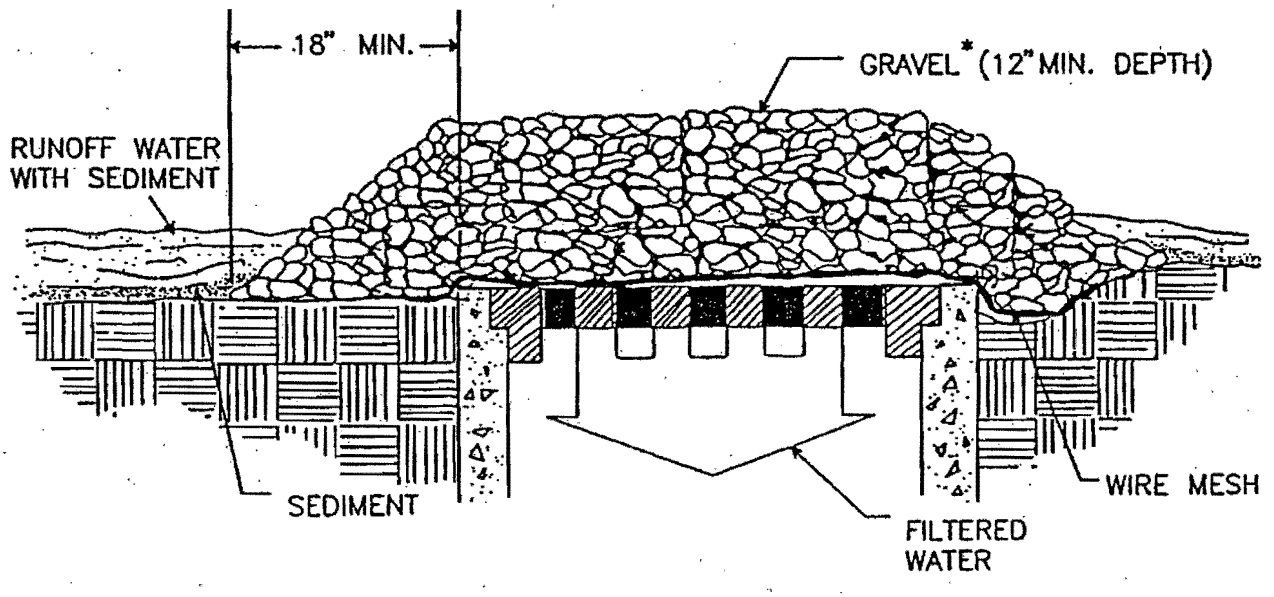
GRAVEL AND WIRE MESH DROP INLET SEDIMENT FILTER

a. Wire mesh shall be laid over the drop inlet so that the wire extends a minimum of 1 foot beyond each side of the inlet structure. Hardware cloth or comparable wire mesh with ½-inch openings shall be used. If more than one strip of mesh is necessary, the strips shall be overlapped.
b. Coarse Aggregate shall be placed over the wire mesh as indicated on Sheet M-17. The depth of stone shall be at least 12 inches over the entire inlet opening. The stone shall extend beyond the inlet opening at least 18 inches on all sides.
c. If the stone filter becomes clogged with sediment so that it no longer adequately performs its function, the stones must be pulled away from the inlet, cleaned and replaced.

Note: This filtering device has no overflow mechanism, therefore, ponding is likely especially if sediment is not removed regularly. This type of device must never by used where overflow may endanger an exposed fill slope. Consideration should also be given to the possible effects of ponding on traffic movement, nearby structures, working areas, adjacent property, etc.

BLOCK AND GRAVEL DROP INLET SEDIMENT FILTER

a. Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, with the ends of adjacent blocks abutting. The height of the barrier can be varied, depending on design needs, by stacking combinations of 4-inch, 8-inch and 12-inch wide blocks. The barrier of blocks shall be at least 12 inches high and no greater than 24 inches high.
b. Wire mesh shall be placed over the outside vertical face (webbing) of the concrete blocks to prevent stone from being washed through the holes in the blocks. Hardware cloth or comparable wire mesh with ½-inch openings shall be used.
c. Stone shall be piled against the wire to the top of the block barrier, as shown in Sheets M-18 and M-19. Coarse Aggregate shall be used.
d. If the stone filter becomes clogged with sediment so that it no longer adequately performs its function, the stone must be pulled away from the blocks, cleaned and replaced.
e. An alternate erosion control method is placing gravel filled bags around the inlet, provided that there are no gaps between bags.

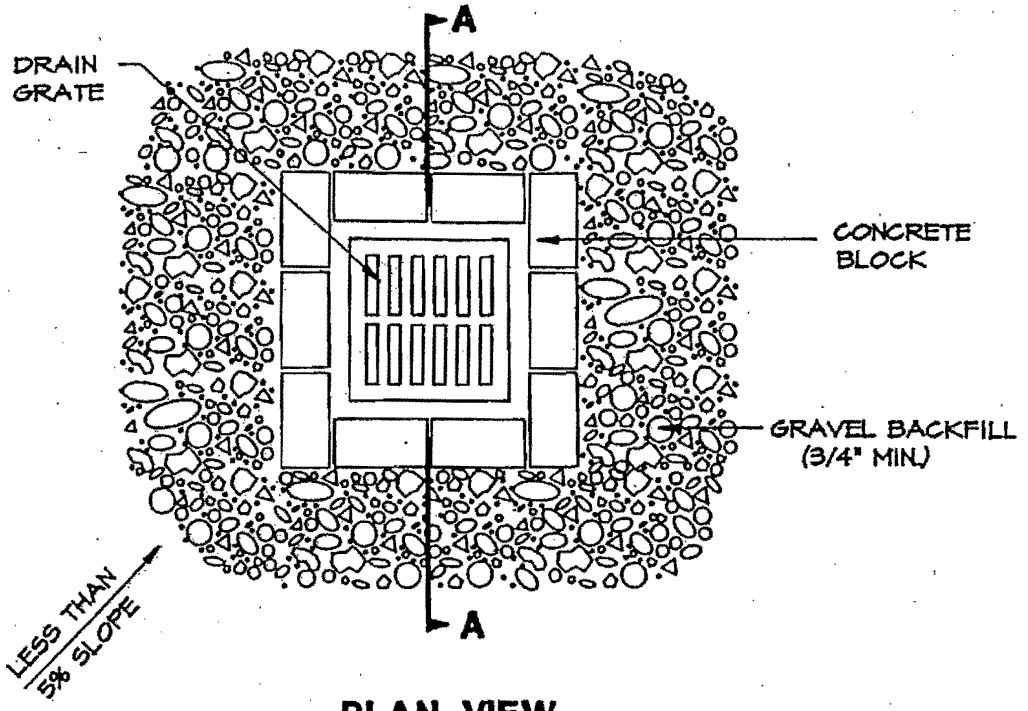


Specific Application

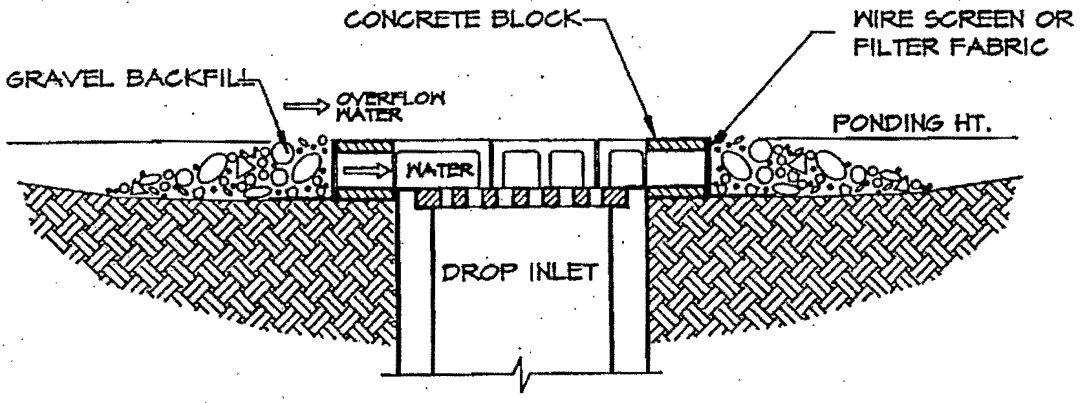
This method of inlet protection is applicable where heavy concentrated flows are expected, but not where ponding around the structure might cause excessive inconvience or damage to adjacent structures and unprotected areas.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: GRAVEL/WIRE MESH PROTECTION STORMWATER DROP INLET	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 1-2-2000		M-17



PLAN VIEW



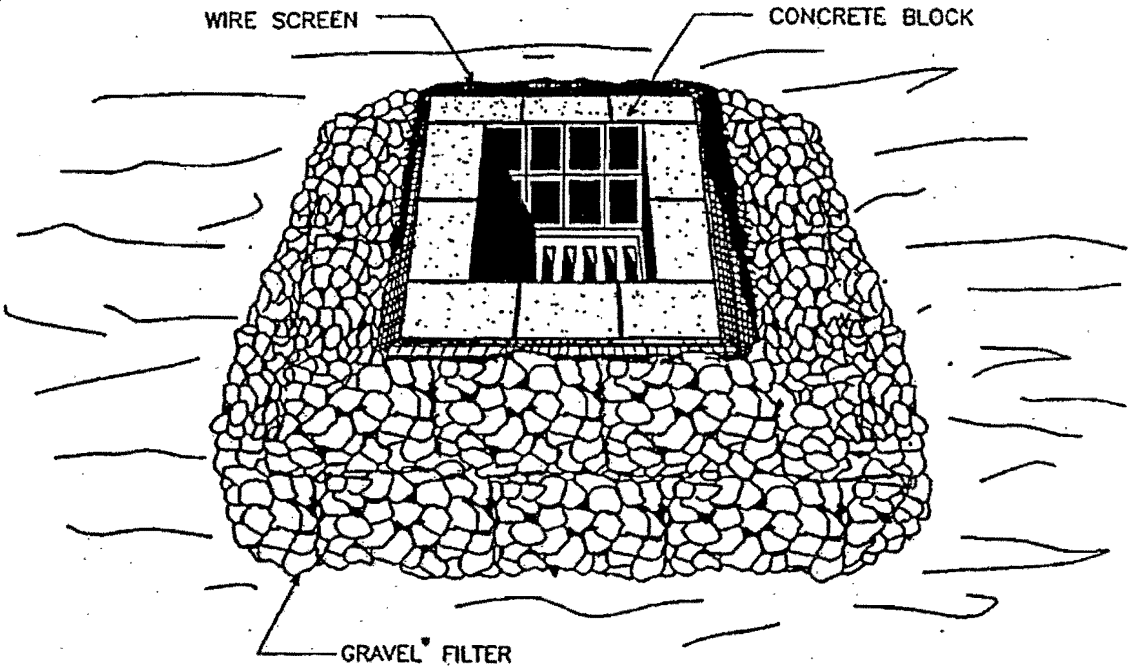
SECTION A - A

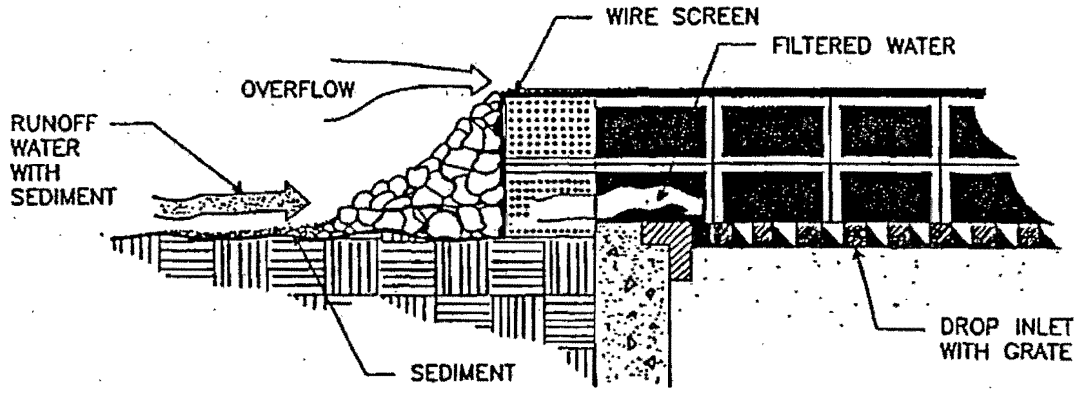
NOTES:

1. DROP INLET SEDIMENT BARRIERS ARE TO BE USED FOR SMALL, NEARLY LEVEL DRAINAGE AREAS. (LESS THAN 5%)
2. EXCAVATE A BASIN OF SUFFICIENT SIZE ADJACENT TO THE DROP INLET.
3. THE TOP OF THE STRUCTURE (PONDING HEIGHT) MUST BE WELL BELOW THE GROUND ELEVATION DOWNSLOPE TO PREVENT RUNOFF FROM BY-PASSING THE INLET. A TEMPORARY DIKE MAY BE NECESSARY ON THE DOWNSLOPE SIDE OF THE STRUCTURE.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: BLOCK/GRAVEL PROTECTION – ONE COURSE STORMWATER DROP INLET	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 1-2-2000		M-18





Specific Application

This method of inlet protection is applicable where heavy flows are expected and where an overflow capacity is necessary to prevent excessive ponding around the structure.

* Gravel Shall be FDOT #3, #357, or #5 Coarse Aggregate.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: BLOCK/GRAVEL PROTECTION – TWO COURSES STORMWATER DROP INLET	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 1-2-2000		M–19

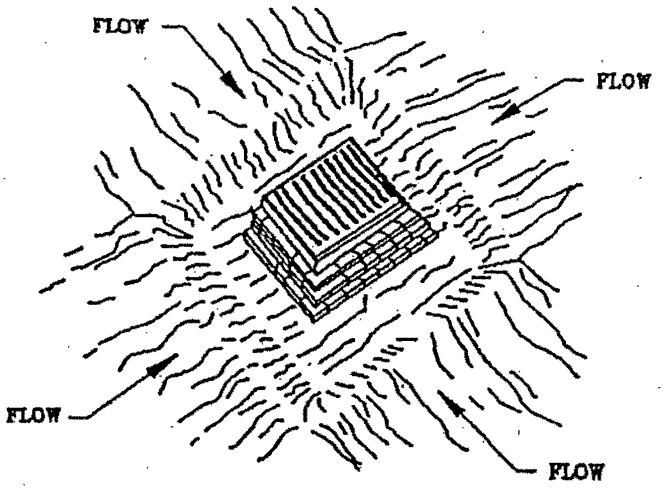
EXCAVATED DROP INLET SEDIMENT TRAP

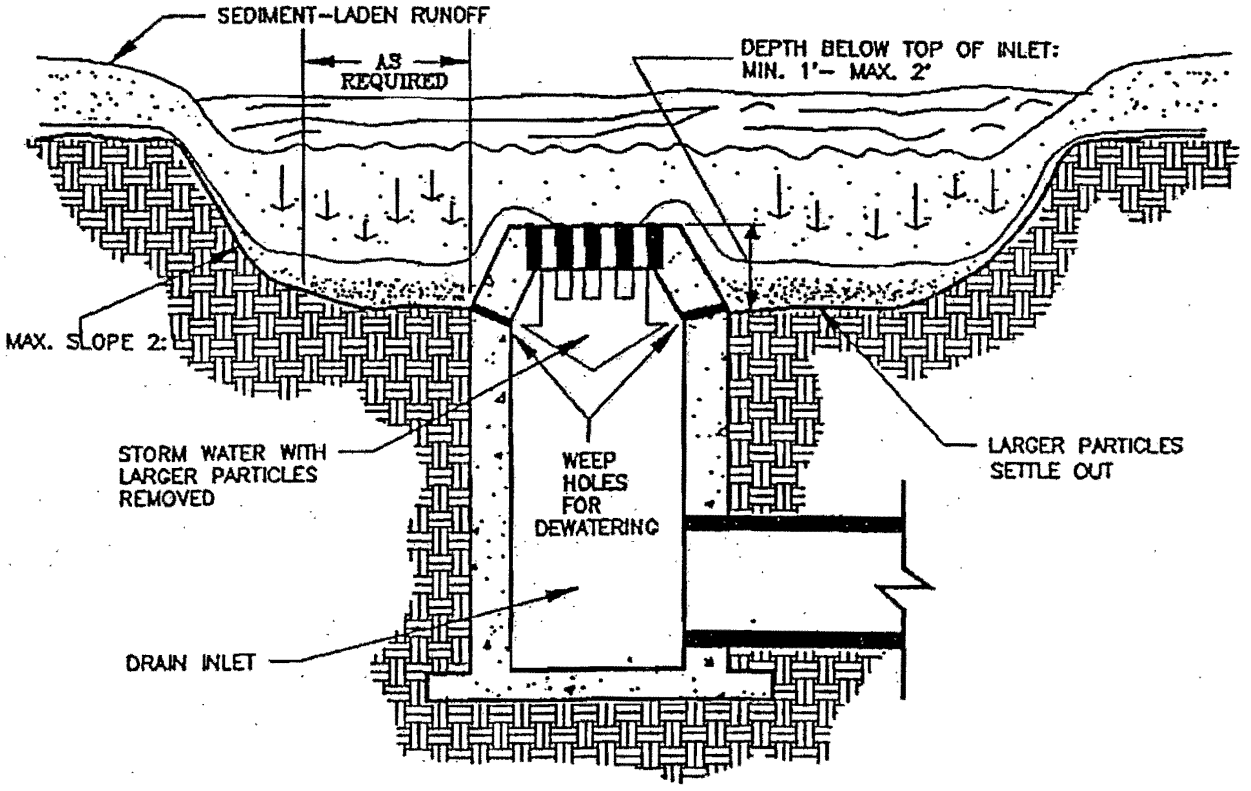
a. The excavated trap shall be sized to provide a minimum storage capacity calculated at the rate of 67 cubic yards for 1 acre of drainage area. A trap shall be no less than 1 foot nor more than 2 feet deep measured from the top of the inlet structure. Side slopes shall not be steeper than 2:1 (See Sheet M-21).
b. The slope of the basin may vary to fit the drainage area and terrain. Observations must be made to check trap efficiency and modifications shall be made as necessary to insure satisfactory trapping of sediment. Where an inlet is located so as to receive concentrated flows, such as in a highway median, it is recommended that the basin have a rectangular shape in a 2:1 ratio, with the length oriented in the direction of the flow.
c. Sediment shall be removed and the trap restored to its original dimensions when the sediment has accumulated to ½ the design depth of the trap. Removed sediment shall be deposited in a suitable area and in a manner such that it will not erode.

SOD DROP INLET SEDIMENT FILTER

a. Soil shall be prepared and sod installed according to the specifications.

b. Sod shall be placed to form a turf mat covering the soil for a distance of 4 feet from each side of the inlet structure, as illustrated in Sheet M-22.



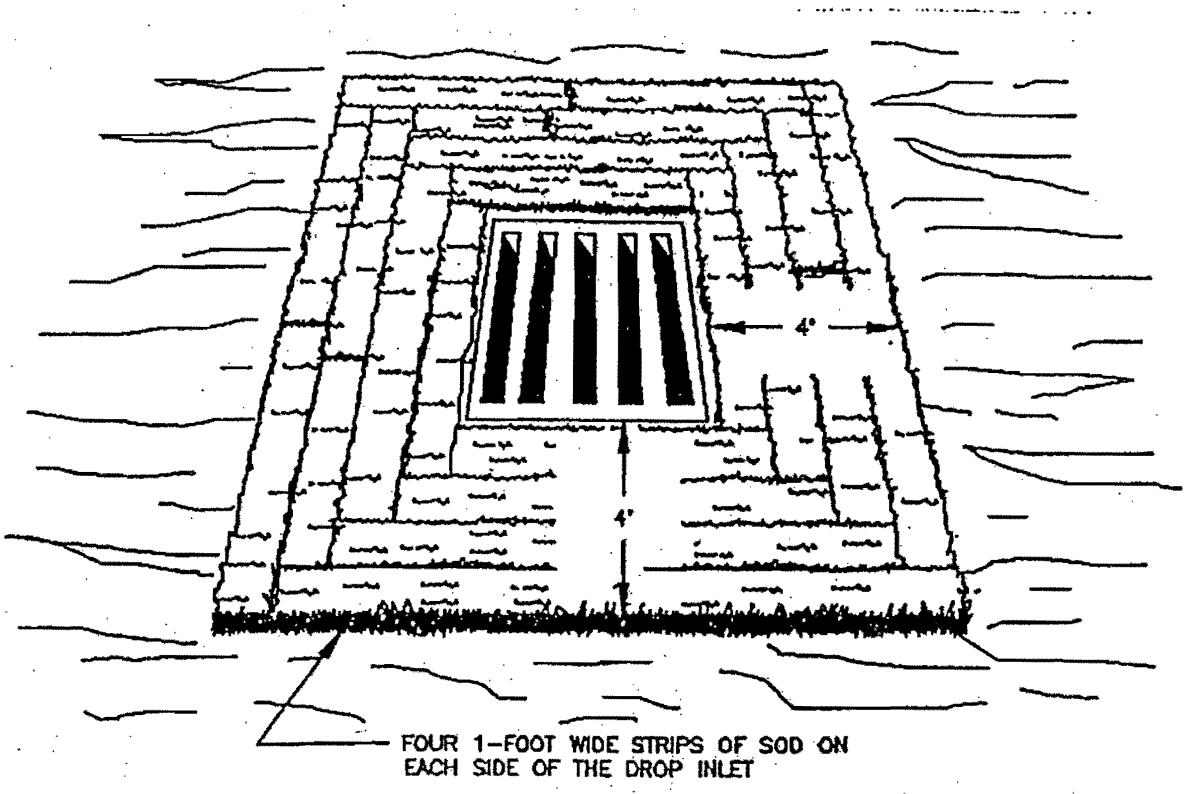


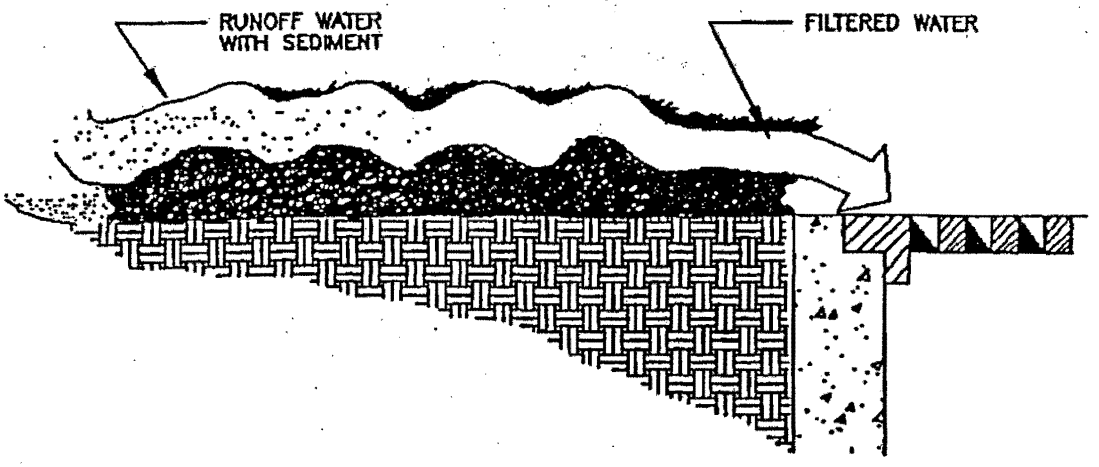
SPECIFIC APPLICATION

THIS METHOD OF INLET PROTECTION IS APPLICABLE WHERE HEAVY FLOWS ARE EXPECTED AND WHERE AN OVERFLOW CAPABILITY AND EASE OF MAINTENANCE ARE DESIRABLE.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: EXCAVATED/ELEVATED THROAT PROTECTION STORMWATER DROP INLET	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 1-2-2000		M-21





SPECIFIC APLLICATION

THIS METHOD OF INLET PROTECTION IS APPPLICABLE ONLY AT THE TIME OF PERMANENT SEEDING, TO PROTECT THE INLET FROM SEDIMENT AND MULCH MATERIAL UNTIL PERMANENT VEGETATION HAS BECOME ESTABLISHED.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: SOD FILTER STORMWATER DROP INLET	REVISIONS :	SHEET NO. M-22
PUBLIC WORKS DIRECTOR	DATE 1-2-2000		

CURB INLETS

1) Gravel sediment filter. See Sheet M-24

a- Hardware cloth or comparable wire mesh with ½ inch openings shall be placed over the curb inlet opening so that at least 12 inches of wire extends across the top of the inlet cover and at least 12 inches of wire extends across the concrete gutter from the inlet opening.
b- Stone shall be pilled against the wire so as to anchor it against the gutter and inlet cover and to cover the inlet opening completely. FDOT No. 1 coarse aggregate shall be used.
c- An overflow can be constructed of 2" x 4" boards to lessen ponding.
d- If the stone filter becomes clogged with sediment so that it no longer adequately performs its function, the stone must be pulled away from the block, cleaned and replaced.

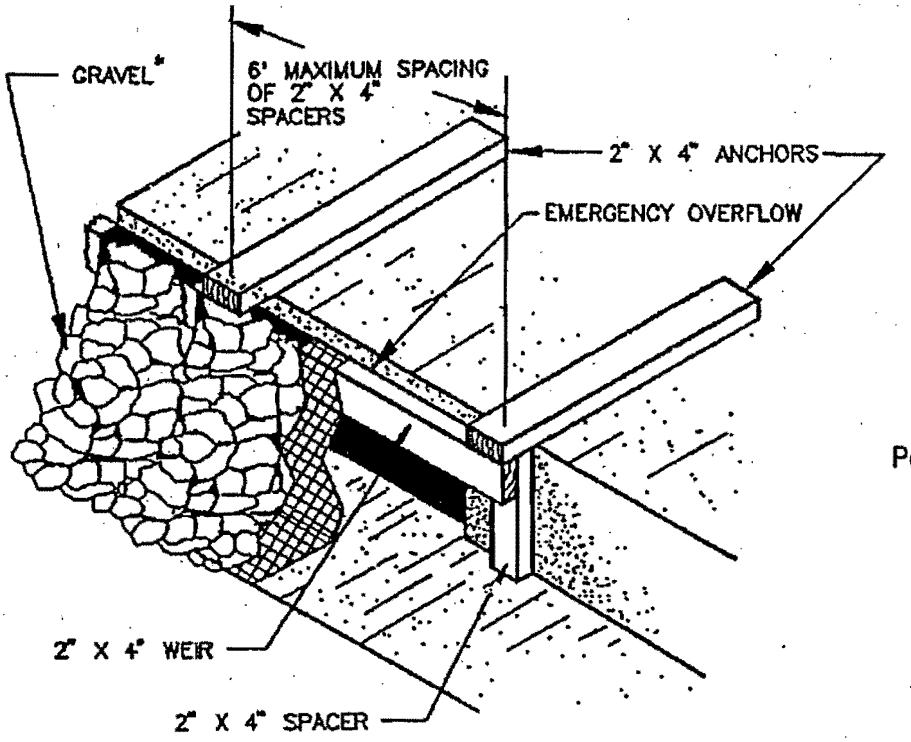
2) Block & gravel sediment filter. See Sheets M-25 and M-26

a- concrete blocks shall be placed on their sides abutting the curb at either side of the inlet opening.
b- a 2" x 4" wood stud shall be cut and placed through the outer holes of each spacer block to help keep the front blocks in-place.
c- concrete blocks shall be placed on either sides across the front of the inlet and abutting the spacer blocks.
d- wire mesh shall be placed over the outside vertical face (webbing) of the concrete blocks to prevent stone from being washed through the holes in the blocks. Hardware cloth with ½ inch openings shall be used.
e- FDOT No. 1 coarse aggregate shall be piled against the wire to the top of the barrier.
f- if the stone filter becomes clogged with sediment so that it no longer adequately performs its function, the stone must be pulled away from the block, cleaned and replaced.
g- as an alternative, gravel filled burlap bags may be stacked tightly around the curb inlet. See Sheet M-27.

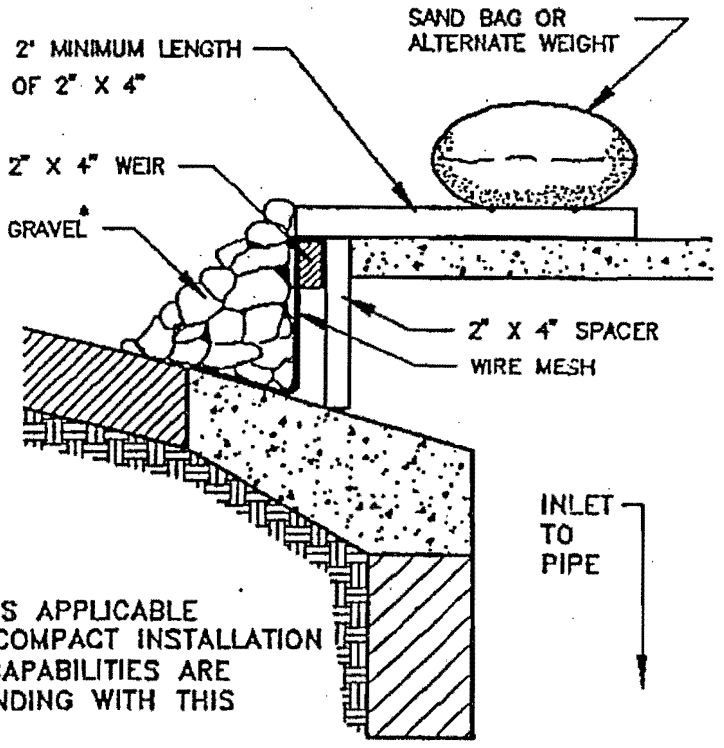
Maintenance

The structures shall be inspected after each rainfall event, and repairs performed as needed.

Structures shall be removed and the area cleaned and stabilized when the work is completed



Perspective View



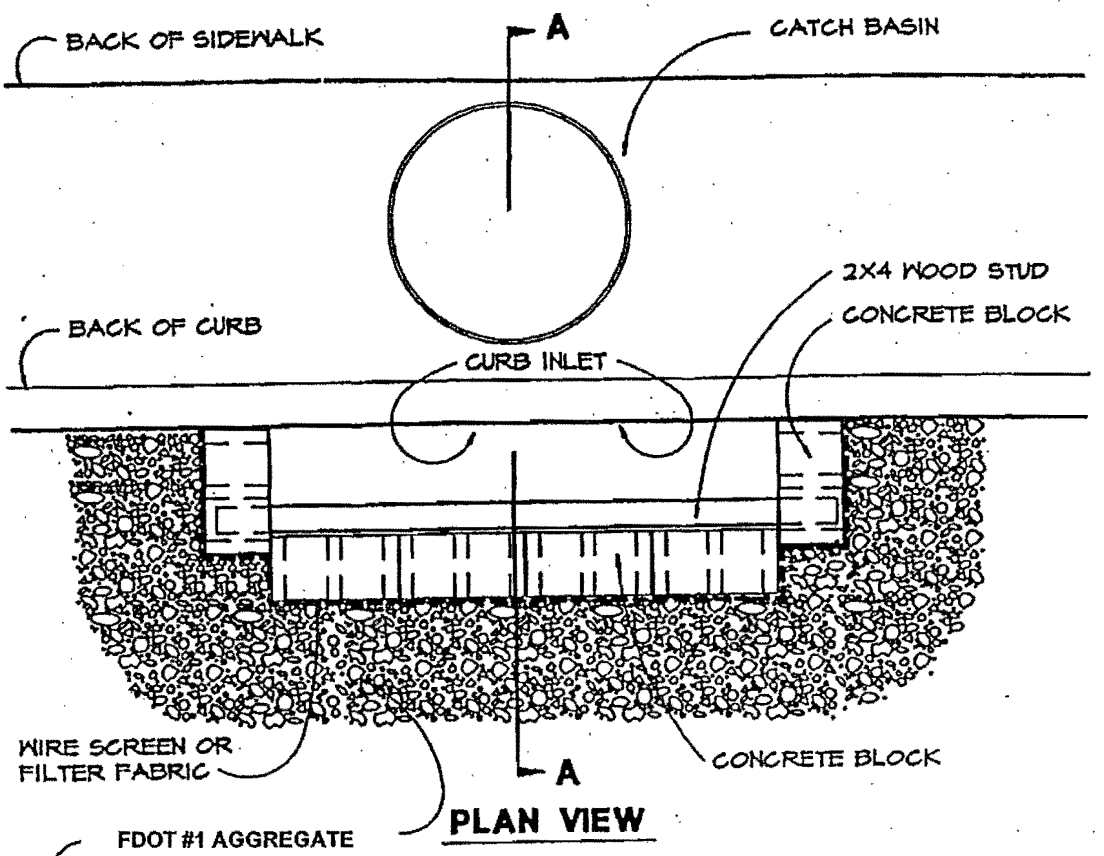
Side Elevation

SPECIFIC APPLICATION

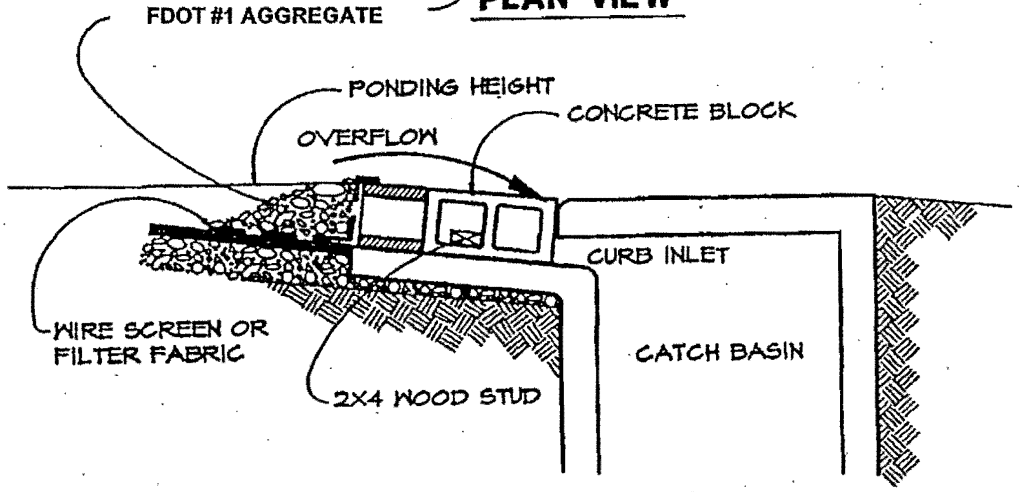
THIS METHOD OF INLET PROTECTION IS APPLICABLE TO CURB INLETS WHERE A STURDY, COMPACT INSTALLATION IS DESIRED. EMERGENCY OVERFLOW CAPABILITIES ARE MINIMAL, SO EXPECT SIGNIFICANT PONDING WITH THIS MEASURE.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: GRAVEL CURB INLET SEDIMENT FILTER WITH OVERFLOW WEIR	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 1-2-2000		M-24



PLAN VIEW



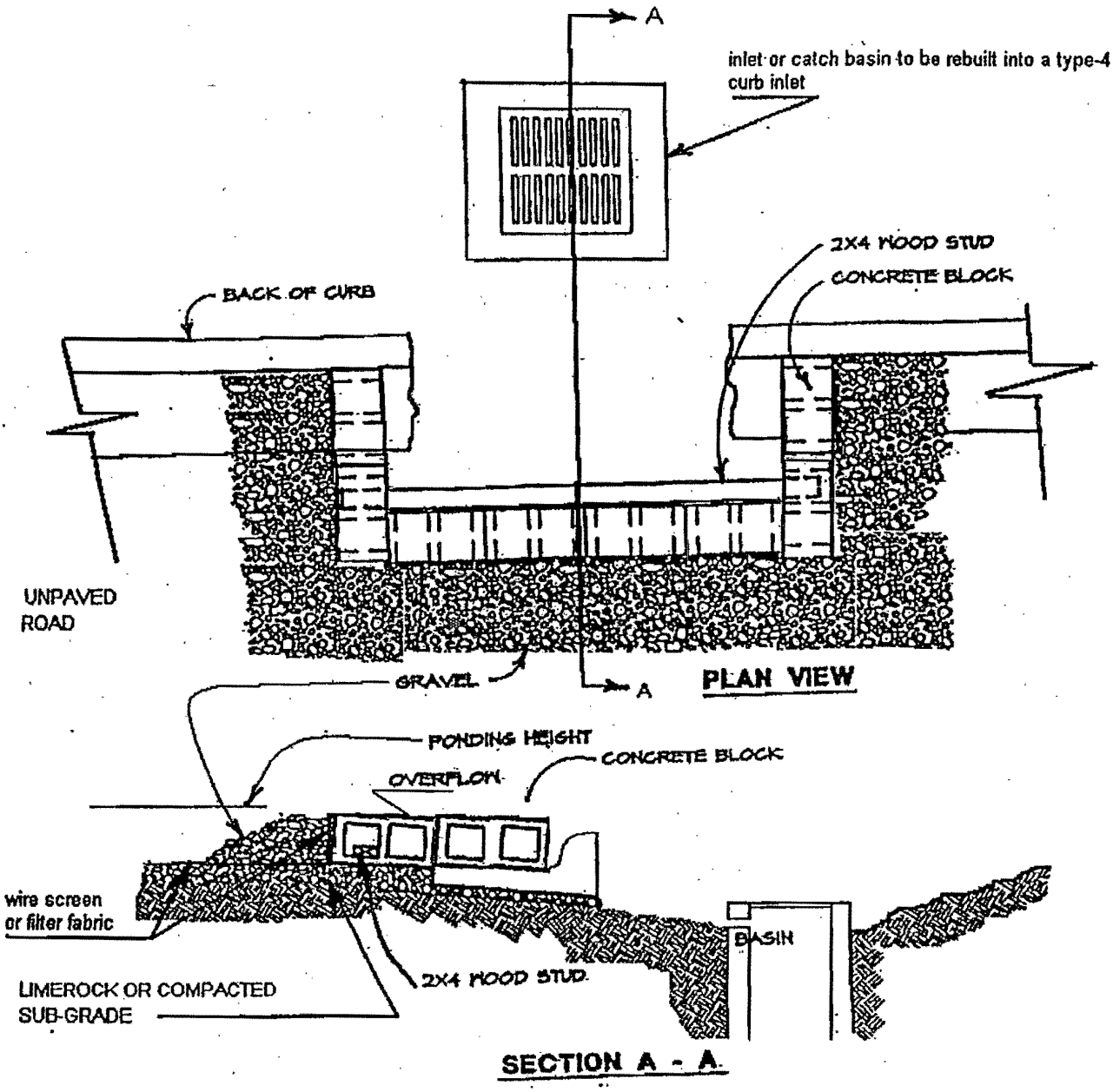
SECTION A - A

NOTES:

1. USE BLOCK AND GRAVEL TYPE SEDIMENT BARRIER WHEN CURB INLET IS LOCATED IN GENTLY SLOPING STREET SEGMENT, WHERE WATER CAN POND AND ALLOW SEDIMENT TO SEPARATE FROM RUNOFF.
2. BARRIER SHALL ALLOW FOR OVERFLOW FROM SEVERE STORM EVENT.
3. INSPECT BARRIERS AND REMOVE SEDIMENT AFTER EACH STORM EVENT. SEDIMENT AND GRAVEL MUST BE REMOVED FROM THE TRAVELED WAY IMMEDIATELY.

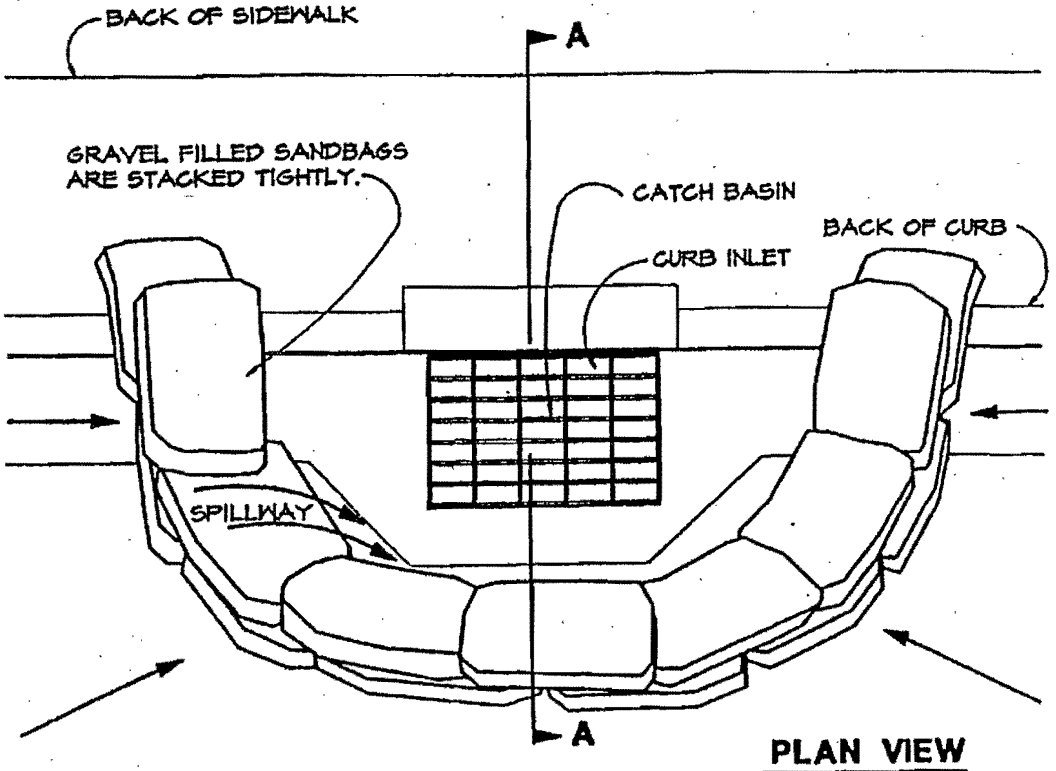
CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: BLOCK AND GRAVEL CURB INLET SEDIMENT BARRIER	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 1-2-2000		M-25

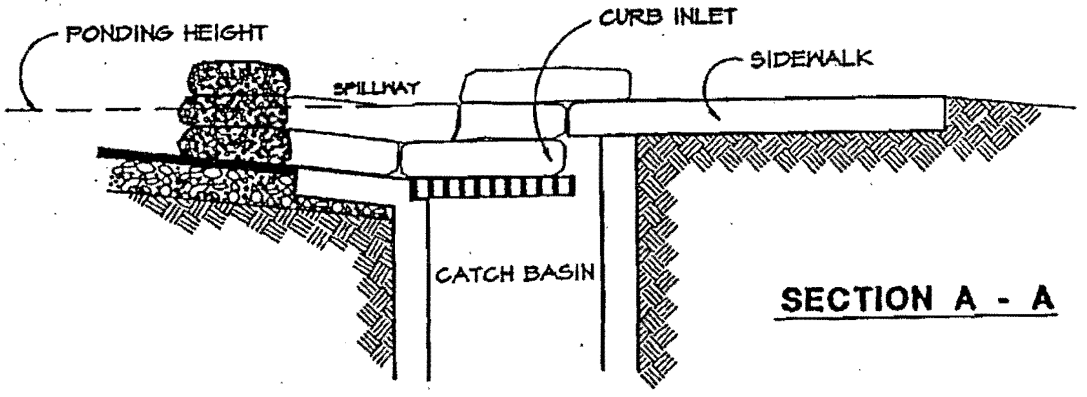


CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: BLOCK AND GRAVEL CURB INLET SEDIMENT BARRIER CONSTRUCTION PHASE	REVISIONS :	SHEET NO. M-26
PUBLIC WORKS DIRECTOR	DATE 1-2-2000		



PLAN VIEW



SECTION A - A

NOTES:

1. PLACE CURB TYPE SEDIMENT BARRIERS ON GENTLY SLOPING STREET SEGMENTS, WHERE WATER CAN POND AND ALLOW SEDIMENT TO SEPARATE FROM RUNOFF.
2. SANDBAGS, OF EITHER BURLAP OR WOVEN GEOTEXTILE FABRIC, ARE FILLED WITH GRAVEL, LAYERED AND PACKED TIGHTLY.
3. LEAVE ONE SANDBAG GAP IN THE TOP ROW TO PROVIDE A SPILLWAY FOR OVERFLOW.
4. INSPECT BARRIERS AND REMOVE SEDIMENT AFTER EACH STORM EVENT. SEDIMENT AND GRAVEL MUST BE REMOVED FROM THE TRAVELED WAY IMMEDIATELY.

CITY OF CAPE CORAL
ENGINEERING DESIGN STANDARD

APPROVED:	TITLE: CURB INLET SEDIMENT BARRIER BURLAP BAGS	REVISIONS :	SHEET NO.
PUBLIC WORKS DIRECTOR	DATE 1-2-2000		M-27

Notice:

Those sections identified as *Utilities (Water, Sewer, Irrigation)*, "U-1" thru "U-66", are superseded by the design standards provided during the Utility Expansion Project under contract PW052698-45, generated by Brown & Root Services.

If there are any questions regarding these items, please contact the Utility Expansion Division at 574-0730.

APPENDIX #1

ADMINISTRATIVE CODE
BOARD OF COUNTY COMMISSIONERS

CATEGORY: TRANSPORTATION AND TRAFFIC MANAGEMENT	CODE NUMBER: AC-11-4
TITLE: TURN LANE POLICY	ADOPTED: 10/19/88
	AMENDED: 10/16/91 3/24/98
	ORIGINATING DEPARTMENT: TRANSPORTATION

PURPOSE/SCOPE:

GENERAL

I. SCOPE

Deceleration, left and right turn lanes are desirable for the safe execution of speed change maneuvers and for storage and protection of left and right turning vehicles. These additional lanes for exit or entrance maneuvers shall be provided in accordance with County Design Standards herein. The pavement width and cross slopes of such lanes shall meet minimum requirements; however, special designs may be allowed when deemed necessary by the Director of the Division of Transportation for County maintained facilities and the Director of the Division of Development Services for privately-maintained facilities. Shoulders and recovery areas should be provided in accordance with the same requirements for other travel lanes; wherever possible.

It should be realized that deceleration, left and right turn lanes constitute an integral part of the geometric design of streets and highways and shall be included in the design for all new and replacement construction projects. At times, deceleration, left and right turn lanes may need to be installed at an existing intersection or access point to improve the existing or outdated design, if and when a traffic analysis shows that the LOS is being degraded by the proposed project traffic, or the turning movements at the intersection are being created at the intersection by the proposed project's traffic. This Policy addresses the warrants and design features for both cases.

POLICY/PROCEDURE:

II. POLICY AND PROCEDURE

Deceleration, left and right turn lanes shall be provided at all intersections and/or access points on county-maintained and privately-maintained facilities as required by this policy. Deceleration, left and right turn lane requirements shall not apply to a single family residence, a duplex residence, or two (2) family residence. When an existing development increases trip generation by expanding facilities or by change in use, a one-time deviation may be granted whereby only the increased trip generation is considered in determining if the warrants for requiring deceleration, left and right turn lanes are satisfied providing such deviation does not create a new or increased existing hazard which is detrimental to the health, safety and welfare of the traveling public.

This policy shall not be used to deny access to county maintained facilities for property which otherwise has the right of access; and for which it is not possible to provide deceleration, left and right turn lanes without acquiring additional Right-of-way (ROW) beyond the limits of the subject property. Nothing in this policy shall be construed to place an obligation upon the County to permit left turn lanes into or out of any development via either any existing or proposed street or access point driveway from any street or highway facility where the Director of the Division of Transportation or the Director of the Division of Development Services (hereinafter referred to as the "Directors") has determined it is not in the best interests of the health, safety and general welfare of the traveling public to allow such left turning movement.

Turn lane and deceleration requirements on state maintained facilities shall be in accord with policies and standards of the Florida Department of Transportation (FDOT) as directed by the FDOT. However, the Directors will confer with appropriate FDOT officials on the applicability and use of these requirements in each case of a development connecting to this system.

III. CLASSIFICATION, FUNCTION AND WARRANTS

A. Classification and Function

Deceleration, left and right turn lanes serve more than one (1) purpose, but may be generally classified according to their main function as follows:

1. Deceleration Lane(s)

The primary function of a deceleration lane is to provide a safe travel path and sufficient distance for exiting vehicles to decelerate from the operating speed on the through lanes of a roadway prior to exiting from the facility.

2. Turn Lane(s)

a. Left Turn

The primary function of a left turn lane is to provide a protected area separated from the flow of through traffic in the same direction where left turning vehicles can slow to a stop and wait until a suitable gap occurs or is provided in the opposing flow of traffic to allow the turning maneuver to be safely completed. A secondary function is to eliminate the delay and congestion which would affect the through traffic movement in the same direction while the left turning vehicles slowed down and waited for a safe and adequate gap in the opposing flow of traffic to complete the turning maneuver.

b. Right Turn

The primary purpose of a right turn storage lane is to provide a protected area separated from the flow of through traffic in the same direction where right turning vehicles can slow to turning speed or stop and wait until the turning maneuver can be safely completed. A secondary purpose is to eliminate the delay and congestion that would occur for through traffic moving in the same direction while turning vehicles slowed down and completed the right turn movement.

B. Warrants

The need for deceleration and turn lanes are generally determined by the following factors:

- Street classification of any particular street or road as identified in the adopted County administrative code entitled "County Road Functional Classification Map and List".
- Posted Roadway Speed
  - a. High speed (45 miles per hour (mph) or greater)
  - b. Intermediate speed (35 or 40 mph)
  - c. Low speed (30 mph or less)

- Number of Turning Movements during the Peak Hour
- Opposing and same direction peak hour through volumes.
- Intersection Sight Distance
- Access Control
- Traffic Control

IV. DECELERATION AND LEFT TURN LANES

As defined in section III.A 1 and 2.a, a deceleration and left turn lane will be required when any two (2) or more of the following warrants are satisfied:

A. Arterial Street

1. Posted speed limit of the arterial street is equal to or greater than thirty-five (35) mph and the peak hour left turning movement is ten (10) or more as conditioned herein.

2. Estimated two-way peak season, peak hour through volume is equal to or greater than 500 vehicles per hour and the number of left turning movements from the arterial is equal to or greater than 15 at through volume = 500 to 599; 14 at through volume = 600 to 699; 13 at through volume = 700 to 799; 12 at through volume = 800 to 899; 11 at through volume = 900 to 999; or 10 at through volume = 1000 or more. Two-way peak season, peak hour volumes to be derived from the AADT estimates in the most recent Lee County Traffic Count Report, as adjusted using the peak season and peak hour factors from the nearest appropriate permanent count station. The volumes should also be adjusted to the appropriate horizon year per the TIS requirements.

3. Available Sight Distance

   for left turning vehicles to observe approaching traffic or for approaching traffic moving in either direction to observe the left turning vehicle is less than the value shown Table A-1 for the posted speed of the arterial street.

4. Arterial street has been designated as a controlled access facility by the BOCC.

5. Traffic Control

   of the intersecting street or access point connection is by a traffic signal.

B. Collector Street

1. Posted speed limit of the collector street is equal to or greater than thirty-five (35) mph and the peak hour left turning movement is twenty (20) or more as conditioned herein.

2. Number of Left Turning Movements

   (a) On multi-lane collector facilities the number of left turning vehicles from the collector roadway is equal to or greater than twenty (20) during either the A.M. or P.M. peak hour of the collector street.

   (b) On two (2) lane two way collectors the estimated two-way peak season peak hour through volume is equal to or greater than 500 vehicles per hour and the number of left turning movements from the collector is equal to or greater than 25 at through volume = 500 to 599; 24 at through volume = 600 to 699; 23 at through volume = 700 to 799; 22 at through

volume = 800 to 899; 21 at through volume = 900 to 999 or 20 at through volume = 1000 or more, Two-way peak season peak hour volumes to be derived from the AADT estimates in the most recent Lee County Traffic Count Report (or developer counts if County counts not available), as adjusted using the peak season and peak hour factors from the nearest appropriate permanent count station. The volumes should also be adjusted to the appropriate horizon year per the TIS requirements.

3. Available Sight Distance

for left turning vehicles to observe approaching traffic or for approaching traffic moving in either direction to observe the left turning vehicle is less than the value shown in Table A-1 for the posted speed limit of the collector street.

4. Traffic Control of

the intersecting street or access point connection is a traffic signal.

C. Local Streets

1. Posted speed limit on the local street is equal to or greater than thirty (30) mph and the peak hour left turning movement is sixty (60) or more as conditioned herein.

2. Number of Left Turning Movements

(a) On multi-lane facilities the number of left turning vehicles from the local street exceeds one hundred (100) during either A.M. or P.M. peak hour of the local street.

(b) On two (2) lane two way facilities the number of left turning vehicles from the local street exceeds sixty (60) during either the A.M. or PM. peak hour of the local street and the opposing through traffic volume exceeds five hundred (500) vehicles during either the A.M. or P.M. peak hour of the local street.

3. Available Sight Distance

for left turning vehicles to observe approaching traffic or for approaching traffic moving in either direction to observe the left turning vehicle is less than the value shown in Table A-1 for the posted speed limit of the local street.

5. Traffic Control of

the intersecting street or access point connection is a traffic signal.

D. Separate left turn lanes are required on an intersecting street or access point connection when any two (2) or more of the following warrants are satisfied:

1. Intersection/Connection to Arterial Streets.

(a) Posted speed limit of the intersecting street or access point connection is equal to or greater than forty five (45) mph.

(b) When the Number of left turning vehicles from the intersecting street or access point connection is equal to or greater than thirty (30) vehicles during either A.M. or P.M. peak hour of the arterial street.

(c) Arterial street which is being entered has been designated as a controlled

access facility by the BOCC.

(d) Traffic Control

of the intersecting street or access point connection is a traffic signal.

2. Intersection/Connection to Collector Street

(a) Posted speed limit of the intersecting street or access point connection is equal to or greater than thirty five (35) mph.

(b) Number of left turning vehicles from the intersecting street or access point connection is equal to or greater than sixty (60) vehicles during either the A.M. or P.M. peak hour of the collector street.

(c) Traffic Control

of the intersecting street or access point connection is a traffic signal.

3. Intersection/Connection to Local Street

(a) Posted speed limit of the intersecting street or access point connection is equal to or greater than thirty (30) mph.

(b) Number of left turning vehicles from the intersecting street or access point connection is equal to or greater than ninety (90) vehicles during either the A.M. or P.M. peak period of the local street.

(c) Traffic Control

of the intersecting street or access point connection is a traffic signal.

V. DECELERATION AND RIGHT TURN LANES

As defined in Section III. A. 1 and 2. b., a deceleration and right turn will be required when any two (2) or more of the following warrants are satisfied:

A. Arterial Street

1. Posted speed limit of the arterial street is equal to or greater than thirty-five (35) mph.

2. Number of right turning movements from the arterial street is equal to or greater than thirty (30) during either the A.M. or P.M. peak hour of the arterial street.

3. Available Sight Distance

of a right turning vehicle to be seen by through traffic traveling in the same direction is less than the value shown in Table A-1 for the posted speed limit of the arterial street.

4. Arterial Street has been designated as a controlled access facility by the BOCC.

5. Traffic Control of the

intersecting street or access point connection is a traffic signal.

B. Collector Street

1. Posted speed limit of the collector street is equal to or greater than thirty five (35) mph.

2. Number of right turning movements from the collector street is equal to or greater than forty-five (45) during either the A.M. or P.M. peak hour of the collector street.

3. Available Sight Distance

   for a right turning vehicle to be seen by through traffic traveling in the same direction is less than the value shown in Table A-1 for the posted speed limit of the collector street.

4. Traffic Control of the

   intersecting street or access point connection is a traffic signal.

C. Local Street

1. Posted speed limit of the local street is equal to or greater than thirty (30) mph.

2. Number of right turning movements from the local street is equal to or greater than sixty (60) during either the A.M. or P.M. peak hour of the local street.

3. Available Sight Distance

   for a right turning vehicle to be seen by through traffic traveling in the same direction is less than the value shown in Table A-1 for the posted speed limit of the local street.

4. Traffic Control of the

   intersecting street or access point connection is a traffic signal.

D. Separate Right Turn Lanes are required on an intersecting street or access point connection when any two (2) or more of the following warrants are satisfied: Separate right turn lanes will not be required if the street being intersected or connected to is operating at Level of Service "C" or better on a peak season, peak hour basis.

1. Intersection/Connection to Arterial Street

   (a) Posted Speed Limit of the intersecting street or access point connection is equal to or greater than forty five (45) mph.

   (b) Number of right turning vehicles from the intersecting street or access point connection is equal to or greater than sixty (60) during either the A.M. or P.M. peak hour of the arterial street.

   (c) Arterial street which is being entered has been designated as a controlled access facility by the BOCC.

   (d) Traffic control of the

   intersecting street or access point connection is by a traffic signal.

2. Intersection/Connection to Collector Street

   (a) Posted speed limit of the intersecting street or access point connection is equal to or greater than thirty five (35) mph.

(b) Number of right turning movements from the intersecting street or access point connection is equal to or greater than ninety (90) during either the A.M. or P.M. peak hour of the collector street.

(c) Traffic Control of the

lintersecting street or access point connection is a traffic signal.

3. Intersection/Connection to Local Street

(a) Posted speed limit of the intersecting street or access point connection is equal to or greater than thirty (30) mph.

(b) Number of right turning movements from the intersecting street or access point connection is equal to or greater than one hundred and twenty (120) during either the A.M. or P.M. peak hour of the local street.

(c) Traffic Control of the

intersecting street or access point connection is a traffic signal.

DESIGN

I. Deceleration lanes consist of two distinct sections. The transition section is the distance needed for vehicles to achieve transfer from the through lane to the turn lane. The deceleration section is the distance needed to slow to a stop.

FDOT has tabulated standards for these distances, but those apply to typical rural highways. Under county urbanized conditions drivers begin deceleration immediately upon entry into the transition section and arrive at the deceleration section at lower speeds than the posted speed. Under urbanized conditions drivers utilize deceleration rates of 12 ft.per sec. per sec. which requires shorter deceleration lengths than 10 ft. per sec. per sec. which is typical of rural conditions. The table below represents a set of calculated County standards which differ from the FDOT standards except for those roads with a posted speed of 50 mph or above. County standards shall be used on County roads, except controlled access roadways which will utilize the FDOT standards. FDOT will specify requirements on State Highways. FDOT standards are found in Index #301.

Design Speed	Trans.	Decel	Total
30	75	50	125
35	80	60	140
40	90	75	165
45	105	95	200
50		See FDOT Index #301	
55		See FDOT Index #301	

The initial 50 feet of the transition length shall consist of pavement taper and the remaining length shall be the full width of the deceleration lane.

II. DESIGN OF LEFT AND RIGHT TURN LANES

Where left and right turn lanes are required, storage lanes shall be used in conjunction with deceleration lanes and their lengths shall be added to the required deceleration length. Turn lanes for right turns shall generally conform to the configuration shown in Fig. FB1. Turn lanes for left turns shall generally conform to the configuration shown in Fig. FB-2.

The following nomographs may be used for computing left turn storage lane length. Figure N-1 is used for storage lane lengths at unsignalized intersections. Figure N-2 is used for storage lane lengths at signalized intersections.

For right turn lane storage length, use opposing left turn volume in N-1.

If a "free flow" right turning movement will be made into an added right turn lane from the right turn lane, the storage length may be omitted. The "free flow" condition shall be documented in the Traffic Impact Statement (TIS) and/or the Traffic Impact Mitigation Plan (TIMP).

Turning movement calculations shall be in accordance with the procedures outlined in the Traffic Impact Statement Guidelines.

III. WIDTH OF TURN LANES

Turn lanes must be of sufficient width to provide safe usage for prevailing speeds on the road being exited. The following minimum widths are required:

Posted Speed	Minimum Turn Lane Width
45 mph or greater	12 ft.
less than 45 mph	11 ft.

IV. OVERLAPPING TURN LANES

Circumstances can result in the overlap or close spacing (100 feet or less) of turn lanes. If left unmitigated, this phenomenon can create undesirable shifts in alignment, or "jogs". These jogs not only create operational problems for the turn lanes, but can negatively impact the adjacent through traffic by creating unnecessary side friction. Mitigative measures shall be taken, which consist of extending the full pavement width between the adjacent turn lanes, thereby creating a continuous turn lane. Advance signing and pavement markings shall be required.

V. TURN LANES WHICH INTERSECT EXISTING ACCESS POINTS

Whenever a proposed turn lane or its taper intersects an existing access point, street or driveway to an adjacent property, the transition and deceleration segments shall be moved upstream of the existing access point, street or driveway a distance equal to the required deceleration lane and transition length. A full width lane shall be provided between the two (2) access points and the deceleration lane will serve both properties.

VI. LANE SHIFTS FOR LEFT TURN LANES

Through traffic lanes occasionally must be shifted from existing alignment to facilitate construction of left turn lanes because there may not be a median of sufficient width to accommodate a left turn lane of the required width. It is essential that through traffic be enabled to travel through at the posted speed limit. The approach taper of the through lane must be sufficient to accommodate this flow.

The lateral shift of the through lane must be equal to the width of the turn lane or it may be lessened by the amount the centerline can be shifted to the left in situations where that is an acceptable solution. The alternate lane shift arrangements are shown in Figure FB-3.

The following formula shall be used to determine the required length of the approach taper:

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

W = Lateral shift, ft
S = Posted speed, mph

It is not desirable to achieve complete lateral shift before beginning the taper into the transition portion of the turn

lane. This taper, sometimes known as the Bay Taper, and set at 50 feet, shall start at the point where 2/3 of the lateral shift has been achieved. This serves to shorten the overall length of the reconstructed area and minimize the tendency of left turn drivers to overlap the markings.

NOTE: Lane shift through a curve shall be based on the above, but may require additional transition.

DEVIATIONS

The Directors may grant a deviation from this policy in part or in whole after finding that any of the following conditions make compliance infeasible.

1. Roadway and driveway geometry does not permit the installation of a left or right turn lane, or dictates deviations from design standards; or
2. Right-of-way constraints do not permit the installation of a left or right turn lane, or dictate deviations from design standards; or
3. Existing topographic features would cause construction of a turn lane to be prohibitively expensive, or dictate deviations from design standards; or
4. Unusual roadway features would cause a turn lane to be detrimental to the health, safety and general welfare of the traveling public.

VARIANCES

Variances shall be applied for and processed in accordance with section 10-104 of the Land Development Code.

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FIGURE FB-1

RIGHT TURN LANE ELEMENTS

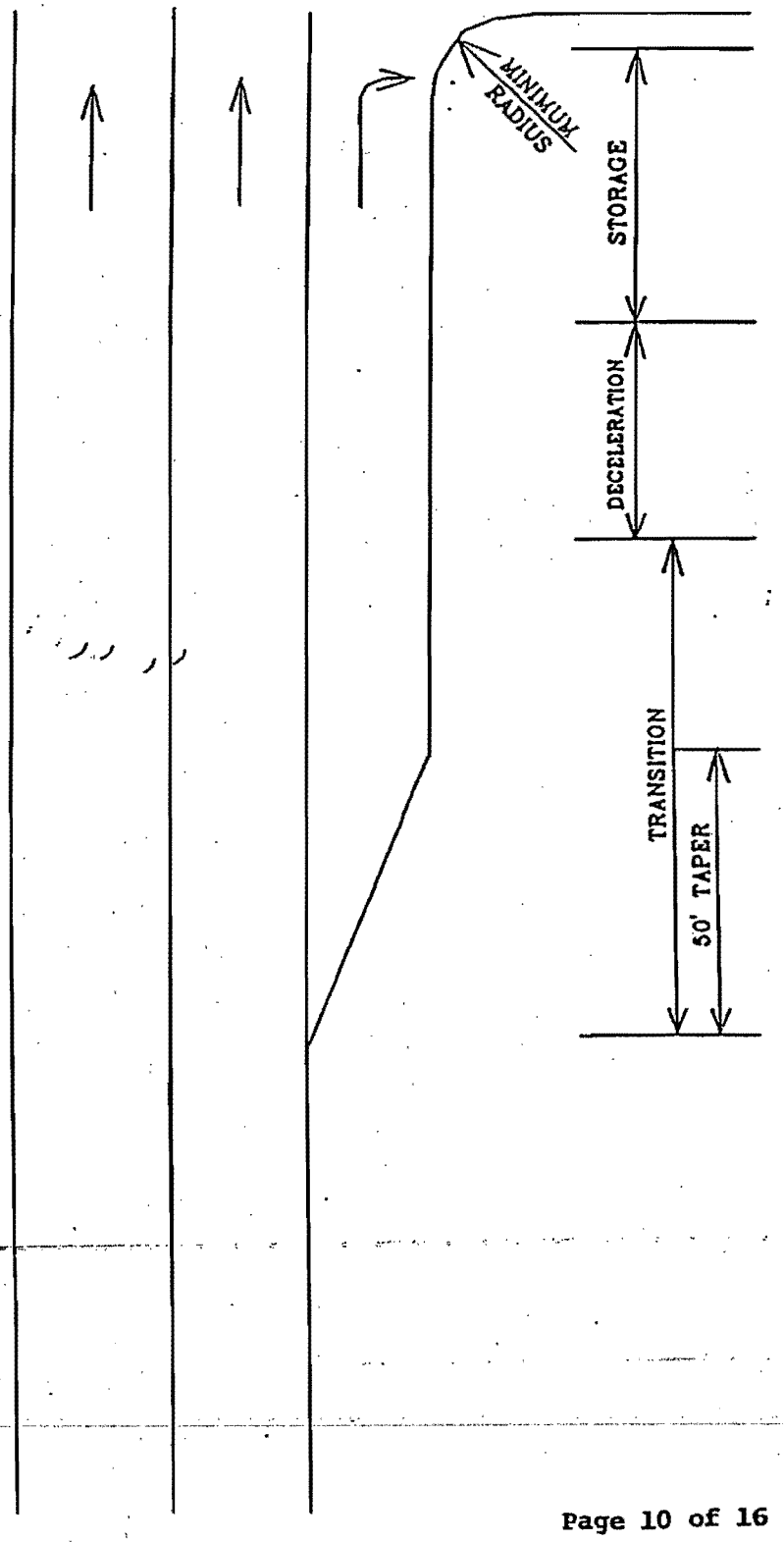


FIGURE FB-2

LEFT TURN LANE ELEMENTS

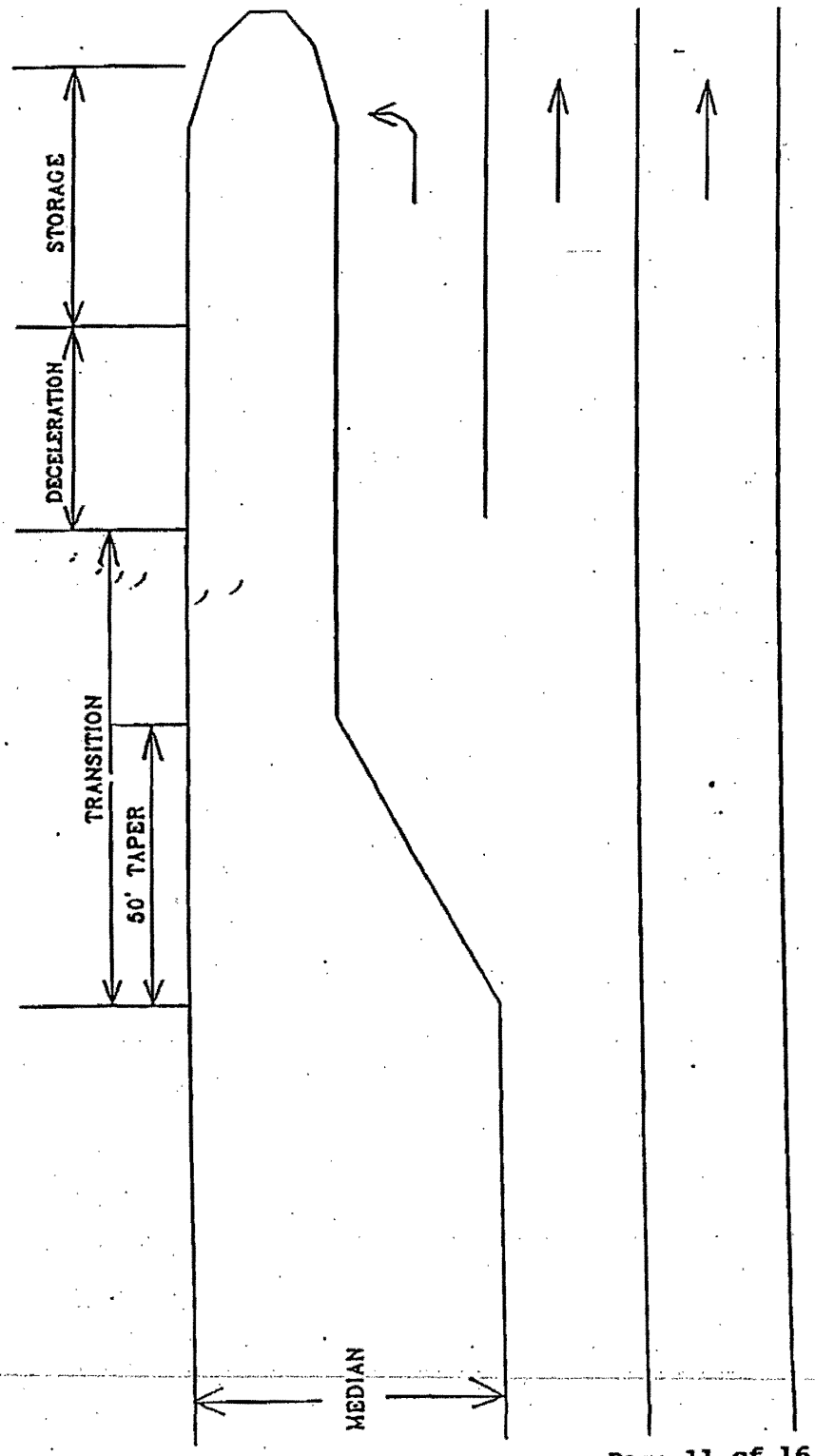
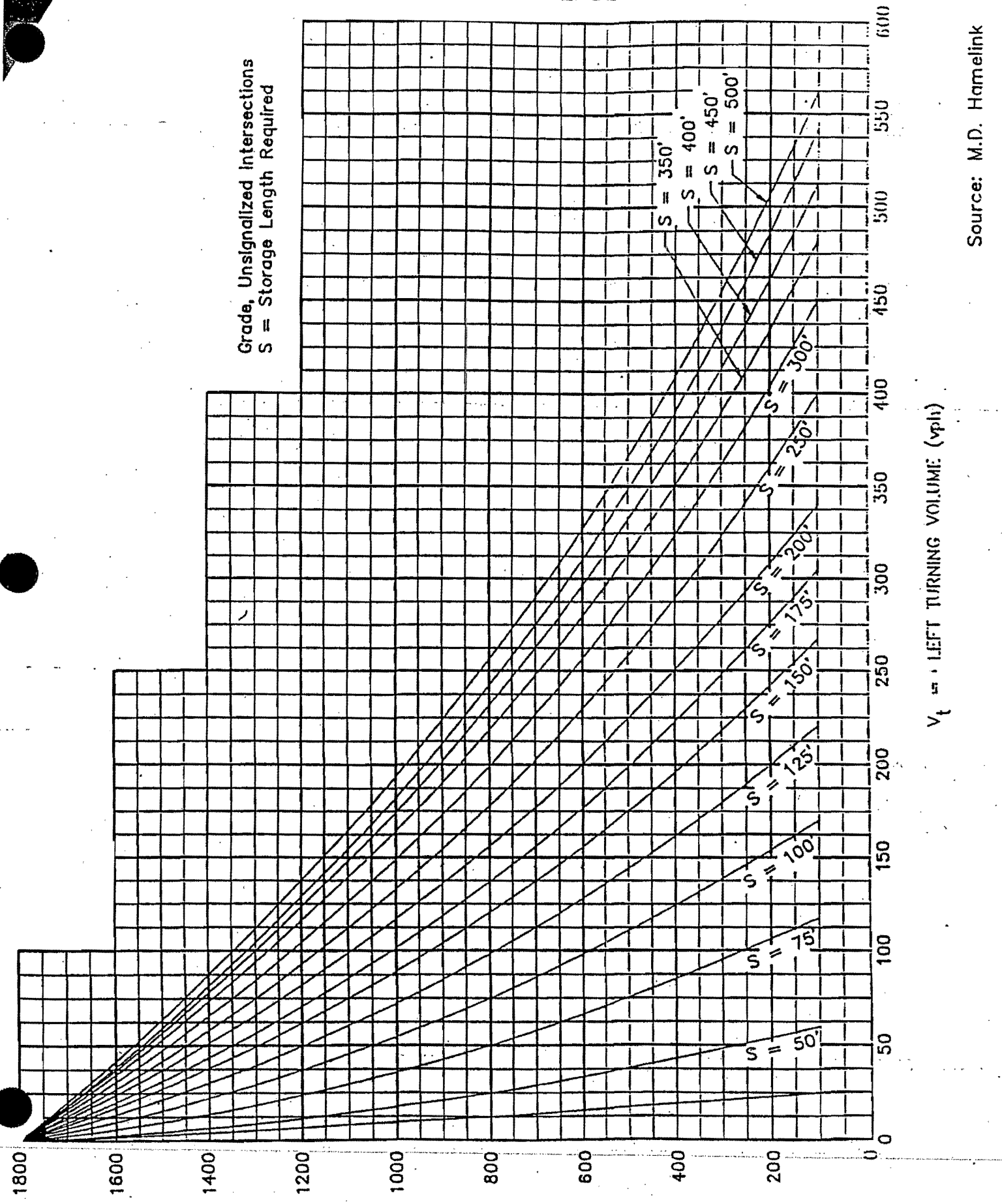


FIGURE N-1

LEFT-TURN STORAGE LENGTH
UNSIGNALIZED INTERSECTIONS



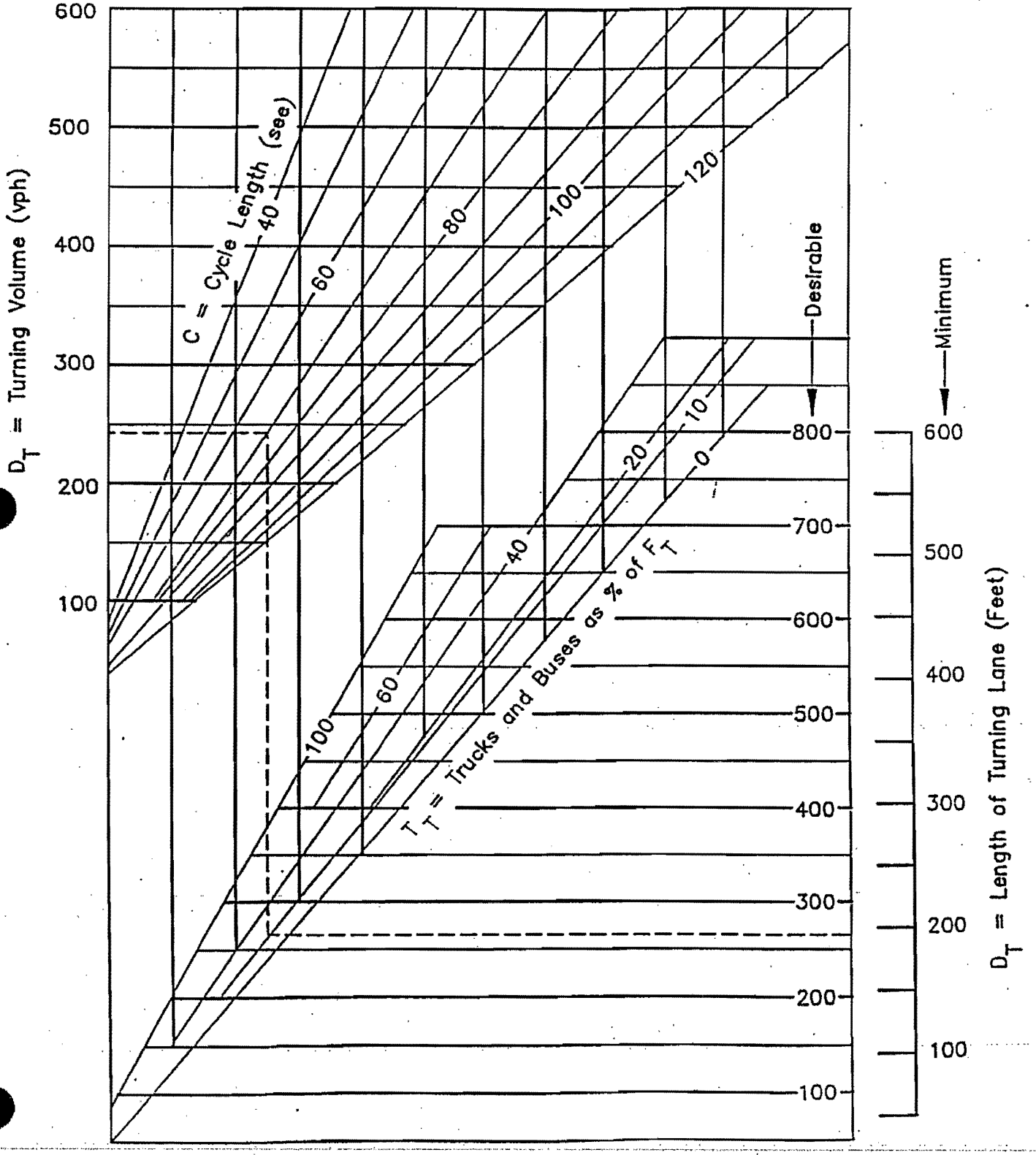
Source: M.D. Hamelink

FIGURE IV-2

LEFT-TURN STORAGE LENGTH
SIGNALIZED INTERSECTIONS

Desirable: 95% probability of storing all left-turn vehicles

Minimum: 90% probability



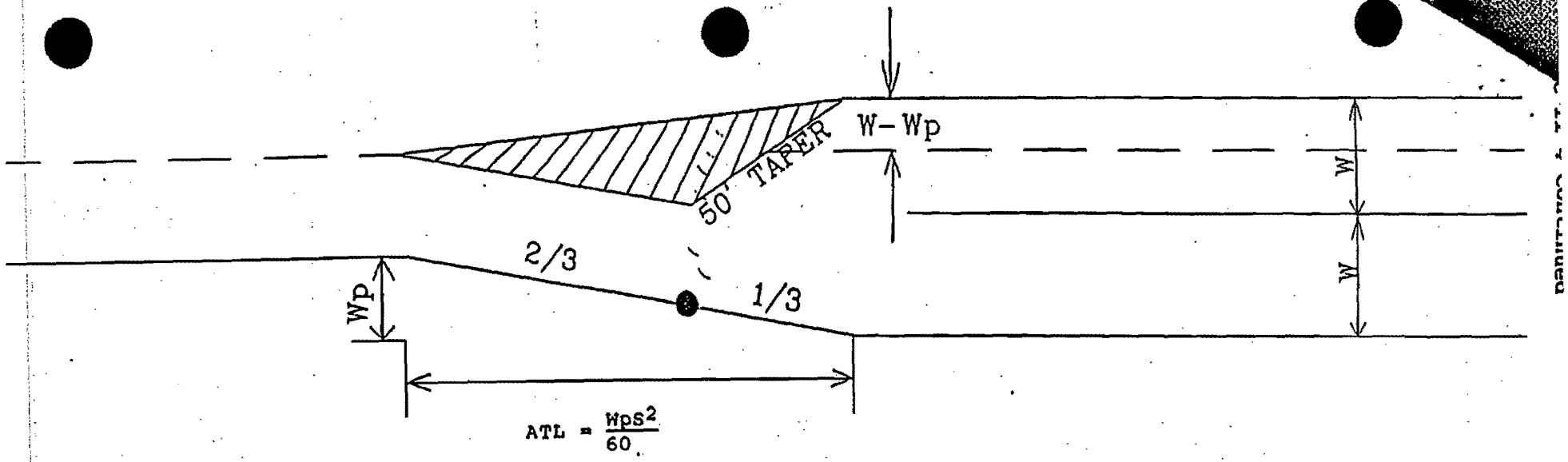
Source: Northwestern University Traffic Institute

FIGURE N-3

EXAMPLES SHOWING USE OF FIGURES N-1 AND N-2

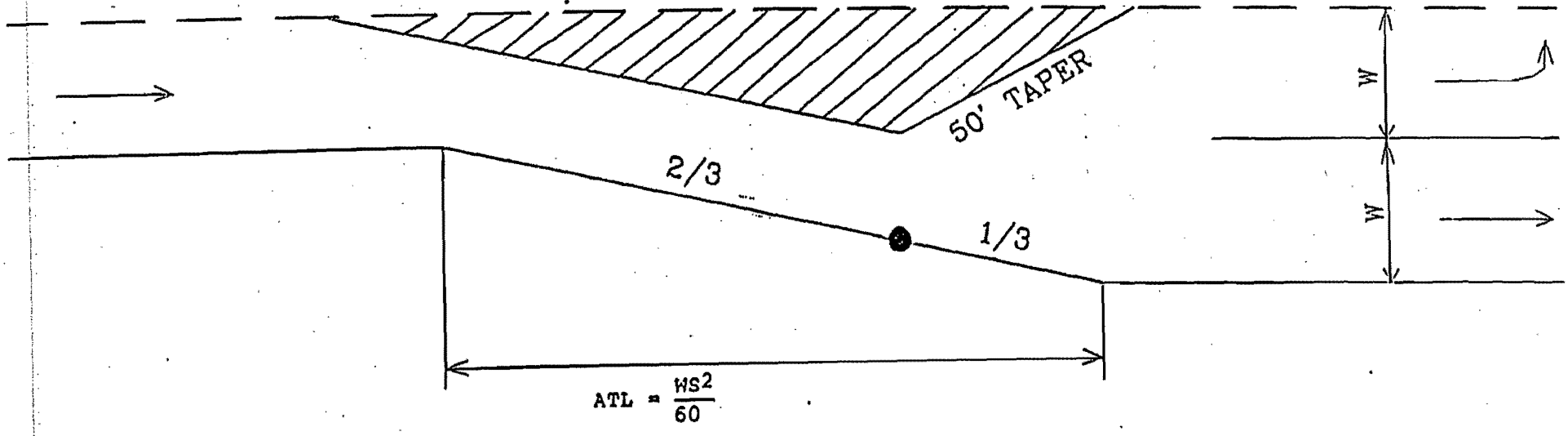
NOMOGRAPH N-1 FOR LEFT-TURN STORAGE AT NONSIGNALIZED INTERSECTIONS. THE NOMOGRAPH IS USED BY READING HORIZONTALLY FROM THE OPPOSING TRAFFIC VOLUME, V_o, ON THE VERTICAL AXIS AND READING VERTICALLY FROM THE LEFT-TURN VOLUME, V_t, ON THE HORIZONTAL AXIS AND LOCATING THE MINIMUM STORAGE LENGTH, S, AT THE POINT WHERE THE HORIZONTAL AND VERTICAL LINES CROSS. FOR EXAMPLE, 100 LEFT-TURNING VEHICLES PER HOUR, V_t, WITH AN OPPOSING THROUGH VOLUME, V_o, OF 950 V.P.H., WILL REQUIRE A MINIMUM STORAGE LENGTH OF ABOUT 150 FEET. SOURCE: M.D. HAMELINK [12].

NOMOGRAPH N-2 FOR A SINGLE-LANE LEFT-TURN STORAGE AT SIGNALIZED INTERSECTIONS. AS ILLUSTRATED, WITH A LEFT-TURN VOLUME OF 240 VEHICLES PER HOUR (V.P.H.), A 70-SECOND CYCLE, AND 10% TRUCKS, A STORAGE LENGTH OF ABOUT 260 FEET IS REQUIRED FOR DESIRABLE CONDITIONS AND ABOUT 200 FEET FOR A MINIMUM. THESE STORAGE LENGTHS WOULD ACCOMMODATE 10 OR 11 VEHICLES FOR THE DESIRABLE CONDITIONS AND ABOUT 8 FOR THE MINIMUM. THE FIGURE CAN BE USED TO ESTIMATE THE STORAGE LENGTH (EXCLUDING TAPER) OF A DOUBLE LEFT-TURN BAY BY DIVIDING BY 1.8. THUS, FOR THE DESIRABLE CONDITIONS, A DOUBLE LEFT-TURN BAY OF ABOUT 145 FEET (EXCLUDING TAPER) WOULD BE REQUIRED. SOURCE: NORTHWESTERN UNIVERSITY TRAFFIC INSTITUTE [26].



$$ATL = \frac{Wps^2}{60}$$

WITH CENTERLINE SHIFT



$$ATL = \frac{Ws^2}{60}$$

WITHOUT CENTERLINE SHIFT

TABLE A-1

SIGHT DISTANCE FOR APPROACH TO STOPS
(rounded values)

DESIGN ~~POSTED~~ SPEED (MPH)	20	30	40	50	60
STOPPING SIGHT DISTANCE					
Minimum (FT)	125	200	275	400	525
Desirable (FT)	200	250	375	475	650