ENGINEERING

DESIGN

CRITERIA

MANUAL

EROSION CONTROL
SUDIVISION REGULATIONS
STREETS & ROADS
STORM DRAINAGE
WATER & SEWAGE
LANDSCAPED SYSTEMS

N O T E

Additional copies of this manual
may be obtained, (at the current price)
by writing to

THE CITY ENGINEER
ENGINEERING DEPARTMENT
ROOM 100A CITY HALL
CITY OF SARASOTA
P.O. BOX 1058
SARASOTA, FLORIDA 34230-1058

E-mail: engineering@ci.sarasota.fl.us

(cut on this line)

If you desire to receive periodic revisions to this document, complete the following form and mail it to the above address.

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Name _____

Title _____

Company _____

Address _____

_____

E-mail Address _____

Phone No. (_____) _____Fax No. (_____) _____

March 2002 E.D.C.M. Copy #_____

AUTHORITY

THIS ENGINEERING DESIGN CRITERIA MANUAL WAS
AUTHORIZED BY THE CITY COMMISSION
OF THE CITY OF SARASOTA, FLORIDA
ON 17 JANUARY, 1989
BY ADOPTING ORDINANCE NUMBER 89-3278
ENACTING A NEW CHAPTER29.5, SARASOTA CITY CODE,
"SITE DEVELOPMENT-- ENGINEERING DESIGN CRITERIA"

1st UPDATE TO THIS MANUAL WAS
APPROVED BY THE CITY COMMISSION
ON 3 DECEMBER 2001
BY ADOPTING ORDINANCE NUMBER 02-4348,
AMENDING CHAPTER 29.5, SARASOTA CITY CODE
ADDING "SUBDIVISION REGULATIONS"

2nd UPDATE TO THIS MANUAL WAS
APPROVED BY THE CITY COMMISSION
ON MARCH 18, 2002
BY ADOPTING ORDINANCE NUMBER 02-4368,
AMENDING CHAPTER 29.5, SARASOTA CITY CODE
CREATING ENTIRE NEW DOCUMENT

ACKNOWLEDGMENT

CITY COMMISSION

Mayor Carolyn J. Mason

Vice Mayor Mary J. Quillin

Commissioner Richard Martin

Commissioner Lou Ann R. Palmer

Commissioner Mary Anne Servian

CITY ADMINISTRATION

Michael A. McNees, City Manager

V. Peter Schneider, Deputy City Manager

Dennis Daughters, PE, City Engineer / Director of Engineering

Timothy D. Litchet, Director of Building, Zoning & Code Enforcement

William G. Hallisey, Director of Public Works

Jane N. Robinson, Planning Director

RESPONSIBILITY

ENGINEERING DESIGN CRITERIA MANUAL

DEVELOPED BY

CITY OF SARASOTA

ENGINEERING DEPARTMENT

DENNIS DAUGHTERS, P.E.

CITY ENGINEER and

DIRECTOR OF ENGINEERING

PREPARED UNDER THE
DIRECT SUPERVISION OF:

[Official copy of this EDCM is located in the City's Engineering Department and is signed and sealed by Dennis Daughters, P.E.]

_____

DENNIS DAUGHTERS, P.E.
FLORIDA REG. NO. 33564

APPLICABILITY

The Engineering Design Criteria standards contained herein are minimum requirements for land development within the City of Sarasota. In addition to being required standards for all land development, these standards shall apply to all other forms of development under the jurisdiction of the City Engineer, including but not limited to subdivision development, right-of-way encroachment agreements, storm drainage improvements, erosion/siltation control systems, water lines, sewer lines and other utilities construction.

By reference, this Manual is incorporated as part of the Subdivision Ordinance as set forth in Chapter 31 of the City Code. Exceptions and/or conditional exceptions for subdivisions may be authorized by the Planning Board and/or City Commission and must be reflected in the planned unit development and/or the tentative map approval conditions.

PURPOSE

This Manual has been prepared by the Engineering Department to provide a guide for City Staff, Developers, and Engineers. Its primary purpose is to establish uniform practices and to ensure that the best information available is applied to project conditions. Although step-by-step procedures are often provided, careful consideration should always be given to site conditions, project requirements, and engineering experience to ensure that procedures are properly applied and adapted as necessary. This Manual neither replaces the need for professional engineering judgment nor precludes the use of information not presented herein.

This Manual has been developed specifically to address the requirements of the City of Sarasota. The user assumes full responsibility for determining the appropriateness of applying the information presented herein.

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ENGINEERING DESIGN CRITERIA MANUAL

PART 1

GENERAL

PART 1. GENERAL

Section A - Site Development Plan Preparation.

1. All site development plans shall be prepared under the direct supervision of and each printed sheet shall bear the signature and raised seal of the following, as applicable:

   a. A Professional Engineer, duly licensed to practice in the State of Florida pursuant to Chapter 471 of the Florida Statutes, or

   b. A Professional Surveyor and Mapper, duly licensed to practice in the State of Florida pursuant to Chapter 472 of the Florida Statutes, or

   c. A Registered Landscape Architect, duly licensed to practice in the State of Florida pursuant to Chapter 481 of the Florida Statutes.

2. Arrangement of the site development plan shall conform to Figure G-1 of this Engineering Design Criteria Manual. All sheets shall be 24" x 36" in size. The plan view shall be laid out such that north is to the right or top of the sheet. Stationing shall increase from left to right. A 5" x 3" blank space shall be located horizontally within 8 inches of the lower right-hand corner of the site development plan. The top of said space shall have the note "FOR CITY ENGINEER'S USE ONLY" imprinted therein.

3. Minimum information shown on the site development plans shall be as outlined herein in Figure G-2 through G-5, inclusive. Standard symbols as shown on Figures G-6 and G-7 shall be used.

4. Scale of the site development plans shall not exceed 1" = 20' horizontal and 1" = 1' vertical unless prior approval is obtained from the City Engineer.

5. The following notes shall be shown in **BOLD** print on the site development plan and shall be complied with:

   a. Contractor shall be responsible for obtaining both driveway and right-of-way construction permits from the City of Sarasota Engineering Department prior to any construction within the right-of-way.

   b. The worked embraced herein, within the right-of-way, shall be done in accordance with the "Special Provisions for Construction" of the City of Sarasota.

   c. Existing traffic control signs shall be removed, stored, relocated, and/or delivered to the City's Public Works Department, as determined by the City Engineer, as part of this project.

   d. Construction equipment is to be placed on construction site (private property) only. No street is to be utilized during construction for the purpose of storing material or equipment (unless otherwise permitted by the City Engineer).

   e. Construction of site development plan shall commence within one-year of City Engineer

certification or become invalid.

f. Sidewalks and curb & gutter shall be replaced within a maximum of two (2) weeks time of its removal, unless otherwise authorized by the City Engineer.

g. No trees and/or hedges shall be planted in drainage swales or in the filtration areas of attenuation basins that may create a negative effect on the attenuation facility, i.e., blocking flow and/or clogging infiltration systems.

h. An Encroachment Agreement is required to be approved by the City for any landscaping and/or non-franchise utilities within the right-of-way in accordance with the requirements of the Zoning Code.

i. All survey markers (both horizontal and vertical) within the general vicinity shall be continuously protected. Any markers disturbed or damaged shall be replaced by a Professional Surveyor and Mapper and shall be certified to the City Engineer prior to release of project Certificate of Occupancy.

Section B - Site Development Plan Processing and Progress of Work.

1. Initial submittal of plans in support of site development permit approval for comment and certification of Code compliance shall be made to the Building and Zoning Department and shall consist of four (4) sets of prints. Upon completion of the review process and any necessary correction(s), six (6) sets of revised prints of on-site and off-site development plans, shall be submitted to the Building, Zoning and Code Enforcement Department for City Engineer's certification of Code compliance. The off-site development plan submittal shall be accompanied by an Engineer's estimate of the cost of the off-site development, to be used to establish bond requirements. Five of the six certified sets of prints will be returned to the Building and Zoning Department.

2. Refer to the City Code, Chapters 30 & 33, and the Zoning Code Articles I & V, regarding fees and agreements.

3. A Faithful Performance Guarantee for any off-site development in an amount equal to 115% of the Engineer's estimate shall be posted with the City, or the work completed to the satisfaction of the City Engineer, prior to release of Certificate of Occupancy of any portion of any development. The City Manager may waive posting of the faithful performance guarantee for non-subdivision developments under $50.000.00 construction cost.

4. Rights-of-way and easements shall be dedicated prior the issuance of to any Certificate of Occupancy, unless such dedication required earlier by the City Engineer, by the terms of the Zoning Code or by conditions contained in the Development Approval as defined in the Zoning Code.

5. Any abandoned driveways shall be removed and full height curb and sidewalk replaced thereto, as required by the City Engineer.

6. Final Approval: Upon completion of development, an inspection officer designated by the City Engineer shall inspect the site for compliance with the approved plan. One set of reproducible mylar plans for off-site development and one sent of signed and sealed prints, shall be submitted to the City Engineer, designating the "As-Built condition".

   Prior to the issuance of a Certificate of Occupancy, the developer's Engineer-of-Record shall furnish to the City Engineer a certificate of compliance stating that the project has been constructed in conformity with the plans as certified by the City Engineer.

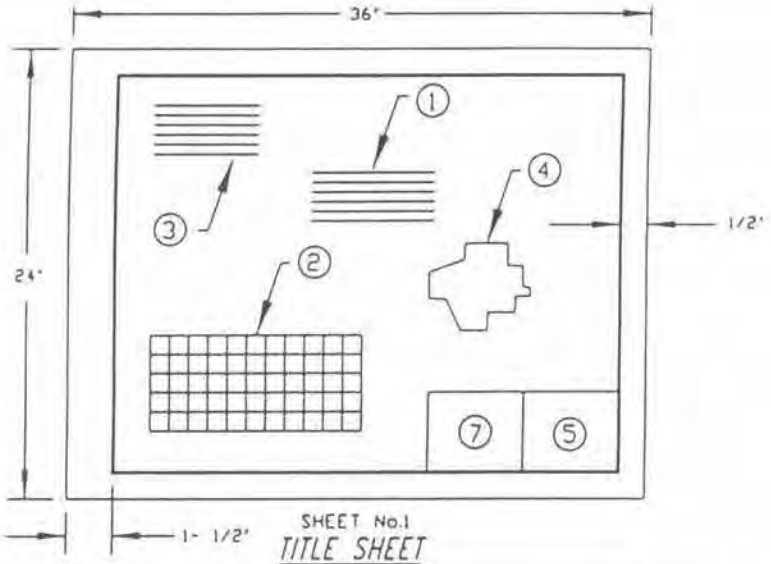
   The format of this "Certificate of Completion" is shown as Figure G-8, Page 1-11 of this Manual.

CITY OF SARASOTA

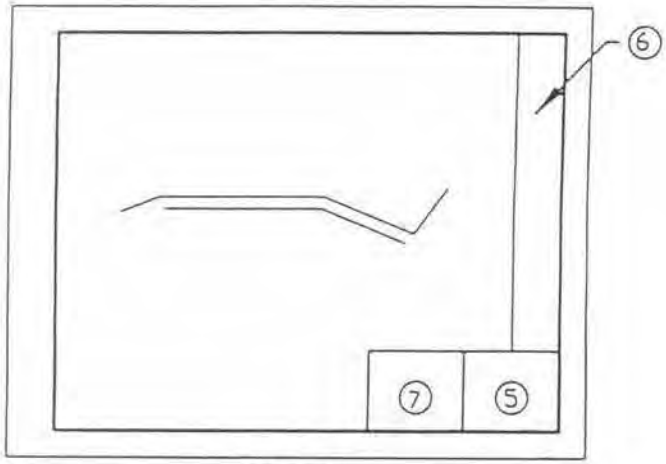
MARCH 2002

1-4

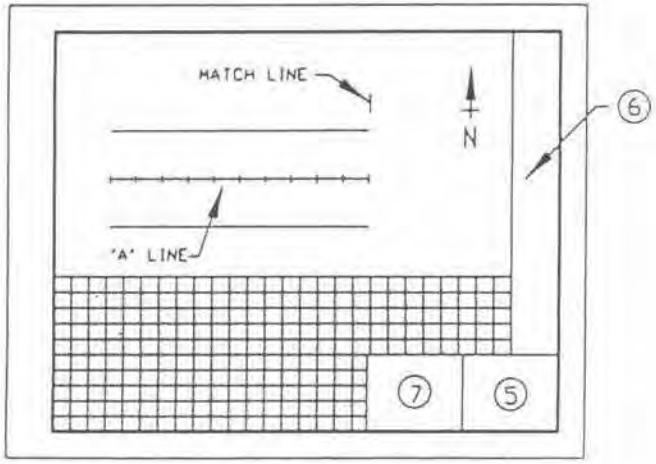
FIG. G-1



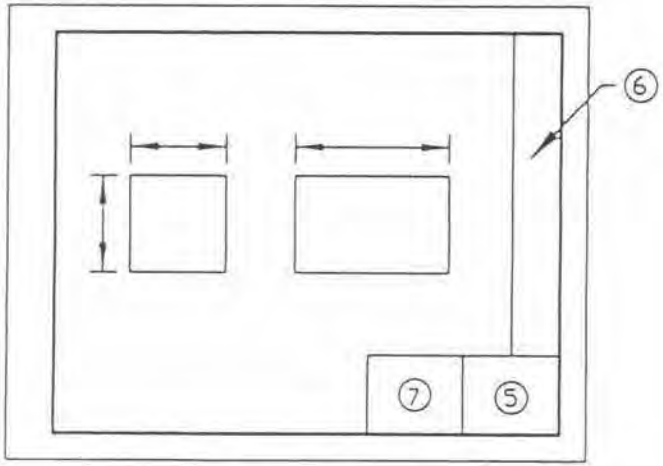
SHEET No.1
TITLE SHEET



SHEET No.2
TYPICAL DETAILS



SHEET No.3
PLAN & PROFILE (same sheet)



SHEET No.4
MISC. CONST. DETAILS

① PROJECT TITLE
② ZONING DATA (as rqd.)
③ INDEX OF SHEETS
④ LOCATION MAP
⑤ TITLE BLOCK
⑥ TITLE BLOCK (alternate location)
⑦ LEAVE BLANK (5" x 3" Min.)

LAYOUT STANDARDS FOR DEVELOPMENT PLANS

N.T.S.

MINIMUM PLAN INFORMATION

1. TITLE SHEET

Project Title and Vicinity Map (Location within city) -

Index of Sheets, including Architect, Engineer, Surveyor -

Names & Addresses of Owner, Architect, Engineer -

Flood Zone, (from FEMA's Flood Insurance Rate Map) -

Special Flood Zone, (Philippi Creek or Whitaker Bayou) -

Proposed Finished Floor Elevation -

Total Land Area and Total Impervious Area -

2. BOUNDARY AND TOPOGRAPHIC SURVEY

(May be two separate sheets, showing :)

Buildings and Misc. structures, showing existing Finished Floor elevations -

Size, type and location of existing trees- fences -

Adequate spot elevations and/or contours based on City Datum and showing a minimum grid detail of 25 feet including 25 feet outside the perimeter of the property -

All ditches, canals, streams, storm sewers and/or any other waterway -

Size and type of water, sewer, electric, telephone, gas, cable system, utility lines, fire hydrants -

Street traveled way - Centerlines and edge of pavement & flowline elevations -

Sidewalk - Curb and gutter - Driveways - Existing traffic control signs -

Existing rights-of-way and easements - Street names -

Bearing and distance of property lines - Scale, north arrow, etc. -

Must be up-to-date (not more than 6 months prior to submittal) and be signed and sealed by a Professional Engineer or Professional Surveyor and Mapper licensed to practice in the State of Florida.

CITY OF SARASOTA **MINIMUM PLAN INFORMATION**

Fig. G - 2

MINIMUM PLAN INFORMATION
(CONTINUED)

3. **SITE DEVELOPMENT PLAN**

Proposed buildings w/ overhangs, awnings, etc., fences, miscellaneous structures -
Attenuation facilities, stormwater facilities, drainage boundaries, direction flow lines -
Roof drain connections, drain pipes -
Parking spaces (numbered), show dimensions -
Finished floor elevations -
Sewer facilities, grease traps -
Water facilities -
Backflow preventors -
Oversize meter vaults -
Other utilities -
Major trees -
Sign locations -
Garbage dumpster location w/ turning radius shown -
Proposed contours (if applicable) -
Boundary lines, easement lines -
Proposed set-backs -
Future right-of-way line -
City Bench Mark reference -
Required notes -
North arrow, scale, graphic scale, etc. -

Do **not** show the following information on this sheet:

Land use -
Zoning information -
Parking requirements (calculations) -
Legal descriptions -
Attenuation calculations -

Site development plans may be separated into:

- Site Drainage Plan
- Site Utilities Plan
- Surface Grading Plan
- Civil Site Plan

Must be signed and sealed by a Professional Engineer licensed to practice in the State of Florida.

CITY OF SARASOTA **MINIMUM PLAN INFORMATION**

Fig. G - 3

MINIMUM PLAN INFORMATION
(CONTINUED)

4. OFF-SITE DEVELOPMENT PLAN

(For facilities to be public-owned)

Plan and profile, with stationing, showing existing, and proposed facilities and utilities, streets, sidewalk, handicapped ramps, curb and gutter, etc. -

Locations of traffic control signs -

Bench mark based on City Datum -

Location map, north arrow, scale, etc. -

Reproducible "As-Built" drawings furnished after completion of work -

5. DETAILS

Typical cross-sections -

City Standard Details -

Details of structures related to site development plan -

Driveway profiles -

Utility details -

6. MISCELLANEOUS

Elevation view of structure showing height of building -

Sign design -

CITY OF SARASOTA **MINIMUM PLAN INFORMATION**

Fig. G - 4

MINIMUM PLAN INFORMATION
(CONTINUED)

7. LANDSCAPING PLAN

Proposed landscaping -

Plant list index/legend -

Proposed retention area with elevations -

Proposed building footprint, parking areas, driveways, etc. -

Existing trees to be removed -

Property boundary lines -

Zoning surrounding the property -

North arrow, scale, etc. -

Must be signed and sealed by a Registered Landscape Architect

8. IRRIGATION PLAN

Diagrammatic irrigation plan -

Sprinkler head index/legend -

Connection to water supply or well -

Building footprint, parking areas, driveways, etc. -

Property boundary lines -

North arrow, scale, etc. -

Must be signed and sealed by a Professional Engineer or a Registered Landscape Architect

7. & 8. Can be on same sheet, but not superimposed.

CITY OF SARASOTA **MINIMUM PLAN INFORMATION**

Fig. G - 5

NATURAL FEATURES

WOODS UNDERGROWTH AND BRUSH
MARSH
TREES DECIDUOUS
EVERGREEN
STREAMS (NOTE DIRECTION OF FLOW)
DITCHES (NOTE DIRECTION OF FLOW)
GULLEYS AND WET WEATHER WATER COURSES
ROCK (DESCRIBE BY NOTE AND STATE WHETHER OUTCROP OR LOOSE ROCK)

ROADS AND STREETS

PLAN

EXISTING CURB
PROPOSED CURB
WALKS (NOTE WIDTH AND TYPE)
CONCRETE VALLEY GUTTER
EDGE MACADEM OR CONCRETE ROAD
EDGE DIRT OR GRAVEL ROAD
EXISTING RIGHT OF WAY LINE } FOR UTILITY DRAWINGS
EXISTING PROPERTY LINE }
CENTERLINE OF EXISTING R/W OR ROAD
CENTERLINE OF PROPOSED R/W OR ROAD
TRANSIT LINE (SHADE IN FOR HUB OR NAIL AND CAP)
P.I. TRANSIT LINE OR C/L
P.L. FACE CURB LINE (NOTE CORNER)
HORIZONTAL CURVES:
- POINT OF CURVATURE — P.C.
- POINT OF TANGENT — P.T.
- POINT OF INTERSECTION — P.I.
- POINT OF REVERSE CURVATURE — P.R.C.
- POINT OF COMPOUND CURVATURE — P.C.C.

ARCHITECTURAL & STRUCTURAL SYMBOLS

CONCRETE
METAL
WOOD
GRAVEL
SAND
RIPRAP
EARTH

ROADS AND STREETS

PROFILE

ESTABLISHED TOP CURB GRADE (CIRCLES DESIGNATE VERTICAL CURVE POINTS, P.I. OF CURB LINES AND P.I. OF INTERSECTING STREETS AND ALLEYS)
CENTERLINE OF EXISTING ROAD
PROPERTY LINES (LABEL EACH SIDE)
VERTICAL CURVES:
- POINT OF VERTICAL CURVE — P.V.C.
- POINT OF VERTICAL TANGENT — P.V.T.
- POINT OF VERTICAL INTERSECTION — P.V.I.
- POINT ON CURVE — P.O.C.
- POINT OF VERTICAL REVERSE CURVE — P.V.R.C.
- POINT OF VERTICAL COMPOUND CURVE — P.V.C.C.

SURVEYORS SYMBOLS

BENCH MARK — B.M. NO.
TRAVERSE HUB
STAKE WITH TACK CENTER
STAKE WITHOUT TACK
IRON PROPERTY PIPE
NAIL OR SPIKE
PROPERTY & BOUNDARY STONES
CITY BOUNDARY
DISTRICT BOUNDARY
AREA BOUNDARY

LAND ACQUISITION

SLOPE EASEMENT
OTHER EASEMENT
EXISTING UTILITY R/W
PROPOSED UTILITY R/W
STREAM RELOCATION AND BRIDGE EASEMENT
EXISTING ROADS AND STREETS R/W
PROPOSED ROADS AND STREETS R/W

STANDARD SYMBOLS

N.T.S.

CITY OF SARASOTA

UTILITIES

EXISTING WORK:

- SANITARY SEWER
- SANITARY SEWER MANHOLE
- SANITARY SEWER TERMINAL MANHOLE
- STORM DRAINS, MISC. CULVERTS
- STORM DRAIN MANHOLE
- STORM DRAIN JUNCTION CHAMBER
- INLET, CURB TYPE
- INLET, GRATING TYPE
- INLET, CURB AND GRATING TYPE
- WATER MAINS
- WATER MAIN VALVE VAULT
- WATER METER BOX
- WATER VALVE, TEE, AND CROSS
- WATER REDUCER, Y BRANCH AND BEND
- WATER BLOW OFF AND AIR RELEASE
- WATER FIRE HYDRANT
- WATER STAND PIPE
- ELEVATED WATER TANK
- FIRE CISTERN
- CONDUITS (ELECTRIC AND TELEPHONE)
- GAS MAINS
- GAS METERS
- GAS DRIP STOP OR PLUG

PROPOSED WORK

- PIPE LINES
- SANITARY SEWER AND STORM DRAIN MH
- SANITARY SEWER TERMINAL MANHOLE
- SANITARY SEWER HOUSE CONNECTION
- STORM DRAIN JUNCTION CHAMBER
- STORM DRAIN INLET AND CATCH BASIN
- WATER HOUSE SERVICE & METER BOX
- WATER VALVE, TEE & CROSS
- WATER REDUCER Y BRANCH & BENCH
- WATER BLOW OFF, AIR RELEASE & FIRE HYDRANT

UTILITIES

REFERENCE SHEET TO SHEET

- SANITARY SEWER
- STORM DRAIN
- WATER

OTHER PROPOSED UTILITIES

- SANITARY SEWER
- STORM DRAIN
- WATER

MISCELLANEOUS

- FENCES, WOOD
- FENCES, IRON
- FENCES, WIRE, BARB, SMOOTH
- FENCES, HEDGE
- FENCES, STONE, BRICK, CONCRETE, WALLS
- POLES, G & E NO. 1000 OR C & P NO. 1000 OR STREET LIGHT
- RAILROAD TRACKS
- EXCAVATION OR CUT
- EMBANKMENT OR FILL
- SINK HOLES, POT HOLES, ETC.
- CELLAR ELEVATION — C.E. 178.45
- CONTOUR LINES (NUMBERED LINES HEAVY) — 100
- TERRA COTTA PIPE — T.C.P.
- VITRIFIED CLAY PIPE — V.C.P.
- EXTRA STRENGTH — V.C.P.X.
- CONCRETE SEWER PIPE — C.S.P.
- EXTRA STRENGTH — C.S.P.X.
- REINFORCED CONCRETE CULVERT PIPE — R.C.C.P.
- EXTRA STRENGTH — R.C.C.P.X.
- WROUGHT IRON — W.I.
- GALVANIZED IRON — G.I.
- CORRUGATED METAL PIPE — C.M.P.
- CORRUGATED METAL ARCH PIPE — C.M.A.P.
- CAST IRON — C.I.P.
- ASBESTOS CEMENT WATER PIPE — A.C.W.P.
- ASBESTOS CEMENT SEWER PIPE — A.C.S.P.
- CAST IRON SOIL PIPE (EXTRA STRENGTH) — C.I.S.P.X.
- MAIL BOXES

STANDARD SYMBOLS

N.T.S.

CITY OF SARASOTA

CERTIFICATE OF COMPLETION BY PROFESSIONAL ENGINEER

Within 14 days after the construction of site development has been completed, please complete this page and mail it to the office of the City Engineer, P.O. Box 1058, Sarasota, Florida 34230-1058.

1. **Project Information:**

Project Name: _____

Project Location: _____

Project Owner: _____

Owner's Address: _____

_____

_____

2. **Certification of Compliance:**

I hereby certify that the site development has been constructed in conformance with the plans certified by the City Engineer and, specifically that the drainage attenuation facilities have been constructed in conformance with said plan.

Any substantial deviations (noted below) will not prevent the facility from functioning in compliance with the applicable criteria of the Sarasota City Code when properly maintained and operated. These determinations have been based upon a review conducted by me or a project representative under my direct supervisory authority.

_____ _____

Name (Please Type) FL P. E. No.

Sign, date & affix seal

_____

Company / Firm Name

_____

Company Address

_____

_____

Phone: (_____) _____

Substantial deviations from the certified plans are as follows:
(Attach additional sheets if necessary, and provide revised plans.)

_____

_____

_____

CITY OF SARASOTA **CERTIFICATION OF COMPLETION**

Fig. G - 8

ENGINEERING DESIGN CRITERIA MANUAL

PART 2

EROSION AND SILTATION CONTROL

PART 2. EROSION AND SILTATION CONTROL

The standards, regulations, and procedures set forth herein represent the erosion and siltation control practices of the City of Sarasota for the purpose of controlling:

1. The alteration of land and topography;
2. The removal and placement of certain vegetation; and
3. The erosion, sedimentation, and pollution within drainage systems.

The content of this regulation shall not be construed as a guarantee against all storm water damage, but will serve as a means to minimize the extent of potential storm water hazards to the public. These are minimum standards only and do not relieve the Developer or his Engineer-of-Record from their designated responsibility to meet the intent of this regulation and to protect the rights of surrounding property owners and the public interest, in accordance with good engineering practices.

Section A - Sea Walls.

1. All seawalls, bulkheads, groins, waterfront elevations and land slope shall be provided, as necessary, to protect waterfront property or waterways from erosion in accordance with Figure ER-1 as approved by the City Engineer.

Section B - Erosion and Siltation Control Permits.

1. All projects requiring any vegetation/root removal in the soil zone at or underlying the surface or removal of existing impervious surface (i.e. asphalt or buildings) such that bare soil remains, shall be required to have an Erosion and Siltation Control (ESC) Permit prior to beginning any such work. Any project five (5) acres or larger shall provide a copy of their Pollution Prevention Plan and "Notice of Intent" for construction activities, per the National Pollutant Discharge Elimination System (NPDES) permit.

Section C - Procedure for Permitting Land Disturbing Activity.

1. No person shall perform any land disturbing activity without first obtaining an Erosion and Siltation Control (ESC) Permit from the City Engineer. Such permit shall be in addition to any other permits or approvals required for the project by any other ordinances, rules, and regulations in effect.

2. Application for an ESC Permit must be made to the Building and Zoning Department in the same manner as Site Development Plans (See page 1-2), and must be accompanied by an Erosion and Siltation Control Plan. The applicant's ESC Plan shall include, in minimum, the following information for the entire tract of land to be disturbed, regardless of whether the tract will be developed in stages:

a. A narrative description of the overall project shall include:

(1) Anticipated starting and completion dates for each sequence and stage of land disturbing activities and the expected date the final stabilization will be completed;

(2) A description of the siltation control program and siltation control practices;

(3) An adequate description of general topographical and soil conditions of the tract;

(4) A description of the current zoning classification of adjacent property and a general description of existing and proposed structures, buildings and other fixed development located within a perimeter of two hundred feet (200 ft.) of the boundary line of applicant's property;

(5) A description of the maintenance program for siltation control facilities, including inspection programs, revegetation of exposed soils, method, and frequency of removal and disposal of solid waste material removed from control facilities, and disposition of temporary structural measures.

(6) Name, address, and telephone number of person and/or company that will have legal responsibility for accomplishing the plan, including maintenance there after.

b. Maps, drawings, and supportive computations bearing the signature and raised seal of a Professional Engineer, and containing:

(1) A site drawing indicating the location of the proposed project in relation to jurisdictional boundaries of roadways, and location of water courses;

(2) A plan for temporary and permanent vegetative and structural erosion and siltation control measures.

c. A boundary line survey of the site on which the work is to be performed bearing the signature and raised seal of a Professional Surveyor and Mapper.

3. If the project is to be developed in phases, then the City Engineer may issue a separate permit for a master plan or for each phase, at the City Engineer's sole discretion.

4. The permit may be suspended, revoked, or modified by the City Engineer or his designee upon a finding that the holder is not in compliance with these regulations or has violated any of the provisions or conditions of the permit.

5. In the case of a suspended or revoked permit, the permittee may be required to resubmit any applicable information deemed necessary for the application of a new permit, and may be subject to penalties as authorized by law.

Section D - Principles and Standards.

1. Implementation: Soil erosion and siltation control measures shall conform to the standards and specifications of this Manual. The application of measures shall apply to all features of the site, including street and utility installations, drainage facilities and other temporary and permanent development. Measures shall be installed to prevent or control erosion and siltation pollution during all stages of any land disturbing activity.

   In addition to the above mentioned considerations, the best management practices contained in the Florida Department of Environmental Protection's, Nonpoint Source Management for Construction Activities should be utilized along with the following additional guidelines, paragraphs 2 through 9.

2. Stabilization of Denuded Areas: No disturbed area may be denuded for more than thirty (30) calendar days unless otherwise authorized by the City Engineer. Denuded areas must be covered by mulches such as straw, hay, filter fabric, seed and mulch, sod, or some other permanent vegetation. Within sixty (60) calendar days after final grade is established on any portion of a project site, that portion of the site shall be provided with established permanent soil stabilization measures according to the original construction plan, whether by impervious surface or landscaping.

3. Protection and Stabilization of Soil Stockpiles: Soil stockpiles shall be protected at all times by on-site drainage controls which prevent erosion of the stockpiled material. Control of dust from such stockpiles may be required depending upon their location and the expected length of time the stockpiles will be present. In no case shall no unstabilized stockpile remain in place longer than thirty (30) calendar days.

4. Protection of Existing Storm Sewer Systems: During construction, all storm sewer inlets receiving drainage from the project shall be protected by sediment traps such as, but not necessarily limited to, secured hay bales, sod, or stone which shall be maintained and modified as required by construction progress, and which shall be approved by the City Engineer before installation. In no case shall sediment or debris be allowed to enter a public right-of-way in such a manner as to create a traffic hazard, a public nuisance, or a threat to existing drainage ways.

5. Sediment Trapping Measures: Sediment basins and traps, perimeter berms, filter fences, berms, sediment barriers, vegetative buffers and other measures intended to trap silt or prevent the transport of silt onto adjacent properties, or into storm sewer systems or existing water bodies, shall be installed, constructed, or, in the case of vegetative buffers, protected from disturbance, as a first step in the land alteration process. Such systems shall be fully operative and inspected by the City Engineer before any other disturbance of the site begins. Earthen structures, including but not limited to berms, earth filters, dams, or dikes, shall be stabilized and protected from drainage damage or erosion within one (1) week or installation.

6. Sedimentation Basins: Areas of three (3) acres or more shall be required to have temporary sedimentation basins as a positive remedy against downstream siltation, which shall be shown and detailed on construction plans. During development, permanent retention areas may be used in place of sedimentation basins provided they are maintained to the satisfaction of the City Engineer. The contractor shall prohibit the discharge of silt through the outfall structure during construction of any retention area and shall clean out the retention area before installing any

permanent subdrain pipe. In addition, permanent retention areas shall be totally cleaned out and operating properly at the time of final inspection and at the end of any applicable warranty period. When temporary sedimentation basins are used, they shall be capable at all times of containing at least on one cubic foot (1 c.f.) of sediment for each one hundred square feet (100 s.f.) of area tributary to the basin. Such capacity shall be maintained throughout construction by regular removal of sediment from the basin.

7. Working In or Crossing Waterways or Waterbodies: Land alteration and construction shall be minimized in all waterways and in a 25-foot-wide strip adjacent to the water, as measured from the top of the bank of the waterway. Construction equipment and motor vehicles shall be kept out of waterways and the 25-foot buffer area whenever possible. Barriers shall be used to prevent access by construction equipment and motor vehicles. Where in-channel work cannot be avoided, precautions shall be taken to stabilize the work area during land alteration, development, and construction to minimize erosion. If the channel or buffer area is disturbed during land alteration, it shall be stabilized within three (3) calendar days after the in-channel work is completed. Silt curtains or other filter/siltation reduction devices shall be installed on the downstream side of the in-channel activity to alleviate increased turbidity. Wherever stream crossings are required, properly-sized temporary culverts shall be provided and shall be removed when construction is completed. Upon completion of construction, the area of the crossing shall be restored to a condition equal to or better than that which existed prior to the construction activity.

8. Swales, Ditches and Channels: All disturbed or constructed swales, ditches, and channels leading from the site shall be sodded within three (3) days of excavation. All interior swales and detention areas shall be sodded prior to issuance of a Certificate of Occupancy.

9. Trench Excavation: The construction of all underground facilities shall be accomplished in an expeditious manner, with backfill and restoration lagging no more than four hundred feet (400 ft.) behind excavation and installation. Where appropriate, excavated material shall be cast onto the uphill side of any trench and shall not be cast into any channel, channel bank, or gutter.

10. Maintenance: All erosion control devices shall be checked regularly, and after each rainfall, and shall be cleaned or repaired as required.

    Maintenance of all soil erosion and siltation control practices, whether temporary or permanent, shall be at all times the responsibility of the Owner. Failure to do so can cause rescinding of ESC Permit, and/or payment to the City for cleaning of downstream facilities and areas.

11. Standard Details: City of Sarasota Standard Figures ER-2 thru ER-8 are examples of accepted methods that may be used and/or required to control erosion and siltation.

Section E - Procedure for Inspection of Land Disturbing Activity.

1. Prior Notification: Construction projects that receive approval of an Erosion and Siltation Plan, shall notify the City Engineers Office five (5) working days before construction begins, regardless of the size or scope of the approved project. The Engineering Department individual responsible for the site review will then schedule a pre-construction meeting on-site to establish procedures to be followed. **FAILURE TO NOTIFY THE CITY ENGINEER'S OFFICE PRIOR TO CONSTRUCTION SHALL CONSTITUTE A VIOLATION OF THE APPROVED PLAN,**

AND SUBJECT THE APPLICANT TO REVOLCATION OF EROSION AND SEDIMENTATION PERMIT.

2. Pre-construction Meeting:

   a. A pre-construction meeting will be scheduled between the Engineering Department site reviewer and the Owner/Developer and or representative, and should include:

      (1)Engineering Department Site Reviewer;

      (2)Owner/Developer and/or Representative;

      (3)Site Construction Supervisor/Responsible Construction Personnel

      (4)Any Necessary Subcontractors/Builders

      (5)A Certified Construction Reviewer (when required).

   b. Items to be discussed during the pre-construction meeting shall include the following:

      (1)The line of communications to be established for the transmittal of written and verbal information.

      (2)Mandatory inspections will be discussed as to stage of construction, and frequency of inspection needed.

      (3)Discussion of the sequence of construction and determination that any changes to the construction sequence shall receive prior approval.

      (4)Determine that limits of disturbance are clearly marked on site, and assure everyone is aware of limitations.

      (5)Discussion of the approved plan and the procedure for potential field modification when needed.

2. Review Authority Responsibilities: All site inspections shall generate a written inspection report and/or notice of violation.

   a. Initial Erosion and Sediment Control Construction Review: Unless waived by the Engineering Department site reviewer, the reviewer shall be notified after the perimeter controls have been installed, but before land clearing and grading begins, including clearing and grading for sediment and stormwater management traps or ponds. The site reviewer shall verify that correct installation of perimeter controls has been completed before authorization is given to proceed with the next item of the sequence of construction.

   b. Required Sediment and Stormwater Construction Review: The Engineering Department site reviewer shall be notified prior to construction of stormwater management facilities as specified in this Manual, as well as previously determined stages of construction. Failure to notify the site reviewer prior to any specified stage of construction may necessitate that the structure or earthwork be constructed again in the presence of the site reviewer.

   c. Routine Construction Review: The Engineering Department site reviewer will, in addition to the above designated inspections, ensure that every active construction site be inspected for compliance with the approved plan on a regular basis. The frequency of inspections will be determined by the size and scope of the project.

d. Authorization to Remove Sediment Controls: In certain instances it may be possible to remove sediment controls when a portion of a site has been completed and stabilized, but prior to a final site inspection. This action shall take place only after authorization of the Engineering Department site reviewer.

e. Final Construction Review: When all site grading and development, including stabilization has been completed, the Engineering Department site reviewer shall be notified for a final inspection. The entire site shall be reviewed for final conformance to the approved Stormwater Management Plan before final acceptance will be granted.

2. Project Review Procedures During Construction: All policies and procedures guiding review of active construction shall be consistent with this Manual.

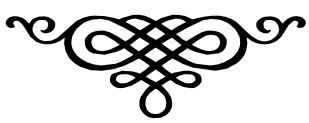
a. Official Identification of Review Authority Personnel: The Engineering Department site reviewer will make his/her presence known to the appropriate individuals on the site before any inspection occurs. The site reviewer will have the appropriate identification and offer it as an introduction. If no appropriate individual can be found, the site reviewer will again attempt to contact the designated persons at the conclusion of the inspection.

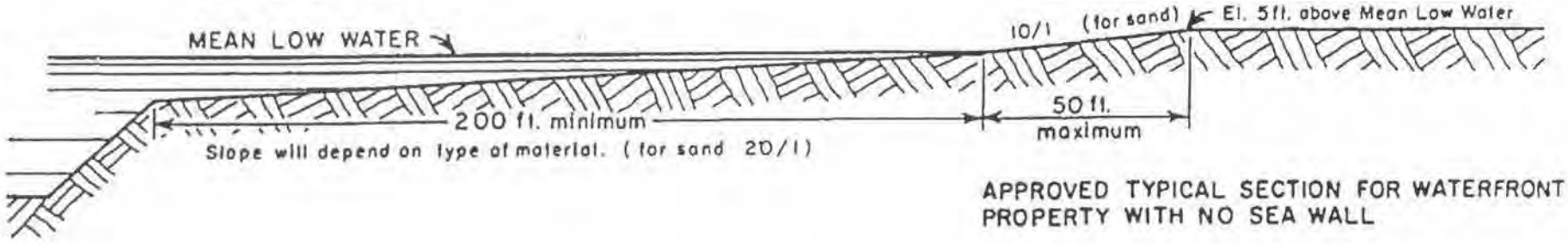
b. Documentation of Site Review and Deficiencies: The Engineering Department site reviewer will complete a written report to be discussed with the contractor's representative or responsible person on site when that person is available. The written report shall be specific as to conformance with the approved plan, and/or a time frame to comply with items that need correction. The inspection report will be transmitted to the contractor's representative or responsible person and owner/developer or representative when appropriate. It shall be discussed that the plan deficiencies must be corrected in an appropriate time frame, or the site shall receive a violation notice. (NOTE: It is up to the discretion of the Engineering Department site reviewer to directly issue a Notice to Comply when the seriousness of the violation warrants.

2. Compliance Review Procedures:

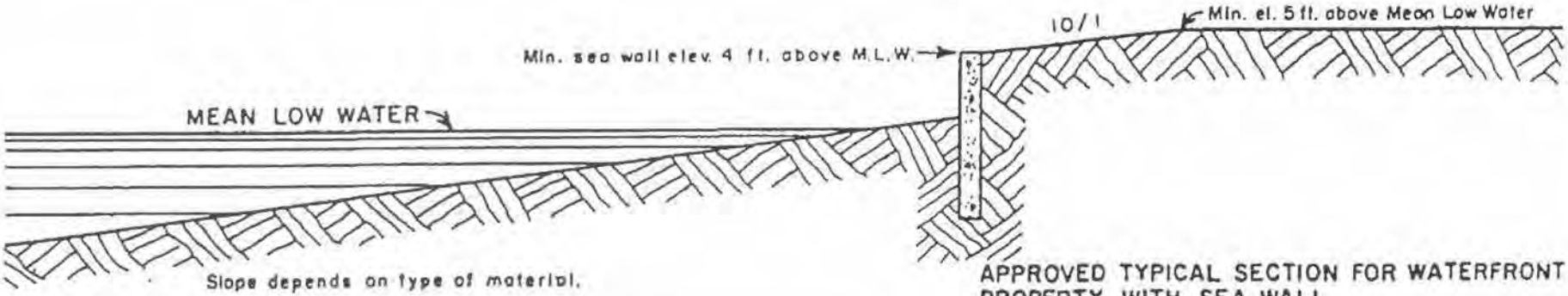
a. Previous Deficiencies Corrected: The site shall be re-inspected by the Engineering Department site reviewer, at the appropriate time, to determine if all necessary corrections have been completed. If all deficient items from the previous inspection have been corrected, it shall be noted on the site inspection form, along with any new items to be corrected.

b. Previous Deficiencies Not Corrected: If previous site conditions have not been corrected, appropriate enforcement action shall be initiated.





APPROVED TYPICAL SECTION FOR WATERFRONT PROPERTY WITH NO SEA WALL



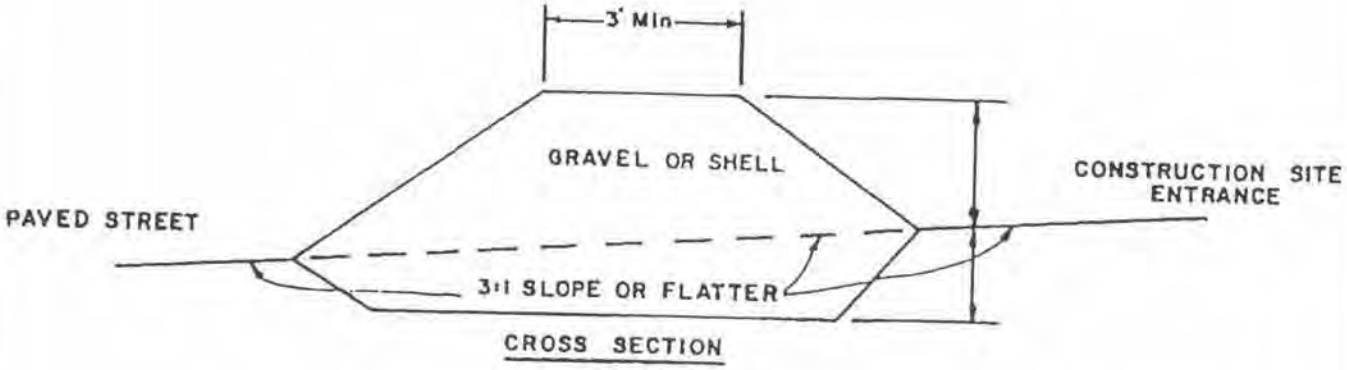
APPROVED TYPICAL SECTION FOR WATERFRONT PROPERTY WITH SEA WALL

CONSTRUCTION OF GROINS, BULKHEADS, SEAWALLS MUST BE IN ACCORDANCE WITH PLANS DRAWN UP BY A LICENSED PROFESSIONAL ENGINEER THOROUGHLY FAMILIAR WITH THIS TYPE OF CONSTRUCTION OR A TYPE WHICH HAS BEEN TIME TESTED AND PROVED SATISFACTORY IN THIS AREA.

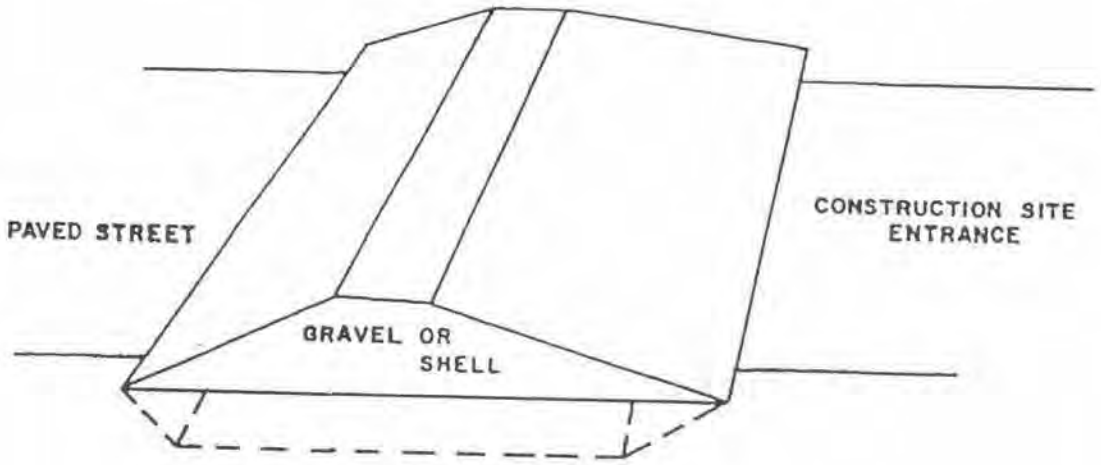
THE ABSOLUTE MINIMUM ELEVATION OF TOP OF CATCH BASIN INLET SHALL BE 4 FEET ABOVE MEAN LOW WATER. MINIMUM LAND ELEVATIONS ARE CONTROLLED BY NECESSARY STORM OR SANITARY SEWERS AND STREET GRADES, ALL OF WHICH MUST BE APPROVED BY THE CITY ENGINEER.

SEA WALL

N.T.S.



CROSS SECTION

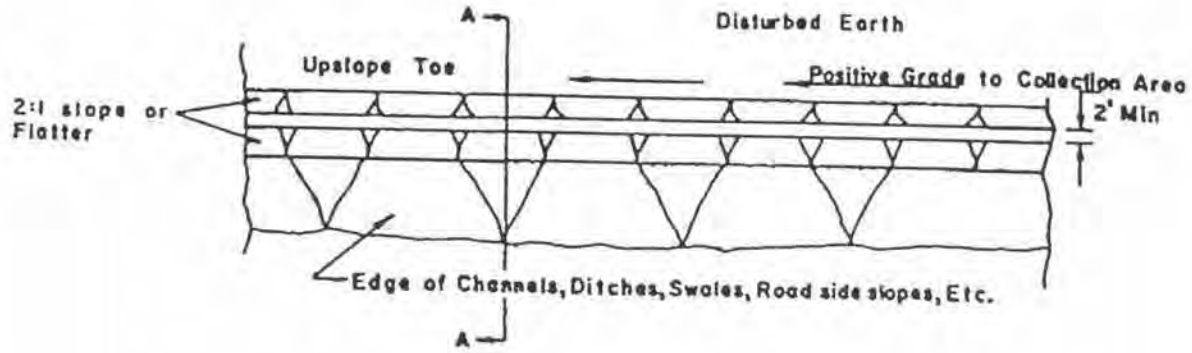


TOP ISOMETRIC VIEW

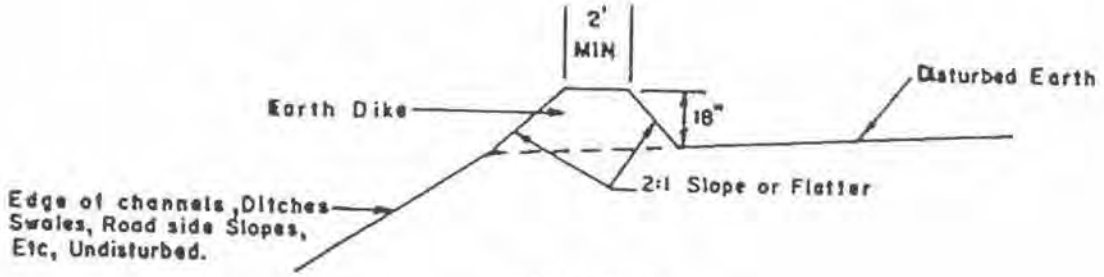
TEMPORARY EROSION CONTROL GRAVEL INTERCEPTOR BERM

N.T.S.

CITY OF SARASOTA



PLAN VIEW

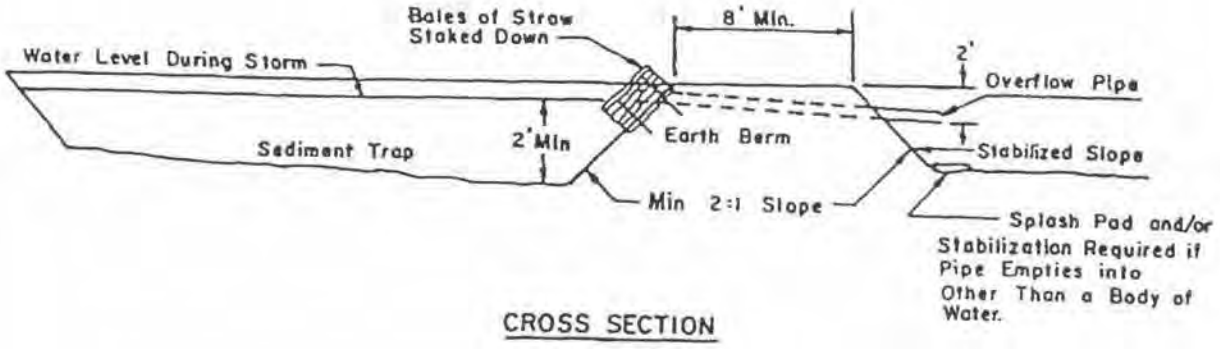


SECTION A-A

TEMPORARY EROSION CONTROL DIVERSION BERM

N.T.S.

CITY OF SARASOTA



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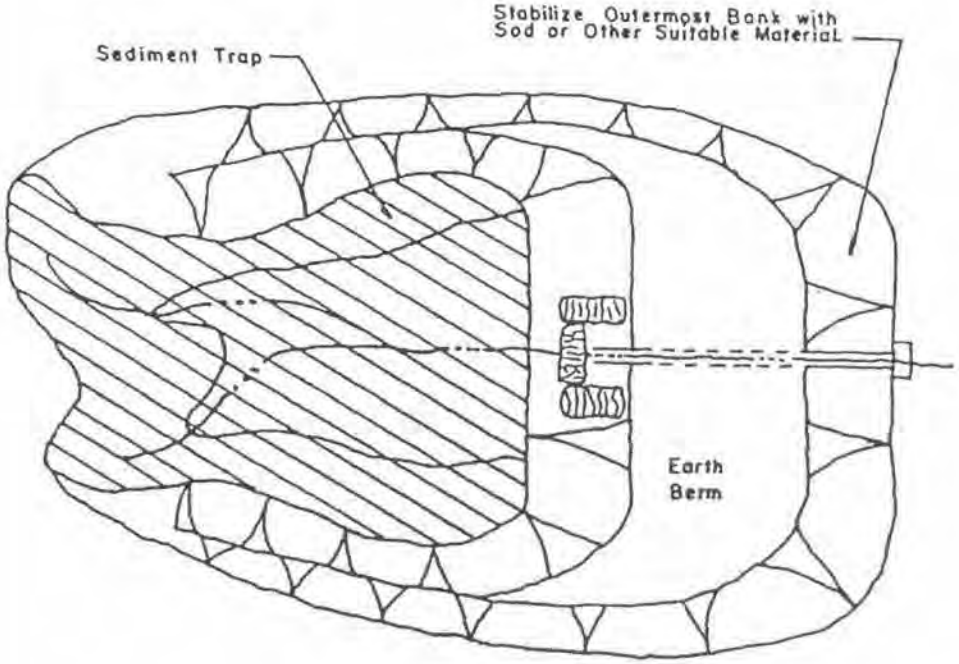

PLAN VIEW

TEMPORARY EROSION CONTROL SEDIMENT BASIN

N.T.S.

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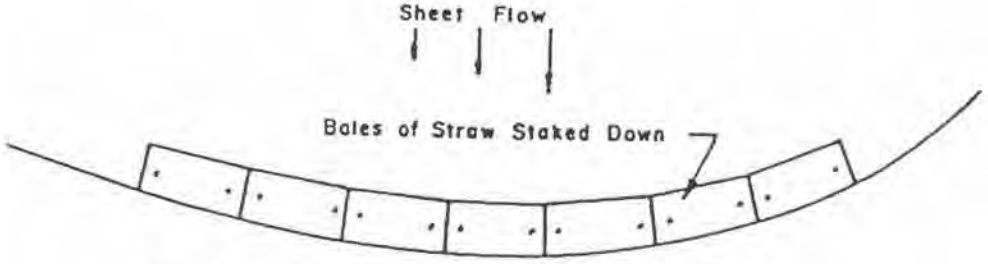
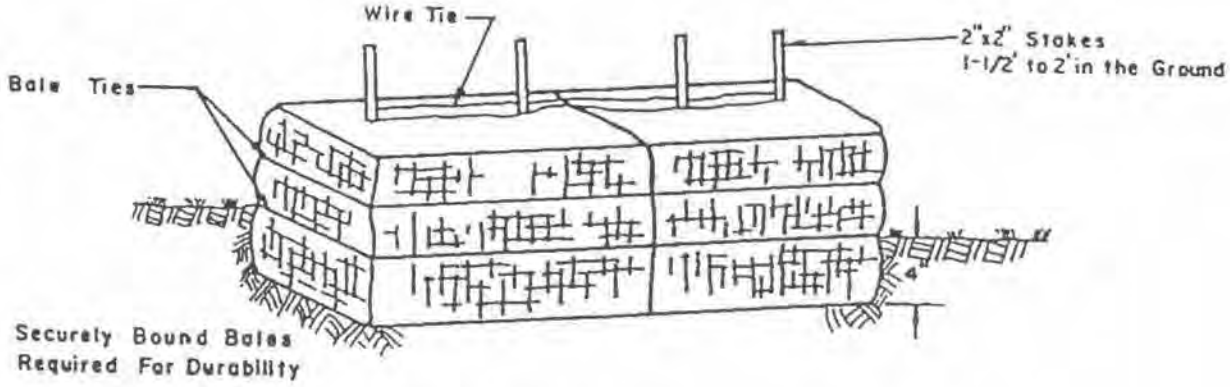


Single Row of Bales of Straw To Be Placed
Prior To The Start of Rough Grading.

PLAN VIEW



ANCHORING BALES

TEMPORARY STRAW BALE SEDIMENT BARRIER

N.T.S.

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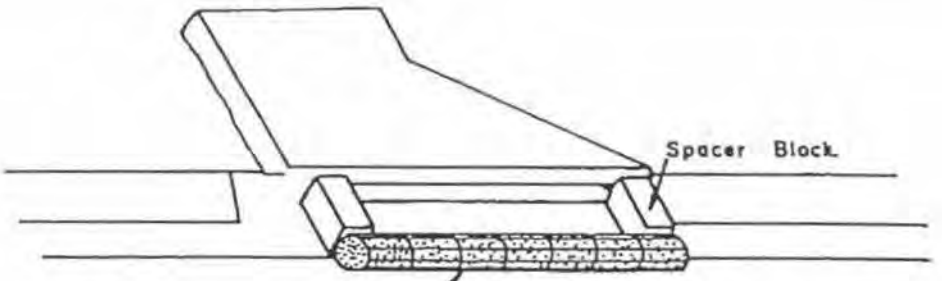
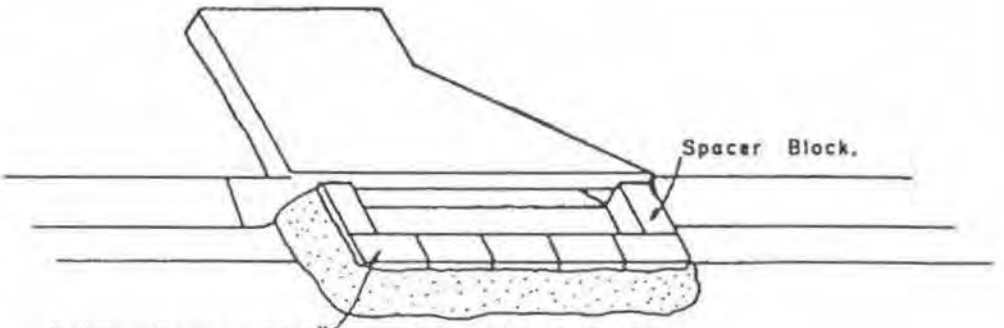
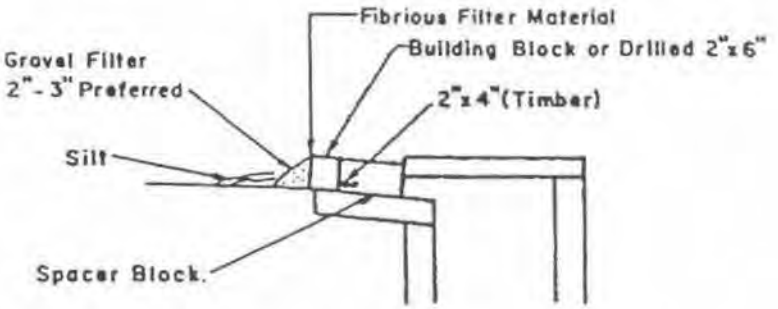


Roll of 12 1/2 Gauge Welded Fence, 2"x2" Mesh, 8"-10" Diameter Filled With 3" Stone.



Building Block Laid 6" From Throat Web Horizontal



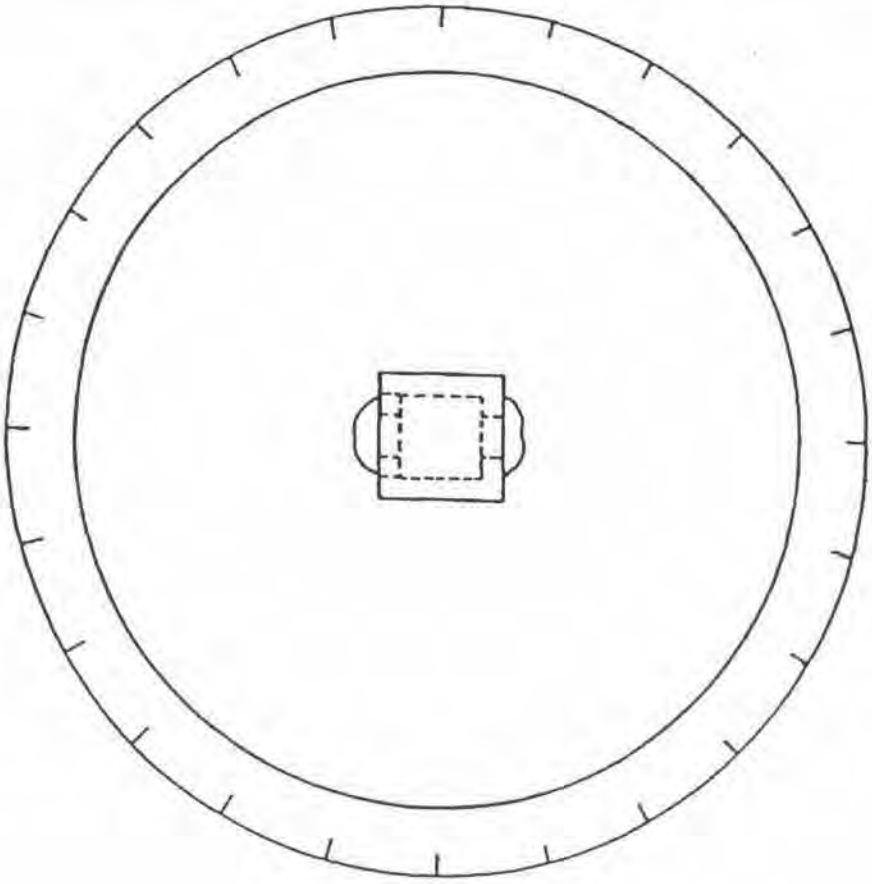
Fibrous Filter Material in Front of Block Prevents Gravel From Washing into Structure.

2"x4" Behind Blocks And Across Throat Helps Keep Block In Place. Place In Outer Hole of Spacer Block.

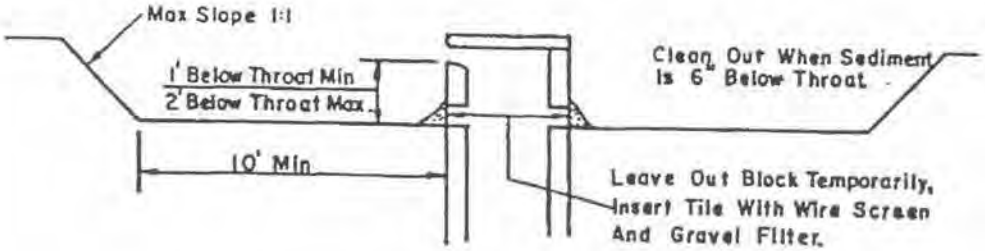
TEMPORARY SEDIMENT TRAP AT CURB INLET

N.T.S.

CITY OF SARASOTA



PLAN VIEW



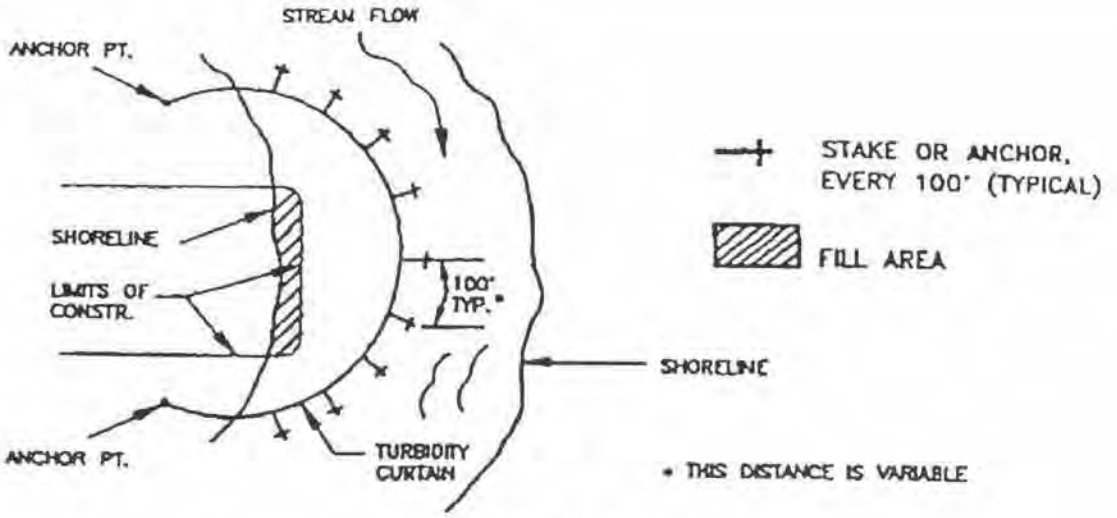
CROSS SECTION

Circular Shape is Not Essential - Vary Shape To Fit Drainage Area And Terrain. Observe To Check Trap Efficiency And Modify As Necessary To Insure Satisfactorly Trapping Of Sediment.

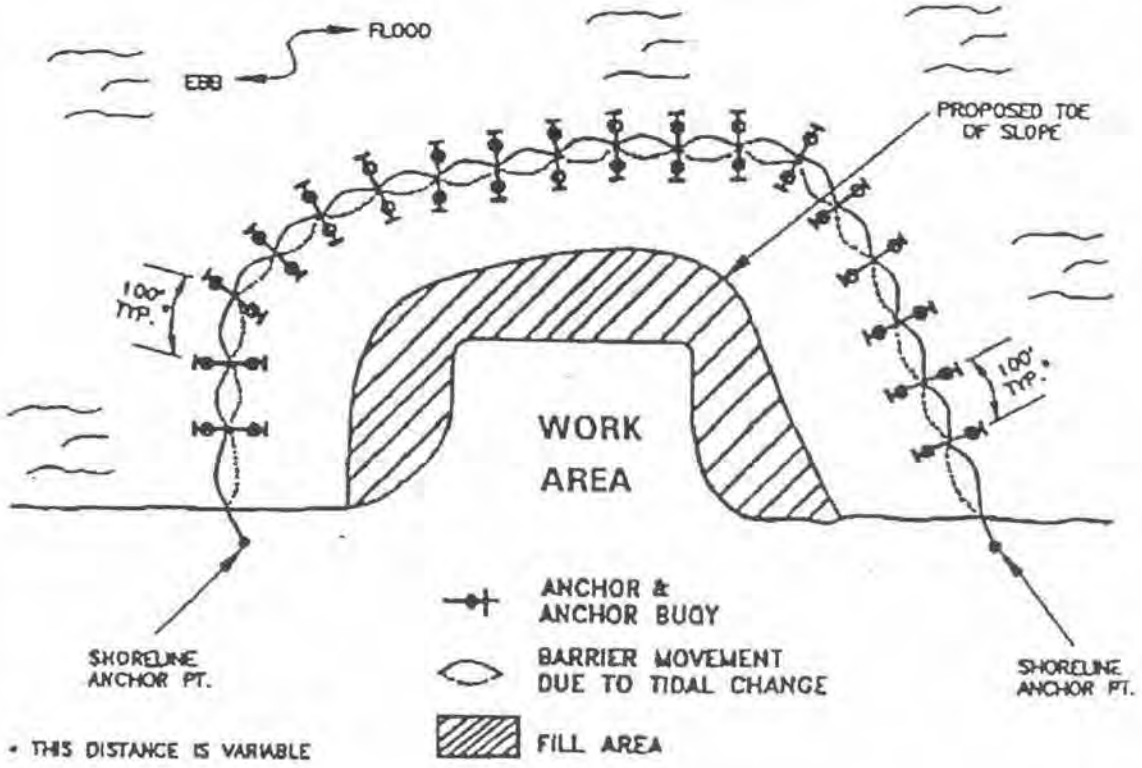
TEMPORARY SEDIMENT TRAP AT STORM DRAIN INLET

N.T.S.

CITY OF SARASOTA



Typical Layouts
Streams, Ponds, and Lakes (Protected and Non-Tidal)



Tidal Waters and/or Heavy Wind and Wave Action

TURBIDITY BARRIERS

N.T.S.

CITY OF SARASOTA

ENGINEERING DESIGN CRITERIA MANUAL

PART 3

SUBDIVISION REGULATIONS

PART 3. SUBDIVISION REGULATIONS

Section A - General.

1. The procedure for subdivision approval includes two processes as shown on the attached process flow diagram in Figure SR-1 on page 3-13. They are:
   a. Site Development Plan Process
   b. Subdivision Platting Process

2. Two steps are required to proceed at the same time.
   a. The site development plan and the final subdivision plat are required to be presented to the Development Review Committee simultaneously.
   b. The site development plan and the final subdivision plat are required to be presented to the Planning Board simultaneously.

3. Certain steps are a prerequisite to the next step, viz:
   a. The site development plans must be certified by the City Engineer before the final subdivision plat may be submitted.
   b. The site development must be constructed and accepted by the City Engineer or a faithful performance guarantee issued to the City before the City Engineer may certify the final subdivision plat.
   c. The final subdivision plat must be recorded with the Sarasota County Clerk of Circuit Court before the City issues a building permit.

Section B - Definitions.

1. For the purpose of these regulations, which shall be known as and may be cited as "City of Sarasota Subdivision Regulations," certain words used herein are defined as follows:
   a. Subdivision. The term "subdivision" means the division of real property or properties into three or more zoning lots; and includes the establishment of new streets and alleys.
   b. Developer. The term "developer" means the person or legal entity that applies for approval of a plat of a subdivision, pursuant to the City of Sarasota Subdivision Regulations.
   c. Plat. The term "plat" means a map or delineated representation of the subdivision of lands, being a complete exact representation of the subdivision and other information in compliance with the requirements of all applicable sections of Chapter 177, Part 1, F.S. and any applicable City regulations, and may include the terms "replat, "amended plat," or "revised plat."
   d. Replat. The term "replat" means any change in a plat, except as provided in Section 177.141, F.S. and a replat shall conform to these regulations in the same manner as plat.
   e. Zoning lot. The term "zoning lot" means an area of land under one ownership of at least sufficient size to meet minimum zoning requirements for use, coverage and area and to provide such yards and other open spaces as are required by the City's Zoning Code (1998). Such zoning lots shall have frontage on a public street or on an approved private street as set out in Section VI-102(L) of the Zoning Code, and may consist of:

(1) A single lot of record,
(2) A portion of a lot of record,
(3) A combination of complete lots of record or complete lots of record and portions of lots of record or of portions of lots of record.
(4) A parcel of land described by metes and bounds;
(5)Provided that in no case of division, boundary adjustment, or consolidation shall any residual area of land be created which does not meet the requirements of the Zoning Code. The grant of an interest, for security or other purposes, in real property for less than an entire zoning lot, or the foreclosure or sale of such interest, shall not be deemed to create a legal zoning lot unless properly approved in accordance with the Zoning Code and these Subdivision Regulations.

f. Surveyor and Mapper. The term "surveyor and mapper" means a surveyor and mapper registered in the State of Florida, under Chapter 472, F.S., who is in good standing with the Board of Professional Surveyors and Mappers.
g. Site Development Plan. The term "site development plan" or "site plan" means a graphic portrayal of a proposed development describing both existing and proposed conditions of the zoning lot(s), including, but not limited to, use, location and bulk of buildings and structures, density of development, public facilities, means of ingress and egress, landscaping, signs, drainage and lighting.
h. Streets and Alleys. The term "street" means any access way such as a street, road, lane, highway, avenue, boulevard, alley, parkway, viaduct, circle, court, terrace, place, or cul-de-sac, and also includes all of the land lying between the right-of-way lines as delineated on a plat showing such streets, whether improved or unimproved, but shall not include those access ways such as easements and rights-of-way intended solely for limited utility purposes, such as for electric power lines, gas lines, telephone lines, water lines, drainage and sanitary sewers, and easements of ingress and egress.
i. Right-of-Way. The term "right-of-way" means land dedicated, deeded, used, or to be used for a street, alley, walkway, boulevard, drainage facility, access for ingress and egress, or other purpose by the public, certain designated individuals, or governing bodies.

Definitions of street classification are shown in Division II, "Definitions", Article-II, of the City's Zoning Code.

Section C - Site Development Plan Process

1. City Engineer Review. The site development plans for a subdivision shall be referred to and be reviewed by the City Engineer for compliance with the applicable criteria set forth in this Manual. Part 1, "General" of this Manual states the criteria for Site Development Plan Preparation and for Site Development Plan Processing and Progress of Work.

2. Data for Plat Approval. Unless otherwise specified the Engineering Department, or the Building and Zoning Department with respect to trees; the site development plans for a subdivision shall, in addition to Subsection C.1., above, show the following:
   a. Sites, if any, for multifamily dwellings, shopping centers, churches, industry or other nonpublic uses exclusive of single-family dwellings.
   b. Minimum building setback lines.
   c. Site data, including number of residential lots, typical lot size, acreage of parks, and the like.

d. Utilities, located on the tract and adjacent to the tract, to include the location, size and invert elevation of sanitary sewers, storm sewers, location and size of water mains, location of gas lines, fire hydrants, electric service, telephone service, cable television and street lights. If water mains and sewers are not on or adjacent to the tract, the direction of and distance to the nearest water mains and sanitary sewers shall be indicated, as well as the size and invert elevation of sewers.
e. Ground elevations on the tract shall be identified, based on a datum plane approved by the City Engineer. For land that slopes less than two percent (2%), spot elevations at all breaks in grade shall be shown along all drainage canals or swales, and at selected points not more than twenty-five feet (25 ft.) apart in all directions. For land that slopes two percent (2%) or more, contours may be shown with an interval of not more than two feet (2 ft.). Elevations shall be shown at least twenty-five feet (25 ft.) outside the perimeter of the tract.
f. Subsurface conditions on the tract shall be identified, if required by the City Engineer. Location and results of tests made to ascertain subsurface soil, rock and groundwater conditions shall be shown. Depth of groundwater shall be included, unless test pits are dry at a depth of five feet (5 ft.).
g. Other conditions related to the tract, such as historical features, watercourses, marshes, rock outcrops, wooded areas, isolated preservable trees, buildings, and other significant features will be identified on the plat.
h. Conditions on adjacent land shall be shown to include the approximate direction and gradient of ground slope, including any embankments or retaining walls; the character and location of buildings, railroads, power lines, towers, and nearby residential land uses or adverse influences; finished floor elevations of adjacent structures; owners of adjacent unplatted land; platted land referred to by subdivision plat name, plat recording date and number; and to adjacent platted subdivisions; and shall include the typical lot size, dwelling type and the approximate percentage of build-out.
i. If required by the City Engineer, photographs shall be supplied, to include data on camera location, direction of views, key numbers and date.
j. Proposed public site development, such as streets, utilities or other major improvements, planned by public authorities for future construction on or near the tract, shall be identified.
k. A preliminary site landscaping plan identifying the types, sizes and location of existing trees and the types, sizes and locations of the trees that the developer proposes to remove or relocate, which are protected by the Sarasota City Code The preliminary site landscaping plan shall contain the items required in Section 35-26(6), Sarasota City Code.

3. City Engineer Certification. A certification by the City Engineer that the submitted site development plans comply with this manual shall be required before the City Engineer may give optional preliminary subdivision plat approval and/or before the City Engineer may certify the final subdivision plat. The form of this Site Development Plan Certification is ink stamped on the plans, with the words "I have conducted the review of engineering features of this site development plan (or it has been conducted under my responsible supervision) and I certify that those engineering features satisfy the requirements of the Codes and regulations of the City of Sarasota.", with the signature of the City Engineer or his designee.

4. Planning Board and City Commission Public Hearings. The Planning Board shall hold a public hearing on the Site Development Plan and on the Final Subdivision Plat. The public notice requirements and the procedures for review set forth in Article IV, Division 10 of the Zoning Code (1998) regarding subdivisions/plats shall be applicable to the simultaneous review of both

the Site Development Plan and on the Final Subdivision Plat submittal. The Planning Board shall make a recommendation upon the conclusion of the public hearing upon the proposed the Site Development Plan and on the Final Subdivision Plat, including any modifications or conditions to the Site Development Plan or the Final Subdivision Plat and the reasons therefore. Upon receipt of the recommendation of the Planning Board, the City Engineer's certification and the written staff analysis, the City Commission shall hold a public hearing to consider the Site Development Plan Application and on the Final Subdivision Plat application and grant, grant with conditions or deny the applications. The City Commission's public hearings may be simultaneous providing the City Engineer has provided the "Site Development Plan Certification" referred to in Subsection C.3, above and the "Certification for Final Subdivision Approval" referred to in Subsection D.2.F, below.

5. Certificate of Completion. Prior to the issuance of a certificate of occupancy, the Engineer-of-Record for the developer shall furnish, to the City Engineer, a certificate of completion stating that the subdivision site developments have been constructed in conformity with the plans certified by the City Engineer. The format of this "Certificate of Completion" is shown as Figure G-8 of this Manual.

Section D - Subdivision Platting Process.

1. Optional Preliminary Subdivision Approval.
   a. Prior to filing an application for final plat approval, the developer may, at his option, cause to be prepared by a Professional Surveyor and Mapper, a preliminary subdivision plat, together with site development plans and other supplementary material as specified in Subsection 4, "Plats and Data", below.
   b. Four (4) copies of the preliminary subdivision plat, with the supplementary material, shall be submitted to the City Auditor and Clerk, with a written application for preliminary subdivision approval.
   c. The City Engineer shall review the preliminary plat and required supplemental material for compliance with this Manual. Additionally, the Building and Zoning Department shall review the preliminary plat and required supplemental material for compliance with the purpose and intent of Chapter 35, Article II, Sarasota City Code, pertaining to tree protection and for compliance applicable zoning criteria. The two Departments shall consult with the developer on changes deemed advisable, to include the kind and extent of site developments to be made by the developer, including off-site development.
   d. The City Engineer may grant approval of the preliminary plat or conditional approval by providing a "Statement of Completeness of Preliminary Subdivision Tract" for the plat; or the City Engineer may deny the preliminary plat, expressing his reasons for denial. The "Statement of Completeness" shall be provided to the developer with a copy provided to the Building and Zoning Department and to the Planning Department. The form of the "Statement of Completeness" is shown on Figure SR-2.
   e. The approval of the preliminary plat, either with or without conditions, shall not constitute approval of the final subdivision plat. The "Statement of Completeness of Preliminary Subdivision Tract" by the City Engineer for the preliminary plat shall be deemed to be approval of the layout submitted on the preliminary plat, as a guide to the preparation of the final plat.

2. Final Subdivision Plat Process.
   a. Refer to Article IV, Division 10. "Subdivision/Plats" of the City's Zoning Code for processing of the final subdivision plat.
   b. The final subdivision plat prepared by a Professional Surveyor and Mapper, with the supplementary material (including all easement, rights-of-way, declarations, etc.) specified in Subsection 4. "Plats and Data" below shall be submitted to the City Auditor and Clerk, with a written application for final approval. The number of copies and the format shall be in compliance with the requirements of the City Auditor and Clerk.
   c. The final subdivision plat shall include the vacation of any prior subdivision, if required by Section 177.101, F.S.
   d. Every subdivision shall be given a name by which it shall be legally known. This "primary name" shall not be the same or in any way so similar to any name appearing on any recorded plat in Sarasota County as to confuse the records or to mislead the public as to the identity of the subdivision, except when the subdivision is further divided as an additional unit or section by the same developer or the developer's successors in title. In that case, the additional unit, section, or phase shall be given the primary name followed by the unit, section, or phase number.
   e. The City Engineer shall review the final subdivision plat and required supplementary material for conformity to Chapter 177, Part 1, F.S., this Manual, and to the conditions, if any, of the preliminary subdivision plat approval. Additionally, the Building and Zoning Department shall review the final plat and required supplemental material for compliance with the purpose and intent of Chapter 35, Article II, Sarasota City Code, pertaining to tree protection and for compliance with applicable zoning criteria. Both reviews shall be required prior to the submission of the final plat to the Planning Board for their public hearing, as described in Subsection C.4. above.
   f. A certification by the City Engineer, that the final subdivision plat complies with the items of 2 (D), above, and site developments have been installed and accepted or a performance guarantee has been delivered, shall be required prior to the submission of the final subdivision plat to the City Commission, as described in Subsection C.4. above. The form of the "City Engineer Certification for final subdivision approval" is shown on Figure SR-3.

3. Subdivision Site Layout.
   a. Street Rights-of-Way. The arrangement, character, extent, width, and location of all street rights-of-way shall conform to the City's Comprehensive Plan "*Sarasota City Plan*" (1998) and to Part 4 and Part 5, "Street Design" of this Manual. Street rights-of-way shall be laid out so as to take into consideration the relation of the street to existing and planned streets; to topographical conditions; to existing trees and to trees proposed to be relocated; to public convenience and safety; and to the appropriate relation of the street to proposed uses of the land to be served by the street. The developer shall arrange the street so as to:
      (1) Provide for the continuation or appropriate projection of existing principal streets in the surrounding area.
      (2) Conform to a plan for the neighborhood, approved or adopted by the City Commission, to meet a particular situation where topographical or other conditions make continuance or conformance to existing streets impractical.
      (3) Maximize the preservation of existing trees and to provide space to relocate existing trees Consistent with the Purpose and Intent of Chapter 35, Article II, Sarasota City Code, pertaining to tree protection.

b. Street Names. Proposed street rights-of-way which are in alignment with existing streets shall bear the name of the existing street. For streets where a name will need to be proposed, the name proposed shall not duplicate or be phonetically similar to any existing street without regard for whether or not the name of an existing street includes its designation as a Street, Avenue, Drive, or Place. Naming of a street is subject to the approval of the City Engineer.

c. Street Design. Street rights-of-way within a subdivision shall be arranged so as to discourage high-speed and through traffic. A street shall be arranged so as to eliminate monotony because of undue length. Energy conservation shall be criteria by which street layout and design may be judged. The following additional standards shall apply:
   (1) Boulevards and Parkways may follow any direction.
   (2) Streets shall run east and west only.
   (3) Avenues shall run north and south only.
   (4) Terraces shall run parallel to a major contour.
   (5) Drives or Roads may be comparatively long but shall not be straight over too great a distance.
   (6) Places shall be narrow and short; they may be curvilinear, may substitute for an alley, shall run north and south, shall be for only minor traffic use, and will normally be located between Avenues.
   (7) Ways and Lanes shall be narrow and short; they may be curvilinear, may substitute for an alley, shall run east and west, shall be for only minor traffic use, and shall be located between Streets.
   (8) Courts shall be short, end with a cul-de-sac and serve ten (10) or less zoning lots; they may be curvilinear, and shall be for only minor traffic use.
   (9) Half-streets are prohibited except where a half of a street width is essential to the reasonable development of the subdivision in conformity with this manual, when the City Engineer finds it will be practical to require the dedication of the other half of the subject street when an adjoining property is subdivided or developed. When a half-street is adjacent to a tract to be subdivided, the other half of the street shall be platted within the adjacent tract.

d. Subdivisions Abutting or Containing Arterial Streets. When a subdivision abuts an existing arterial street, or if an existing arterial street is located within a part of the subdivision, the City Engineer may require marginal-access streets and reverse frontage with screen planting in a non-access area along the rear property line, deep lots with a rear service alley, or such other treatment as the City Engineer deems necessary for adequate protection of residential properties and to afford separation of local traffic from through traffic using the arterial street.

e. Subdivisions Bordering or Containing Railroad or Limited-access Highway. Where a subdivision borders on or contains a railroad right-of-way or limited-access highway right-of-way, the City Engineer may require a street approximately parallel to and on each side of the railroad right-of-way, at a distance suitable for the appropriate use of the intervening land for park purposes. In determining suitable distances, due regard for the requirements of approach grades and future grade separations shall be given.

f. Reserve Strips. Reserve strips, to control access to streets, shall be prohibited unless a reserve strip is required by the City Engineer, Planning Board, or City Commission on such terms and conditions as are deemed warranted with respect to any particular subdivision.

g. Alleys. Alleys shall be provided in commercial and industrial districts unless this requirement is waived by the City Engineer. The City Engineer may grant a waiver where it is assured that adequate provisions have been made for service access, such as off-street loading and unloading, and for parking, all of which is adequate for the particular proposed uses of the

land.

h. Easements. Easements, across lots or centered on rear or side lot lines, shall be provided for public and private utilities when necessary. All easements shall be at least ten feet (10 ft.) in width, or in conformity with the requirements of this Manual. When a subdivision is traversed by a watercourse, drainage way, channel or stream, a storm water easement or drainage right-of-way shall be provided which conforms substantially to the lines of the watercourse, drainage way, channel or stream. The City Engineer shall determine the proposed width of the storm water easement or drainage right-of-way. The width shall be adequate for its intended purpose, as stated in Section F of Part 6, "Storm Drain Design", of this Manual. Parallel streets or parkways may be required in connection with such easement.

i. Blocks.

(1)The lengths, widths, and shapes of blocks shall be determined by consideration of the following:

(a) Provision of adequate building sites suitable to the special needs of the type of use contemplated.

(b) Zoning requirements as to lot size and dimensions.

(c) A need for convenient access, circulation, control, and safety of street traffic.

(d) Limitations and opportunities relating to topography.

(e) Block lengths shall not exceed thirteen hundred feet (1,300 ft.) nor be less than four hundred feet (400 ft.).

(f) Pedestrian trails shall be included where essential to provide circulation or access to schools, playgrounds, parks, shopping centers, transportation or other community facilities and shall be of concrete surface of no less than six feet (6 ft.) width within ten feet (10 ft.) wide easements or rights-of-way.

4. Lots. Lot size, width, depth, shape, and orientation, including minimum building setback lines, shall be appropriate for the location of the subdivision and for the type of development and use contemplated. Provided, however, that all dimensions shall conform to the requirements of the Zoning Code. In addition:

(1) Depth and width of properties reserved or laid out for commercial and industrial purposes shall be adequate to provide for the off-street service and parking facilities required by the type of use and development contemplated.

(2) Corner lots, for residential uses, shall have width to permit appropriate building setbacks from each street.

(3) Each lot shall have satisfactory access, by means of a public or private street or easement, to public streets.

(4) Double-frontage and reverse-frontage lots shall not be used except where essential to provide separation of residential uses from traffic arteries or when necessary to overcome specific disadvantages of topography and orientation. A planting screen easement, at least ten feet (10 ft.) in width, across which there shall be no right of movement, shall be provided along the line of lots abutting a traffic artery or other disadvantageous use.

(5) Side lot lines should be substantially at right angles or radial to street lines.

5. Public Sites and Open Spaces. When a proposed park, playground, school or other public use identified in the City's Comprehensive Plan, "Sarasota City Plan", (1998) is located in whole or in part within a subdivision, the City Engineer may require the dedication or reservation of such area, within the subdivision, in accordance with applicable law. Based upon the particular type of development, especially in large-scale neighborhood unit developments not anticipated in the

Comprehensive Plan, the City Engineer may require the dedication or a reservation of areas of sites or character, extent and location suitable to the needs created by such development for schools, parks, public beaches, fire and police stations, sewer, water or other utility plants, and other neighborhood purposes, in accordance with applicable law.

6. Required Site Development.
   a. Monuments. Monuments shall be placed in accordance with Section 177.091, F.S. The monuments shall be of the material, size, and length approved by the City Engineer.
   b. Utility and Street Site Developments. Utility and street site developments shall be provided in each new subdivision in accordance with this Manual, including:
      (1) All utilities shall be underground
      (2) All streets shall have curb, gutter and sidewalk
      (3) All street parkways shall be planted with canopy-type trees
      (4) All streets shall have pedestrian friendly ornamental-style street lights as approved by the Director of Public Works.

7. Plats and Data.
   a. Application Requirements for Final Plat.
      (1) General subdivision information shall be provided to describe or outline the existing conditions of the site and the proposed development. This information shall be in sufficient detail to supplement the drawings required under subsection (b) below. This information may include data on existing covenants, land characteristics, available community facilities and utilities as well as information describing the subdivision itself, such as the number of residential lots, typical lot width and depth, price range, business area, playgrounds, park areas, other public areas, proposed protective covenants and proposed utilities and street development.
      (2) A location map shall be submitted to show the relationship of the proposed subdivision to the existing community facilities which serve or influence it. The location map shall include the name of the subdivision and its location, the main traffic arteries, public transportation lines, shopping centers, elementary and high schools, parks and playgrounds, principal places of employment, other community features such as airports, hospitals and churches and the location map shall include a title, scale, north arrow and date.
      (3) On a topographic survey, a sketch plan shall be drawn setting forth the proposed layout of streets, lots and other features in relation to existing conditions. The sketch plan shall include the existing topographic data, as identified in Subsection (B) (1) below, or so much of that data as the City Engineer determines is necessary for his review of the sketch plan.

8. Data for Plat Approval.
   a. The optional preliminary and/or the final plat shall conform to the requirements of Chapter 177, Part 1, F.S. and specifically Section 177.091.
   b. Unless otherwise specified the Engineering Department, or the Building and Zoning Department with respect to trees, the optional preliminary and/or the final plat shall show existing and proposed conditions, including:
      (1) The present tract designation according to the official records of the Clerk of the Circuit Court for Sarasota County, Florida, shall be included. The title under which the proposed sub-division is to be recorded shall be set forth. A notation shall state the acreage. A

certification of a Professional Surveyor and Mapper, including the date of survey, name, address, and telephone number of the surveyor and mapper shall be included. A key plan shall show the location of the tract.

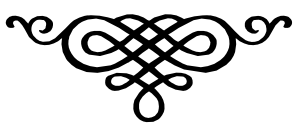
(2) Title, scale, north arrow and date on all sheets.
(3) The following shall be drawn on every sheet showing any portion of the lands subdivided.
(4) Boundary lines with bearings and distances.
(5) Lot lines, lot numbers and block numbers.
(6) Easements with location, width, and purpose.
(7) Street rights-of-way on the tract and adjacent to the tract.
(8) Zoning on land adjacent to the tract shall be shown.

c. Size of Drawings. The optional preliminary and/or the final plat shall be drawn utilizing sheets eighteen inches (18 in.) wide by twenty- inches five (25 in.) long.
d. Scale of Plat. The optional preliminary and/or the final plat shall be drawn at a scale of sufficient size to show all detail and shall be both stated and graphically illustrated by a graphic scale drawn on every sheet showing any portion of the lands subdivided.
e. Covenants.
(1) A draft of restrictive or protective covenants the developer proposes to record, so as to protect the use of the subdivision, shall be submitted to the City Engineer with the optional preliminary plat.
(2) An original of protective covenants the developer proposes to record, so as to protect the use of the subdivision, shall be submitted to the City Engineer with the final plat, in a proper form for recording.
(3) Any subsequent changes thereafter to the recorded protective covenants shall be submitted to the City Engineer, prior to and in the proper form for recording.

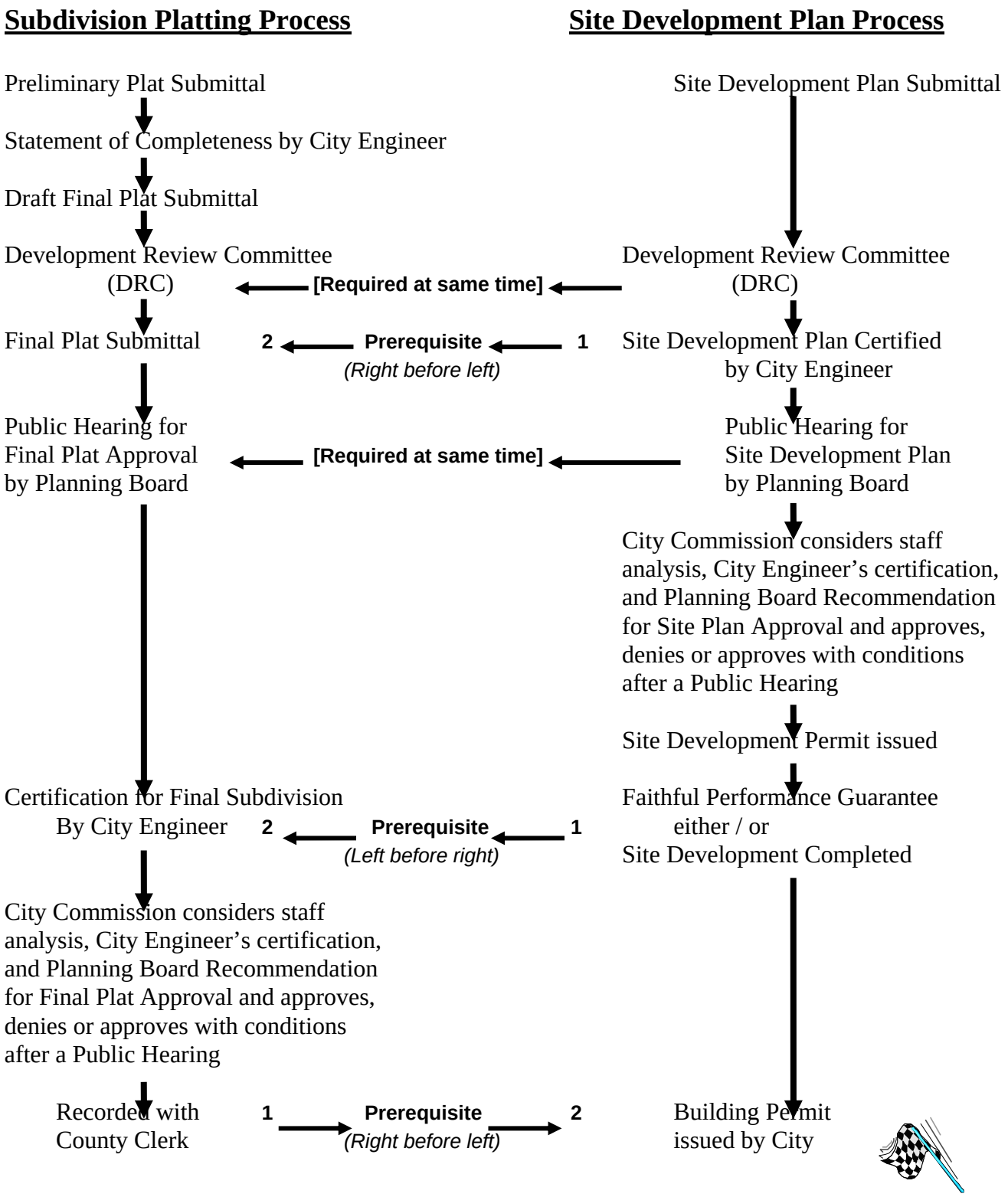
9. Prior to the submittal for final plat approval, the City Engineer shall certify that the developer has complied with one of the following:
   a. All site development have been installed in accordance with the requirements of these Subdivision Regulations, in conformity with the preliminary plat, if any, and in conformity with this Manual and have been accepted; or
   b. Delivery of a faithful performance guarantee in the amount of one-hundred-fifteen percent (115%) of the Engineer's estimate of the cost of any site development shall be issued to the City, to assure completion of all required site development.

10. The submittal for final plat approval shall be accompanied by a final site landscaping plan identifying the types, sizes and locations of existing trees and the types, sizes and locations of the trees that the developer proposes to remove or relocate, which are protected by Chapter 35, Article II, Sarasota City Code. The final site landscaping plan shall contain the items required in Section 35-226(6), Sarasota City Code.

11. Other data such as certificates, affidavits, endorsements, or deductions as may be required by the City in the implementation of these regulations.



PROCEDURE FOR SUBDIVISION APPROVAL



CITY OF SARASOTA **PROCEDURE FOR SUBDIVISION APPROVAL**

Fig. SR - 1

STATEMENT OF COMPLETENESS OF PRELIMINARY SUBDIVISION TRACT

This "Statement of Completeness" by the City Engineer, for the preliminary subdivision plat, shall be deemed to be approval of the layout submitted on the preliminary plat, as a guide to the preparation of the final subdivision plat.

1. **Subdivision Information:**

Subdivision Name: _____

Subdivision Location: _____

Developer's Name: _____

Developer's Address: _____

_____

_____

Developer's Phone Number: (_____) _____ Fax Number: : (_____) _____

2. **Certification of Compliance:**

I hereby certify that the preliminary subdivision plat complies with Chapter 177, Part 1, Florida Statutes, the City Code, and the Engineering Design Criteria Manual. These determinations have been based upon a review conducted by me or a project representative under my direct supervisory authority.

Dennis Daughters, P. E., City Engineer
Florida Professional Engineer No. 33564

City of Sarasota, Florida
Engineering Department, Room 100A
1565 First Street
Sarasota, FL 34236

Phone: (941) 954-4180 Fax: (941) 954-4174
E-Mail: engineering@ci.sarasota.fl.us

Sign, date & affix seal

Conditions of the preliminary subdivision plat are as follows:

_____

_____

_____

_____

CITY OF SARASOTA

STATEMENT OF COMPLETENESS OF PRELIMINARY SUBDIVISION

Fig. SR - 2

CITY ENGINEER CERTIFICATION FOR FINAL SUBDIVISION APPROVAL

A certification by the City Engineer that the final subdivision plat
Complies with the City of Sarasota Subdivision Regulations, is required
Prior to the submission of the final subdivision plat to the City Commission.

1. **Subdivision Information:**

Subdivision Name: _____

Subdivision Location: _____

Developer's Name: _____

Developer's Address: _____

_____

_____

Developer's Phone Number: (_____) _____ Fax Number: : (_____) _____

2. **Certification of Compliance:**

I hereby certify that the final subdivision plat complies with Chapter 177, Part 1, Florida Statutes, the City Code, the Engineering Design Criteria Manual, and to the conditions, if any, of the preliminary plat approval. I further certify that all site developments have been installed in accordance with City regulations and have been accepted or a faithful performance guarantee has been issued to the City in a sufficient amount to assure completion of all required site development.

Any substantial deviation (noted below) is considered minor and the plat will remain in compliance with the above criteria. These determinations have been based upon a review conducted by me or a project representative under my direct supervisory authority.

Dennis Daughters, P. E., City Engineer
Florida Professional Engineer No. 33564

Sign, date & affix seal

City of Sarasota, Florida
Engineering Department, Room 100A
1565 First Street
Sarasota, FL 34236

Phone: (941) 954-4180 Fax: (941) 954-4174
E-Mail: engineering@ci.sarasota.fl.us

Substantial deviations from the applicable criteria are as follows:

_____

_____

_____

_____

CITY OF SARASOTA **CERTIFICATION FOR FINAL SUBDIVISION APPROVAL**

ENGINEERING DESIGN CRITERIA MANUAL

PART 4

STREET DESIGN

Outside of Downtown and Environs Area

PART 4. STREET DESIGN
Outside of Downtown and Environs Area (DEA)

Section A - General.

1. Part 4. of this Engineering Design Criteria Manual shall apply to all roadways outside of the Downtown and Environs Area (DEA). See Figure DE-1, in Part 5, on page 5-11 for a map of the boundaries of the DEA.

2. The City Manager, or his designee, may issue written technical deviations from this Part 4. Such deviations must be based upon review of a detailed study prepared by a Professional Engineer for the applicant, which demonstrates that the performance of designs proposed for deviation will perform at the same or higher level than those specified in this Manual. See Section G. 5. for relief on sidewalk requirements.

3. Existing rights-of-way within, or the half of the existing right-of-ways adjacent to, the site development, without regard for whether or not such streets provide access to the development, shall be improved to the standard of this Manual as shown in Figures ST-1 and ST-2, by constructing roadway, and/or bicycle lanes, and/or curb and gutter, and/or sidewalk.

4. The *Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways* ("Greenbook") 2001 or later edition and the *Bicycle Facilities Planning and Design Handbook*, 1998 or later edition, both prepared by Florida Department of Transportation, Tallahassee, Florida and the *Manual on Uniform Traffic Control Devices* ("MUTCD") 2001 or later edition, and the *Roundabouts: An Informational Guide* June 2000 or later edition, both prepared by U. S. Department of Transportation, Federal Highway Administration and *A Policy on Geometric Design of Highways and Streets 2001* or later edition, prepared by American Association of State Highway Officials (AASHTO) shall be used as a guide in the design of all public streets. Copies of all of the above are on file at the office of the City Engineer. In case of conflict, the criteria established in this Engineering Design Criteria Manual shall supersede.

Section B - Street Right-of-Way Widths.

1. Street right-of-way (ROW) widths shall be as shown in the Thoroughfare Plan of the Comprehensive Plan and where not shown therein shall be not less than as follows:

STREET CLASSIFICATION	RIGHT-OF-WAY WIDTH (feet)
Major Arterial	100
Minor Arterial	90
Major Collector	75
Minor Collector	60
Commercial/Industrial Local	60
Residential Local With Parking	60
Residential Local Without Parking	50
Cul-de-Sac (Radius)	45
Marginal Access Street	40

Section C - Street Widths.

1. All streets outside of the Downtown and Environs Area (DEA) shall conform to the minimum elements of geometric cross section as shown in Figures ST-1 and ST-2.

2. Curb and gutter shall be in accordance with Figures ST-3 and ST-4.

Section D - Street Alignment and Grades.

1. Street grades: Street grades on all streets and roads shall be at the sole discretion of the City Engineer and shall not exceed six percent (6%), nor be less than three-tenths percent (0.3%).

2. Intersection grades: The gradient of the street entering an intersection shall not be more than three percent (3.0%) within a distance of twenty feet (20 ft.) from the gutter flow line of the intersected street. A grading plan may be required by the City Engineer to ensure that there are no flat areas and/or dips created by the design.

3. Vertical curves: Vertical curves shall be provided for all grade breaks of one percent (1.0%) or more.

4. Horizontal curves: Where a center-line deflection angle of more than ten degrees (10°) in the alignment of a street occurs, a horizontal curve of reasonable long radius shall be introduced. Residential Local streets having a right angle change in alignment shall provide a minimum centerline right-of-way turning radius of seventy-five feet (75 ft.).

5. Reverse curves: A center-line tangent of at least two hundred feet (200 ft.) shall be introduced between reverse horizontal curves on Arterial and Collector streets. On Residential Local streets, the transition rate angle, to connect offsetting centerlines of the road, shall not exceed five degrees (5.0°).

6. Superelevation: Streets shall be superelevated only if required by the City Engineer.

7. Crown: Crown of a street shall normally be at the center-line, but may be shifted to eight feet (8 ft.) from the edge of pavement, subject to the approval of the City Engineer.

8. Intersection: Street intersections shall be designed and constructed as follows:

    a. Angle of intersection: Street intersections shall be as nearly as possible at right angles and no angle of intersection between streets or between a street and an alley shall vary more than thirty degrees (30°) from a right angle. Angles other than ninety degrees (90°) may require the use of setback lines, special rounding of corners, or other devices to assure desirable results as to traffic movements, visibility and safety.

    b. Offsets at intersection: Street jogs with center-line offsets of less than one hundred twenty-five feet (125 ft.) shall be prohibited. Arterial and Collector street center-line offsets shall be prohibited.

c. Visibility at intersections:

On a corner property in any zone district, no fence, wall, hedge or other planting or structure shall be erected, placed or maintained in a manner that it will obstruct sight visibility on the streets. Sight visibility requirements, specific to any corner shall be in conformance with Figures III-8 through III-11, inclusive, of Chapter III of the Florida Department of Transportation's *"Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways (Greenbook)"*, 2001 or later edition. The sight distance required for the safe execution of a crossing or turning maneuver is dependent on the acceleration capabilities of the vehicle, the crossing distance, and the design speed of the street to be crossed. The minimum design speed for this analysis shall be 25 miles per hour (mph). For design speeds below those available in the Florida *Greenbook*, specific calculations will be required to justify an exception. This minimum sight distance should be provided for a given vehicle class (trucks) if it constitutes five percent (5%) or more of the total crossing traffic or experiences thirty (30) or more crossings or left turn movements per day.

Street signs and/or plant material may encroach in this triangle, except between the heights of two and one-half feet (2 ½ ft.) and eight feet (8 ft.) from normal ground surface.

d. Limited access streets: Intersections with Arterial streets shall be at the approval of the City Engineer based on public safety and proximity of other intersecting streets.

e. Corner radii: Curb return radii, at corners, measured at edge of pavement, shall be provided at all intersections. Curb return radii shall be at least that as required for:
(1) a Single Unit Truck or Bus Design Vehicle (AASHTO Designation = SU or BUS) to turn the corner while staying within the designated lane and,
(2) a Semitrailer Combination Large Design Vehicle (AASHTO Designation = WB-50) to turn the corner while staying in the left lane of a multiple-lane road being entered or traveling into the oncoming lane on a two-lane road being entered. On streets classified as Arterial or Collector in the City's Comprehensive Plan, this vehicle shall stay within the designated lane and,
(3) a bicycle lane and the gutter portion of curb and gutter may be utilized for the truck turn.
(4) an absolute minimum of twenty-two feet (22 ft.). Where parallel parking is present on one or both streets and an adequate "effective" turning radius is increased by the parking lanes, the curb return radii can be reduced to 15 feet.

f. Corner right-of-way: A radius or diagonal cutoff shall be provided at the street-side property lines for right-of-way on all intersections. The amount of right-of-way shall be in accordance with Section 8. (e) above along with the provision for, parkway, sidewalk, traffic signal and/or utility strip. The City Engineer may require a greater radius or diagonal cutoff at the intersection of any street with an Arterial street dependent on visibility requirements and truck traffic volume. Right-of-Way radius may be provided by dedication as a portion of the street right-of-way or as an easement for street purposes.

g. Arterial and Collector Intersection right-of-way requirements: On any Arterial and/or Collector street, within one hundred fifty feet (150 ft.) of its intersection with another Arterial and/or Collector street, the right-of-way and paving width shall be increased by seven feet (7.0

ft.) on both sides to permit proper intersection design. This additional right-of-way may be dedicated or deeded as a right-of-way easement.

h. Cross-Gutter: Concrete cross-gutter shall be in accordance with Figure ST-5.

9. No-outlet: Dead-end streets other than cul-de-sac streets shall be prohibited, except where appropriate to permit future extension into adjoining unsubdivided tracts. When such streets are over two hundred feet (200 ft.) in length and immediate development of the adjacent property is not planned, a temporary turn-around shall be provided. When a street is designed as a cul-de-sac, having one end permanently closed, it shall terminate in a circular area of public right-of-way having a minimum property line radius of fifty feet (50 ft.) with a minimum edge-of-pavement radius of thirty-six feet (36 ft.) as shown in Figure ST-6. A "T" type turnaround may be allowed, in accordance with Section A. 2. above. A no-outlet street shall not exceed five hundred feet (500 ft.) in length, except for finger island projections.

10. Pavement cross slope shall be adequate to provide proper drainage. The recommended cross slope is 0.02 feet per foot. The cross slope shall not be less than 0.015 feet per foot or greater than 0.04 feet per foot. The change in cross slope between adjacent through travel lanes should not exceed 0.04 feet per foot as described in the FDOT *"Greenbook"*.

Section E - Structural Section.

1. Structural section of any Arterial street shall be in accordance with Florida Department of Transportation *"Flexible Pavement Design Manual"*.

2. Structural section of any Collector or Local street shall be as follows:

   a. Surface Course: 1 ½ inches of asphaltic concrete plant mix (High stability Type S-III or S-I).

   b. Base Course: One of the following:
      (1) - 3 inches of Asphalt Base Course Type 3 (ABC 3)
      (2) - 6 inches of Cement-Stabilized Base (Shell Base or Crushed Concrete).

   b. Sub-base Course: LBR 30, 8 inches of stabilized subgrade compacted to 95% density; unless Shell Cement-Stabilized Base is used, then use LBR 40, 8 inches of stabilized subgrade compacted to 95% density.

3. Soil borings shall be furnished to determine the structural sub-base and base course requirements.

4. Pavement resurfacing and/or overlay of any street or alley shall be as follows:
   a. The material used for leveling course shall be Type II or Type III asphaltic concrete.
   b. The material used for resurfacing course shall be Type III asphaltic concrete.
   c. Any asphaltic concrete mix used shall consist of no more than twenty-five percent (25%) recycled materials.

Section F - Alleys.

1. The width of an alley right-of-way shall be a minimum of twenty feet (20 ft.).

2. Alleys shall be paved to the full width of the right-of-way.

3. Alley intersections and sharp changes in alignment shall be avoided, but where necessary, corners shall be cut off sufficiently to permit safe vehicular movement.

4. No dead-end alleys shall be permitted unless provided with a turn-around which meets the minimum cul-de-sac standards.

Section G - Sidewalks.

1. Sidewalks shall be required on both sides of all streets. Minimum sidewalk width shall not be less than five feet (5 ft.) and thickness shall be four inches (4 in.). Sidewalks adjacent to the curb shall not be less than six feet (6 ft.) wide. Sidewalks on high intensity pedestrian traffic corridors (i.e., adjacent to elementary schools, recreational facilities, etc.), to be defined by the City Engineer, shall not be less than eight feet (8 ft.) wide. The pitch shall be 1/4-inch per foot (2.0%) toward the street as shown in Figure ST-7.

2. Handicap ramps, as shown in Figures ST-8 and ST-9, shall be placed at all street corners and as otherwise required by the City Engineer (i.e., near handicap parking).

3. At signalized intersections, sidewalks shall be in accordance with Figure ST-10.

4. For sidewalks at driveways, see Figure ST-11, 12 and 13.

5. The City Engineer may grant relief from this section on the basis of unique conditions and may review and set specific alignment for sidewalks within rights-of-way in relation to unique conditions such as topography or unusually large trees.

6. Mid-block pedestrian crossings may be approved by the City Engineer for Minor Collector and Residential Local streets, where such crossings are warranted by high pedestrian volumes. Mid-block pedestrian crossings shall be placed a minimum of three hundred feet (300 ft.) from the nearest traffic signal

Section H - Driveways.

Driveways shall be constructed or reconstructed as shown on Figures ST-11, 12 and 13. In addition, the following specifications shall be complied with:

1. Driveways shall not interfere with a legal encroachment or create a hazard or nuisance and shall be spaced to make maximum street parking available. Driveways onto Arterial and Collector streets shall be kept to minimum.

2. A plan, drawn to a scale of 1" = 10', and a profile, drawn to scale of 1" = 10' horizontal and 1" = 1.0' vertical, must be submitted for approval prior to the issuance of a driveway permit. The plan shall show the driveway location relative to property lines, streets, and to other driveways on the property or adjacent thereto.

3. A common driveway will be allowed if right-of-ways over both properties are granted to each property owner.

4. Adequate sight distance shall be provided in all cases. The minimum sight distance shall be two hundred fifty feet (250 ft.). On one-way streets, the sight distance requirement applies only to the approaching direction. Sight distance is not required if the driveway is "entrance only", i.e., leaving from the street only.

5. Driveways shall intersect streets as nearly as possible at right angles and no angle of intersection shall be less than sixty degrees (60°) from the street.

6. Driveway width shall be measured at the throat as shown on Figure ST-11. Maximum driveway widths "W" shall be:

Single family dwelling		=	20 feet
Multifamily or Commercial		=	36 feet
Industrial,	one-way	=	24 feet
	two-way	=	48 feet

7. The driveway flare (curb transition) shall be a straight line. If curvilinear warp-edge is desired, then standards for intersecting streets shall apply.

8. When more than one driveway is to serve a given property frontage, the total width of all driveways shall not exceed seventy percent (70%) of the frontage and no less than ten feet (10 ft.) of full height curb shall be provided between driveways.

9. No part of any driveway for a corner property shall be constructed closer than shown in Figure ST-11. No part of any driveway for a non-corner property shall extend beyond the intersection of the curb line and the extension of the adjacent property line except where common driveways are permitted. No driveway shall be closer than one hundred feet (100 ft.) from a rail of an active railroad track.

10. Trees or shrubbery may only be removed to provide vehicular access where no suitable alternate exists and in accordance with the supervision and direction City Engineer.

11. Subdivision plans shall show a driveway design for each lot conforming to these regulations, unless the City Engineer approves delay of the design is appropriate due to construction phasing of the project.

Section I - Street and Right-of-Way Lighting.

1. Lighting designs shall be based on standards established by the *"American National Standard Practice for Roadway Lighting,"* sponsored by the Illuminating Engineering Society, and approved by the American National Standards Institute, a copy of which is on file at the office of the Director of Public Works.
2. All street lighting illumination sources shall be High Pressure Sodium Vapor (HPSV).
3. All circuits shall be multiple.
4. Refractor shall provide an IES Type III pattern.
5. Horizontal foot candles required:

Street	Zoning Classification		
Classification	Commercial	Multi-Family	Residential
Arterial	2.0	1.4	1.0
Collector	1.2	0.9	0.6
Residential	0.9	0.6	0.4
Alley	0.6	0.4	0.2

6. Luminaires, poles, brackets, and circuitry shall be as approved by the Director of Public Works. In general, poles and brackets shall be aluminum; luminaires shall be "Cobra Head" type.
7. Decorative lighting within rights-of-ways shall meet all applicable portions of the above, and be approved by the Director of Public Works before installation.

Section J - On-Street Parking.

1. On-street parking spaces shall not be marked unless required by the City Engineer because of the demand for significant parking.

2. Where marked, on-street parking spaces shall be marked with thermoplastic and in the configuration of FDOT "Standard 17346, Special Marking Areas (Parking)", and Type III preferred. Type II, if used, shall have a middle stall length of at least twenty-two feet (22 ft.). See Figure ST-14.

3. Clearance (No Parking Zone) from established pedestrian crosswalks shall be as shown on Figure 3-16, *"Manual on Uniform Traffic Control Devices"* (MUTCD). See Figure ST-14.

4. For streets with no pedestrian cross-walk, the clear zone shall be twenty-five feet (25 ft.) from the point of tangency of the curb radius, when the intersection is not signalized. The clear zone shall be thirty feet (30 ft.) when the intersection is signalized.

5. Clearance for mid-block driveways shall be twenty feet (20 ft.) from the driveway curb transition to the parking stall. See Figure ST-14.

Section K – Bicycle Network.

1. Bicycle facilities shall be provided according to Figure ST-15 through ST-18, the manuals named in Section A. 3. above, on page 4-1 and the following.

2. "Bike Lanes" are defined as a portion of the roadway that has been designated by striping, signing, and/or pavement markings for the preferential or exclusive use of bicyclists.

3. "Bike Routes" are defined as a portion of the right-of-way that has been designated by striping, signing, and/or pavement markings for the joint, but not exclusive, use of bicyclists.

~~4.~~ "Multi-Use Recreational Trails" are defined as a path open for shared public use (including bicyclists) physically separated from motor vehicle traffic by an open space or barrier and usually on exclusive right-of-way.

5. Bicycle racks shall be the "Inverted U" type (or equivalent) and shall conform to Figures ST-19 through ST-22 and the following, unless otherwise approved by the City Engineer.
   a. Bicycle racks shall not be located within bus stops, loading zones, or other areas where on-street parking is permitted.
   b. Bicycle racks shall be placed a minimum of four feet (4 ft.) from existing street furniture.
   c. Bicycle racks shall have a twelve foot (12 ft.) clearance from the edge of fire hydrants.
   d. Bicycle racks shall be placed a minimum of six feet (6 ft.) from each other.
   e. Bicycle racks shall only be installed on sidewalks with a width of ten feet (10 ft.) or greater and shall allow a minimum six feet (6 ft.) wide clear, unobstructed path for pedestrians.
   f. Bicycle racks shall be installed three feet (3 ft.) back of the face of curb.

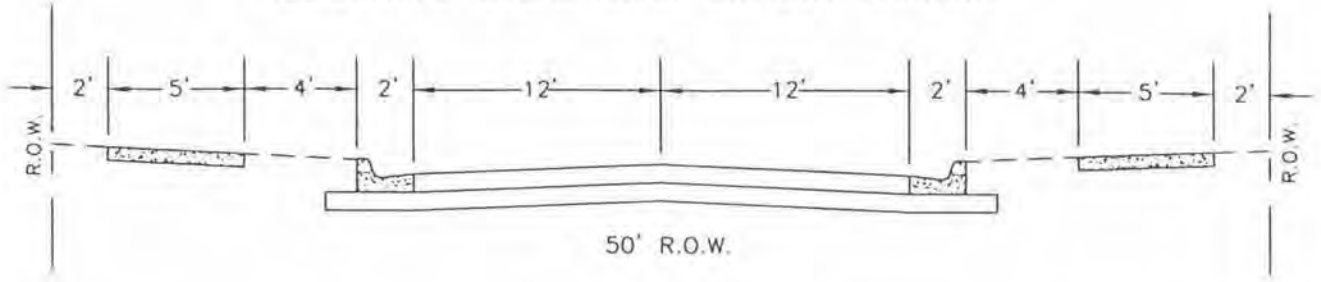
Section L - Miscellaneous.

1. Concrete Collars: Reinforced concrete collars shall be installed around all storm drain and sanitary manhole frame and covers, and around all water valve boxes in accordance with Figure ST-23.

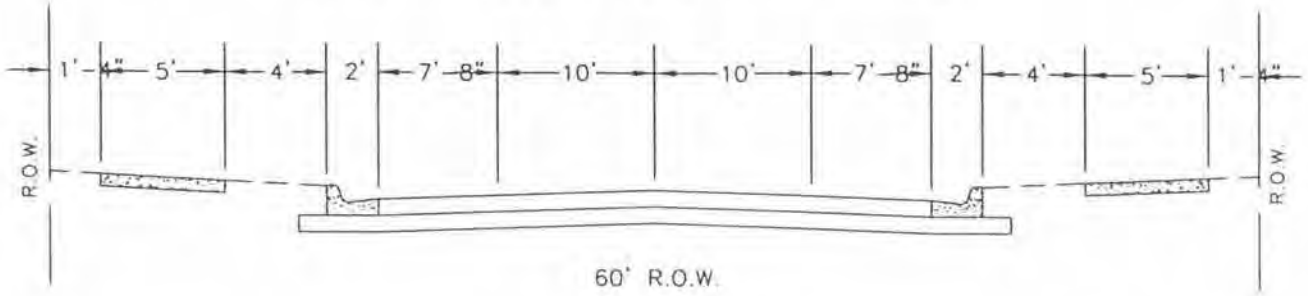
2. Traffic Sign Preservation: ~~.~~All public property along the line of work, or which is in the vicinity of the work, shall be preserved from damage. All existing roadside traffic signs for which permanent removal is not indicated shall be protected against damage or displacement. Whenever such signs lie within the limits of construction, or wherever so directed by the City Engineer due to exigencies of construction operations, the existing roadside signs shall be taken up by the Contractor, and delivered to City Public Works Department. At the Contractor's option, the Public Works Department will remove the signs at the expense of the Contractor.

3. Street Name Sign: Street name signs shall be in accordance with Figure ST-24, or as otherwise approved by the City Engineer.

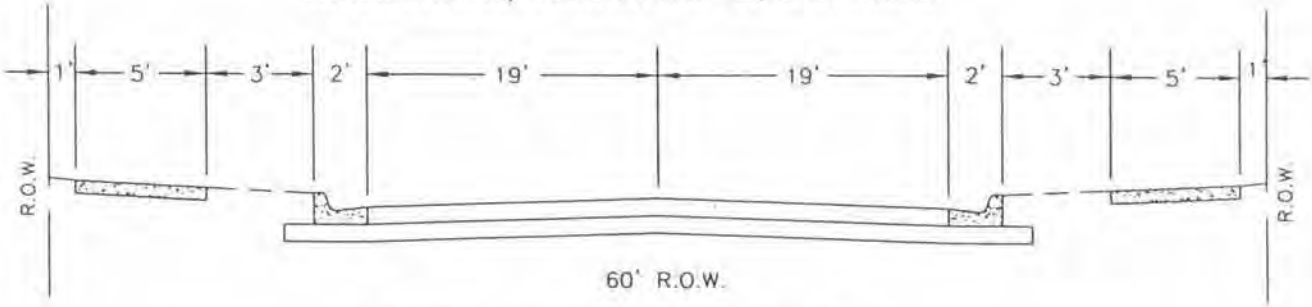
RESIDENTIAL LOCAL ROAD WITHOUT PARKING



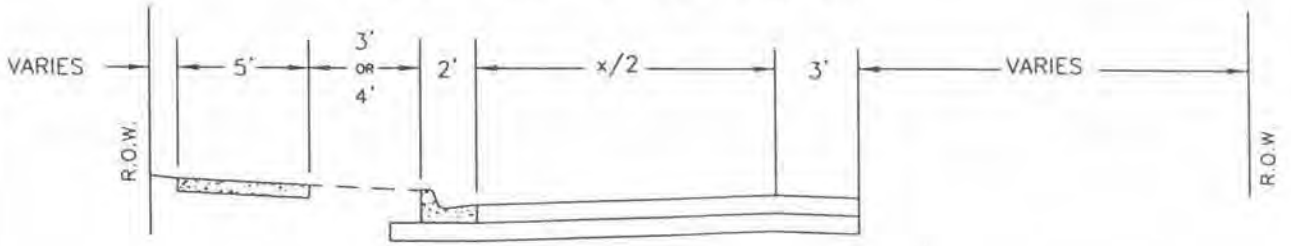
RESIDENTIAL LOCAL ROAD WITH PARKING



COMMERCIAL/INDUSTRIAL LOCAL ROAD



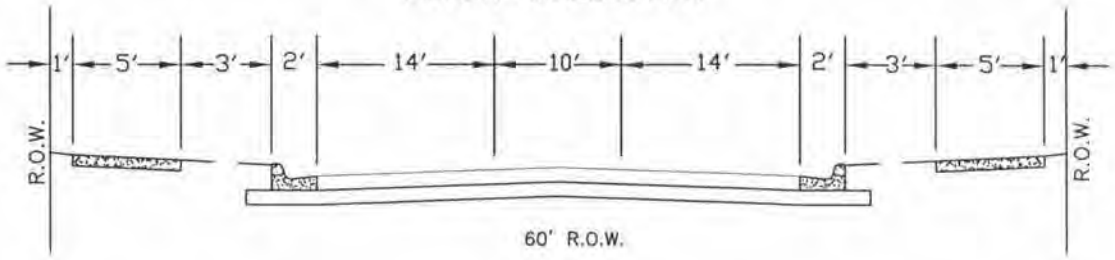
TYPICAL HALF-STREET SECTION



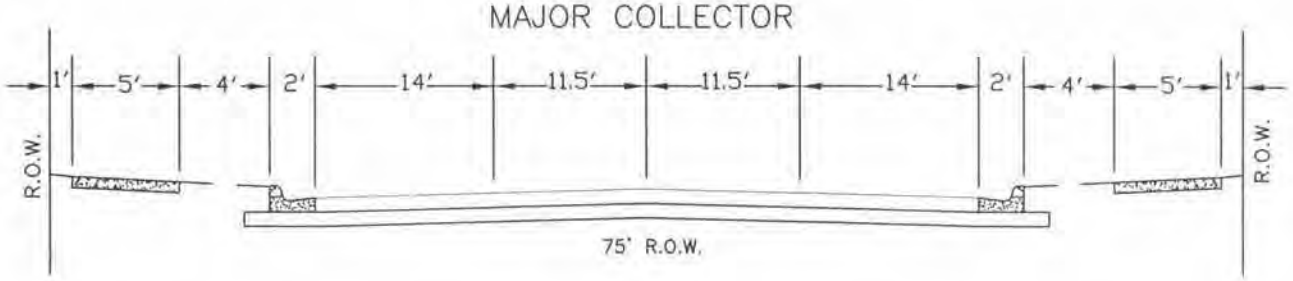
DESIRABLE LOCAL ROAD CROSS SECTIONS

N.T.S.

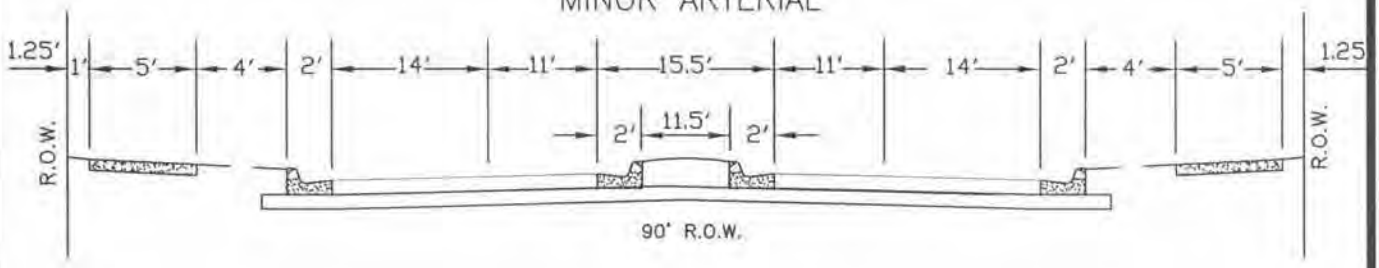
MINOR COLLECTOR



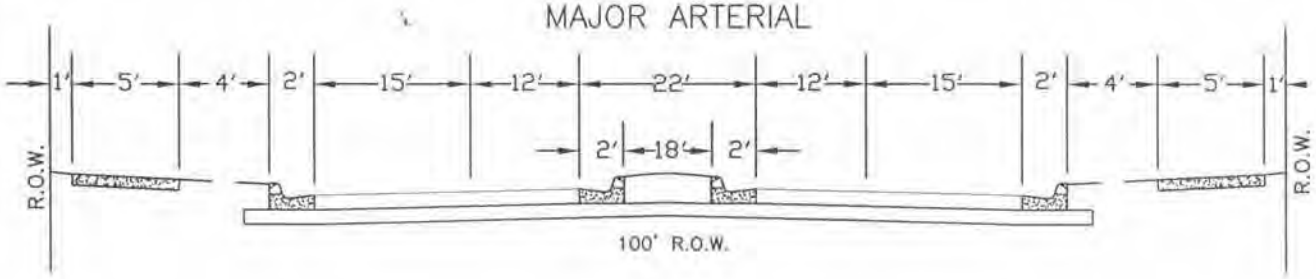
MAJOR COLLECTOR



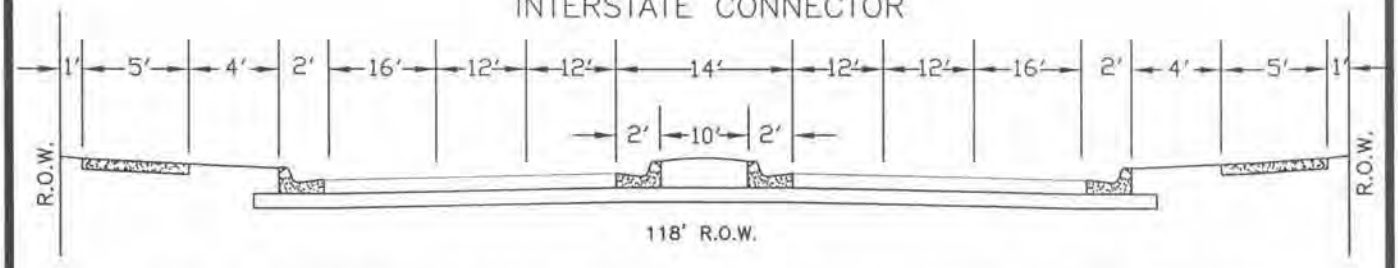
MINOR ARTERIAL



MAJOR ARTERIAL



INTERSTATE CONNECTOR



DESIRABLE THOROUGHFARE CROSS SECTIONS

N.T.S.

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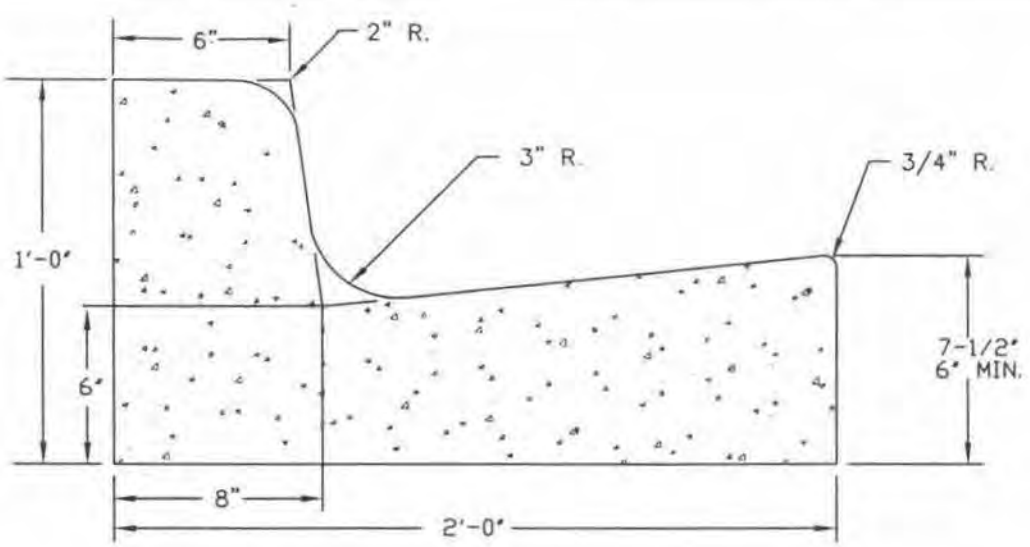
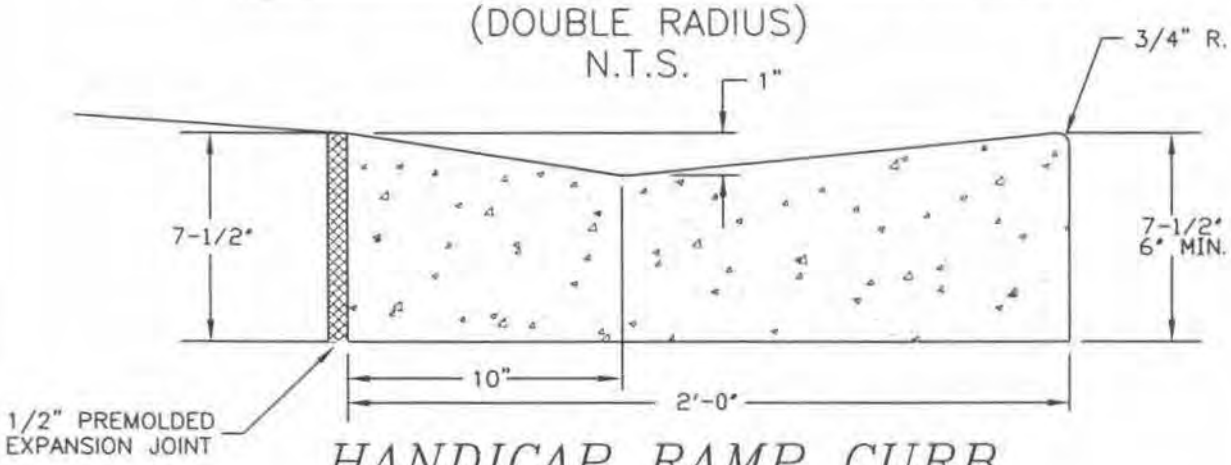


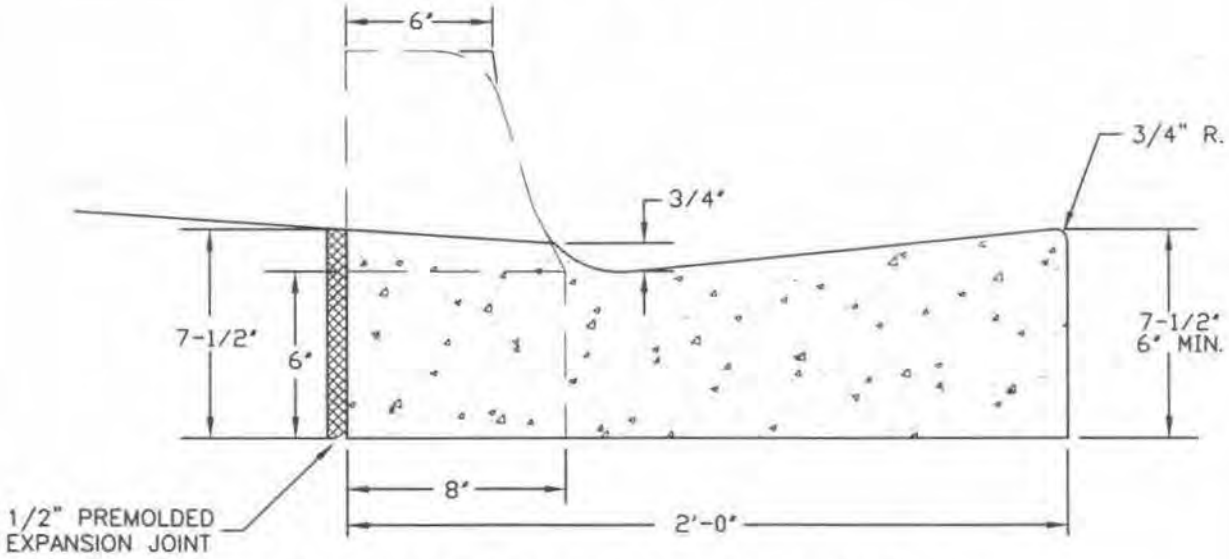
TYPE "F" CURB & GUTTER

(DOUBLE RADIUS)
N.T.S.



HANDICAP RAMP CURB

N.T.S.



DRIVEWAY DROP CURB

N.T.S.

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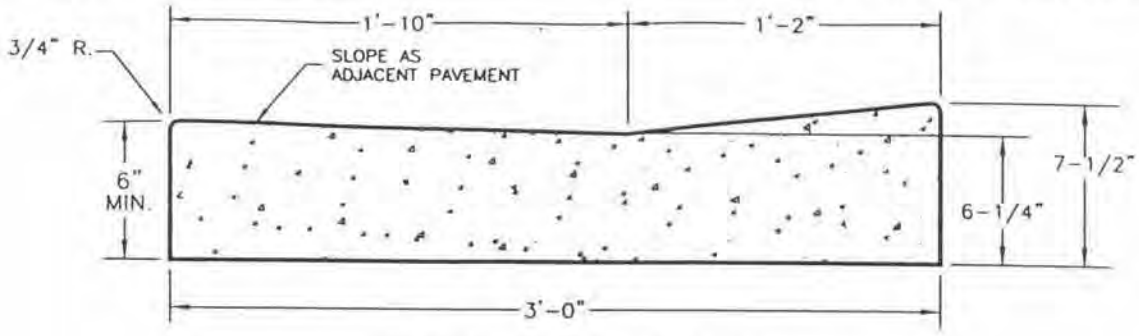
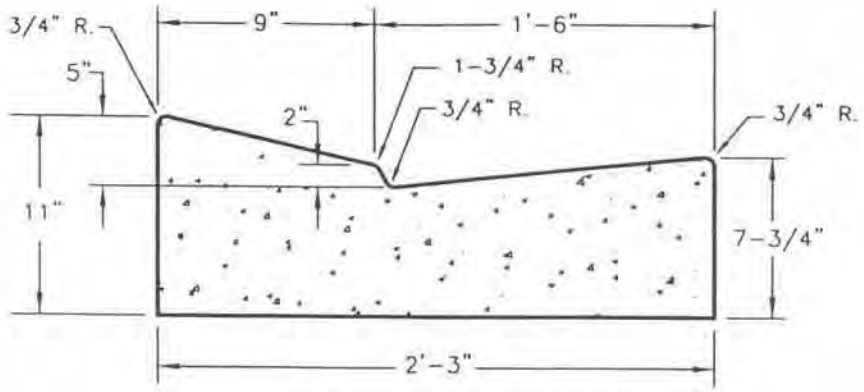
INTERSECTING STREET THROUGH STREET



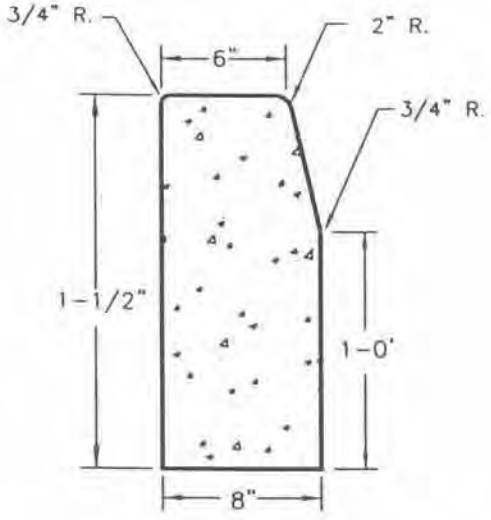
TYPE "AA" CURB

(VALLEY GUTTER)



TYPE "E" CURB

(MEDIAN CURB & GUTTER)



TYPE "D" CURB

(BARRIER CURB)

STANDARD CURB & GUTTER

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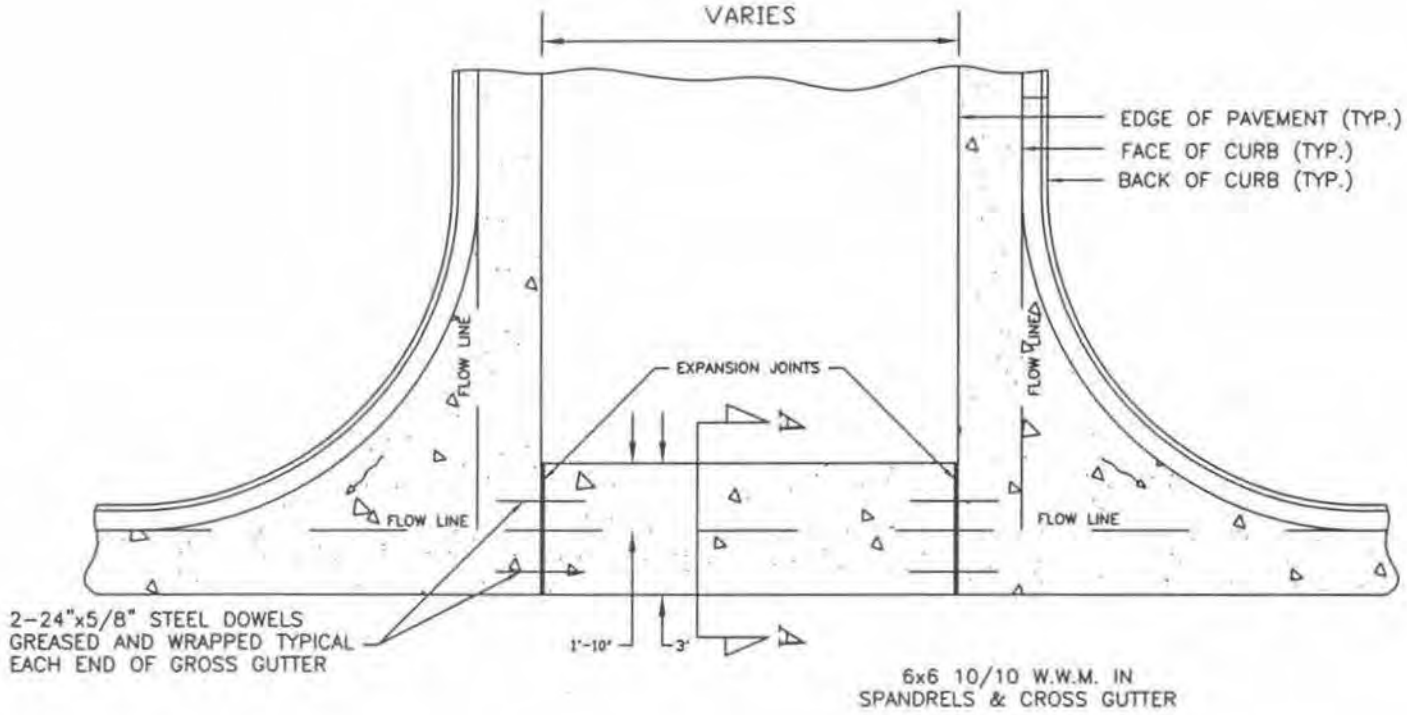
CONCRETE CROSS GUTTER

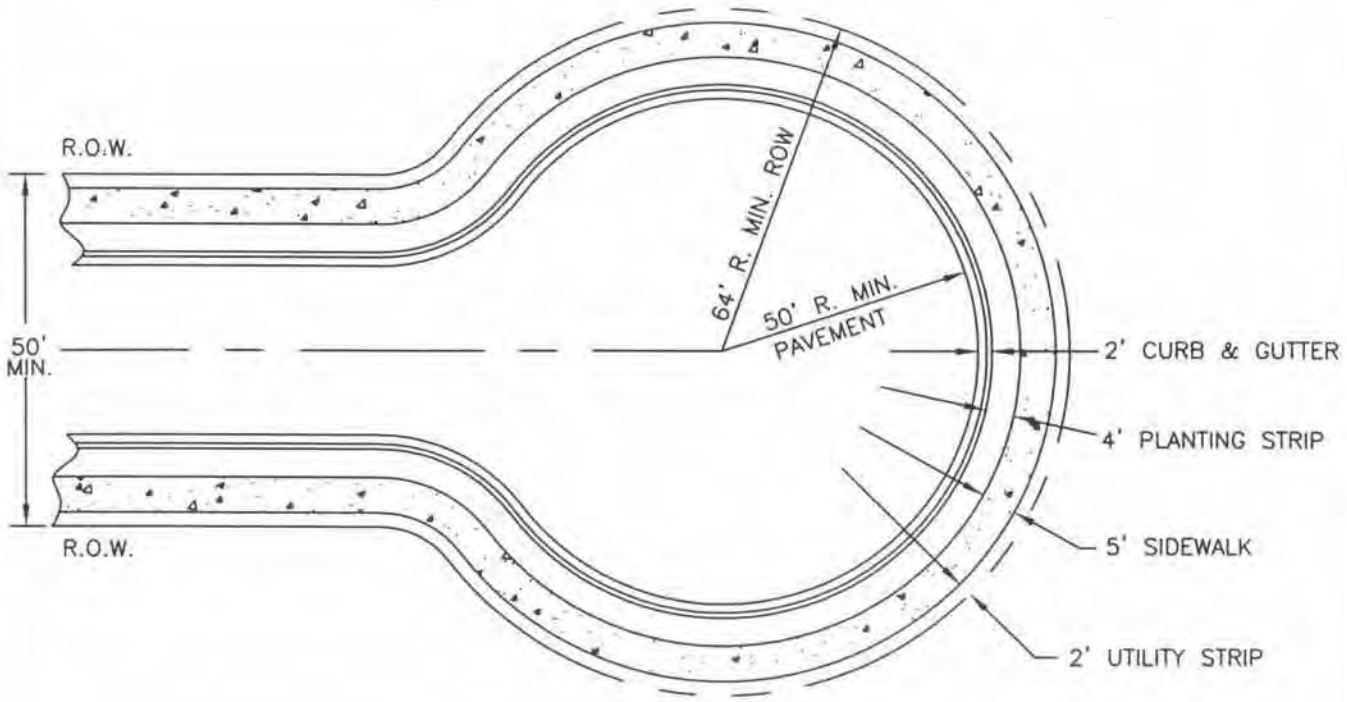
N.T.S.



NOTE: TYPE "F" CURB AND 6" THICK CLASS B P.C.C. SPANDRELS AND CROSS GUTTER ON BASE MATERIAL

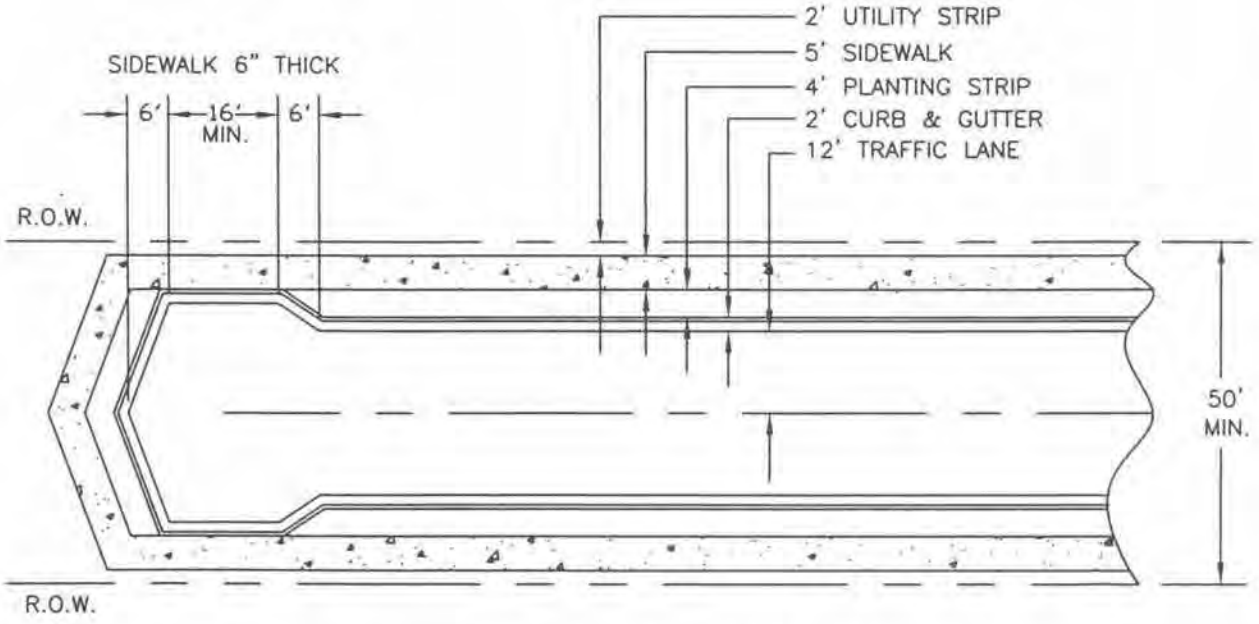
MAXIMUM DEPRESSION IN CROSS GUTTER AT FLOW LINE IS 1-1/2"

FOR SECTION A-A
SEE FIGURE ST-4



CUL-DE-SAC

N.T.S.



T-TURNAROUND

N.T.S.

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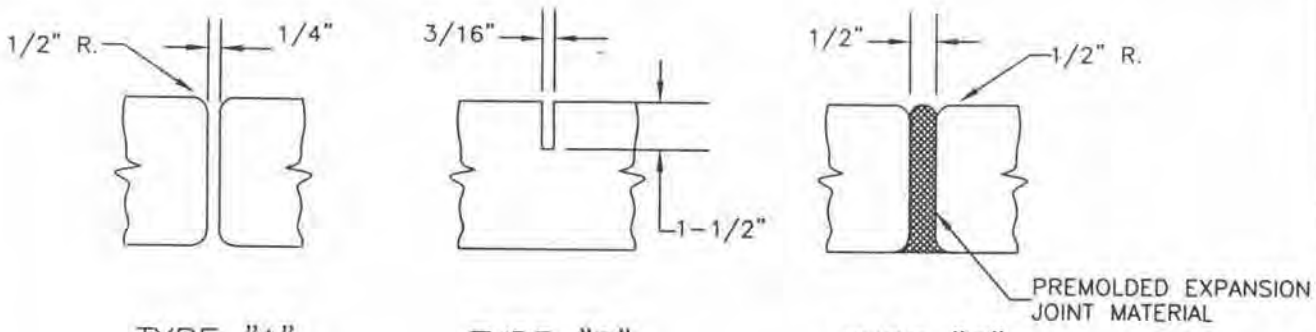


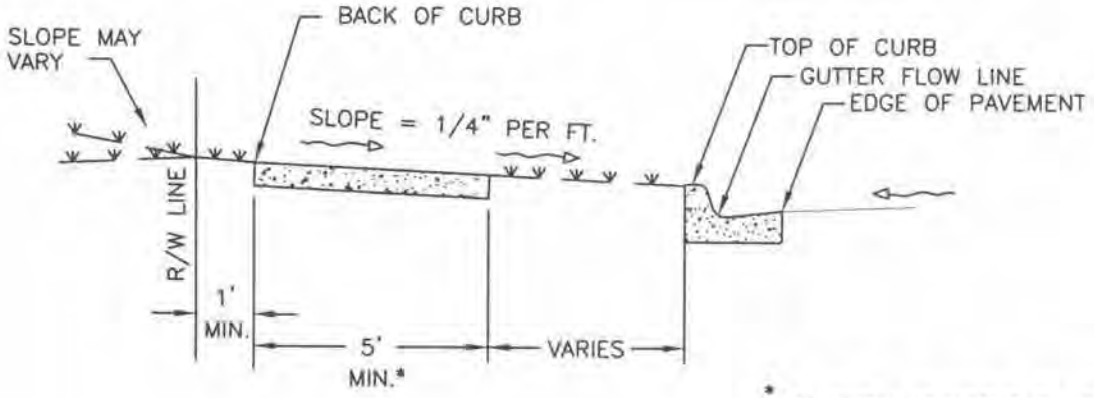
TYPE "A" TYPE "B" TYPE "C"

SIDEWALK JOINTS	
TYPE	LOCATION
"A"	P.C. & P.T. OF CURVES JUNCTION OF EXISTING & NEW SIDEWALKS
"B"	5'-0" CENTER TO CENTER ON SIDEWALKS
"C"	WHERE SIDEWALK ABUTS CONCRETE CURBS, DRIVEWAYS AND SIMILAR STRUCTURES AT INTERVALS NOT TO EXCEED 80 FEET

SIDEWALK THICKNESS	
LOCATION	"THICKNESS"
NON TRAFFIC AREAS	4"
AT DRIVEWAYS AND TRAFFIC AREAS	6"

NOTES:

1. ALL ORGANIC MATERIAL & DEBRIS SHALL BE REMOVED AND THE AREA SHALL BE GRADED AND COMPACTED PRIOR TO CONCRETE PLACEMENT
2. THE MINIMUM COMPRESSION STRENGTH OF THE CONCRETE SHALL BE OF CLASS I (@) 3,000 p.s.i. @ 28 DAYS.
3. TYPE "A" JOINTS MAY BE SAW CUT. WITHOUT THE RADIUS
4. TYPE "B" JOINTS SHALL BE SAW CUT.



* 6' WHEN ADJACENT TO CURB
8' ON HIGH INTENSITY CORRIDORS

STANDARD SIDEWALK

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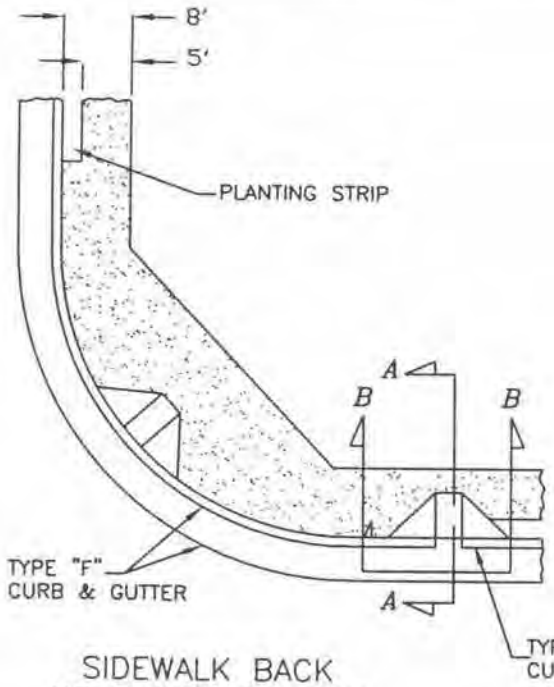
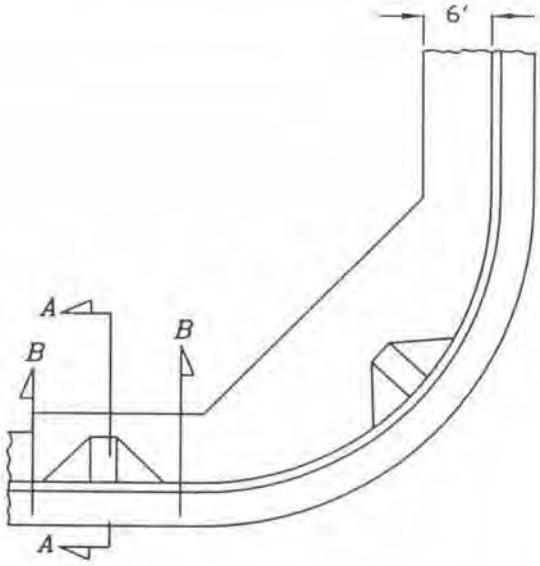
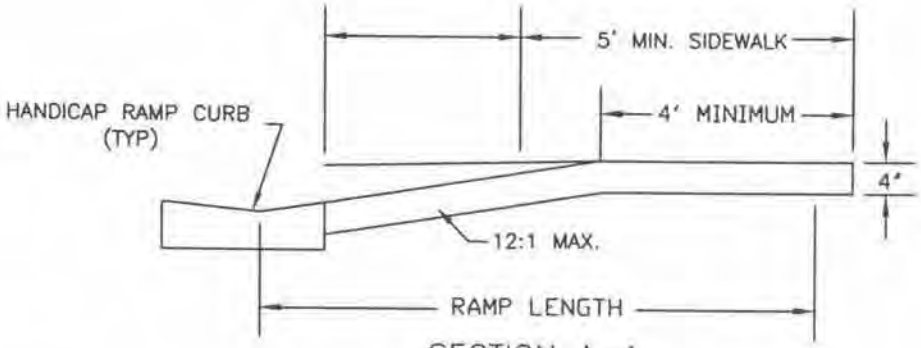


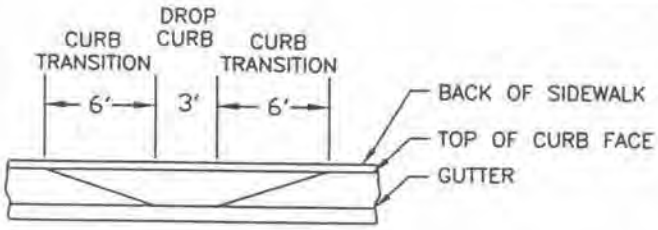
SIDEWALK BACK
OF PLANTING STRIP



SIDEWALK
ADJOINING CURB



SECTION A–A



SECTION B–B

GENERAL NOTES

1. RAMPS TO BE LOCATED IN ACCORDANCE WITH CROSSWALK MARKINGS DETAILS AS SHOWN IN PLANS.
2. RAMPS TO BE CONSTRUCTED AT ALL LOCATIONS IN THE PLANS EVEN WHEN SIDEWALK IS NOT CONSTRUCTED CONCURRENTLY.
3. IF LOCATED ON A CURVE THE SIDES OF THE RAMP NEED NOT BE PARALLEL, BUT THE MINIMUM WIDTH OF THE RAMP SHALL BE 3'(ft.).
4. THERE SHALL BE NO "LIP" ON HANDICAP RAMP CURB
5. RAMP SURFACE TO BE FINISHED IN ACCORDANCE WITH FIG. ST–9.
6. FOR SUPPLEMENTAL DETAILS, SEE F.D.O.T. INDEX 515.

STANDARD CURB CUT FOR HANDICAP RAMPS

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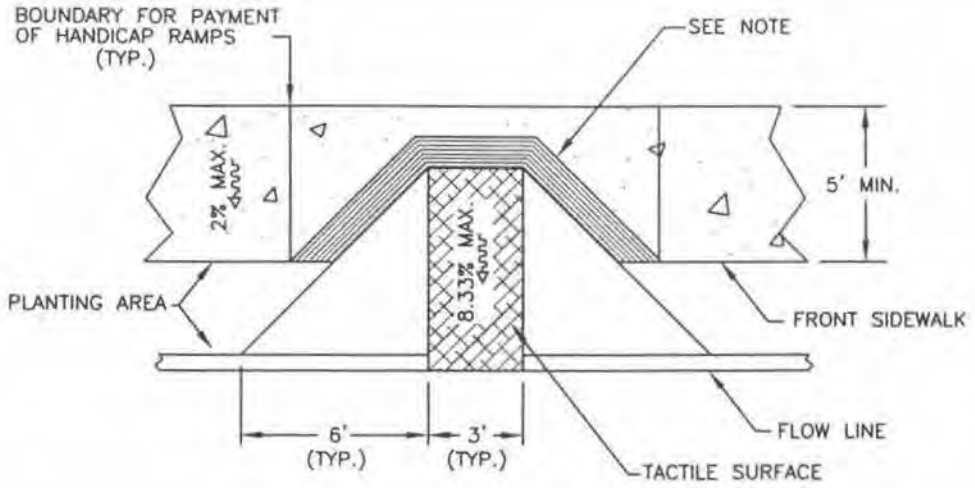

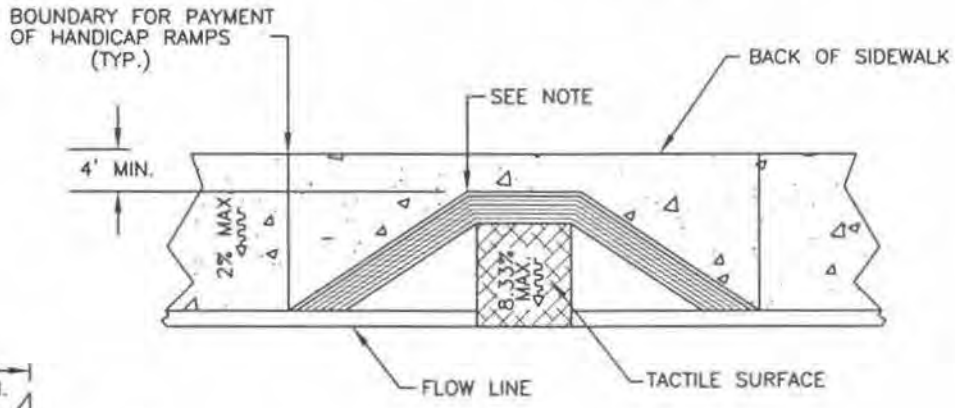

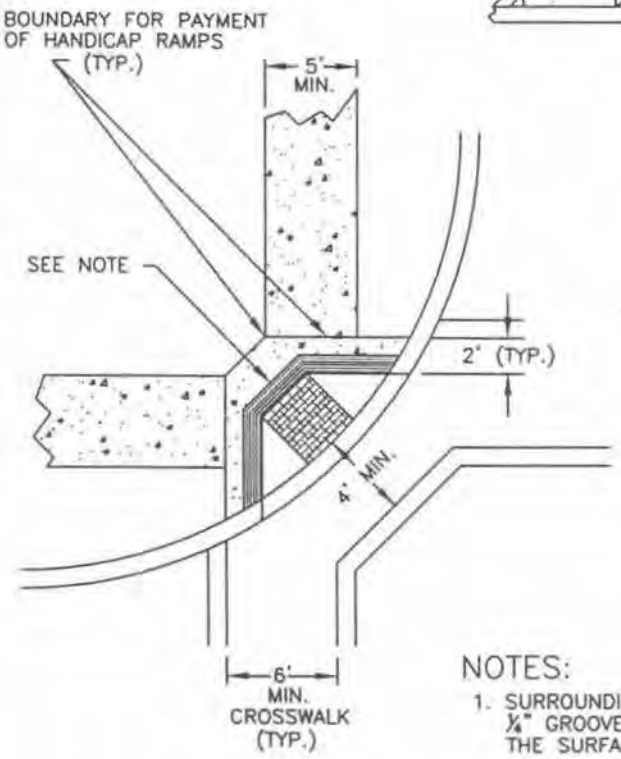

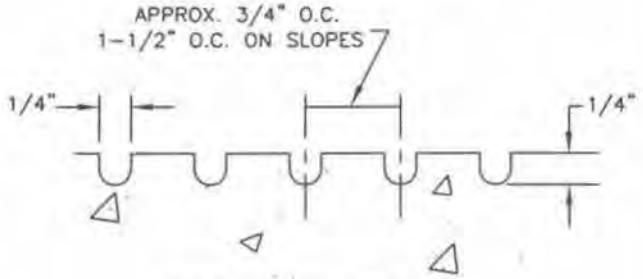

GROOVING DETAIL

NOTE:
GROOVES ARE FOR ASSISTANCE TO BLIND PERSONS AND NOT SURFACE TEXTURE.

NOTES:

1. SURROUNDING THE RAMP SHALL BE A 12" WIDE BORDER WITH ¼" GROOVES APPROXIMATELY ¾" O.C. (SEE GROOVING DETAIL). THE SURFACE OF THE RAMP SHALL CONFORM TO F.D.O.T. INDEX NO. 304.
2. RAMPS ON CORNERS SHALL BE A 6" THICK, ALL OTHERS MAY BE 4" THICK.

HANDICAP RAMPS WITH TACTILE STRIPS

N.T.S.

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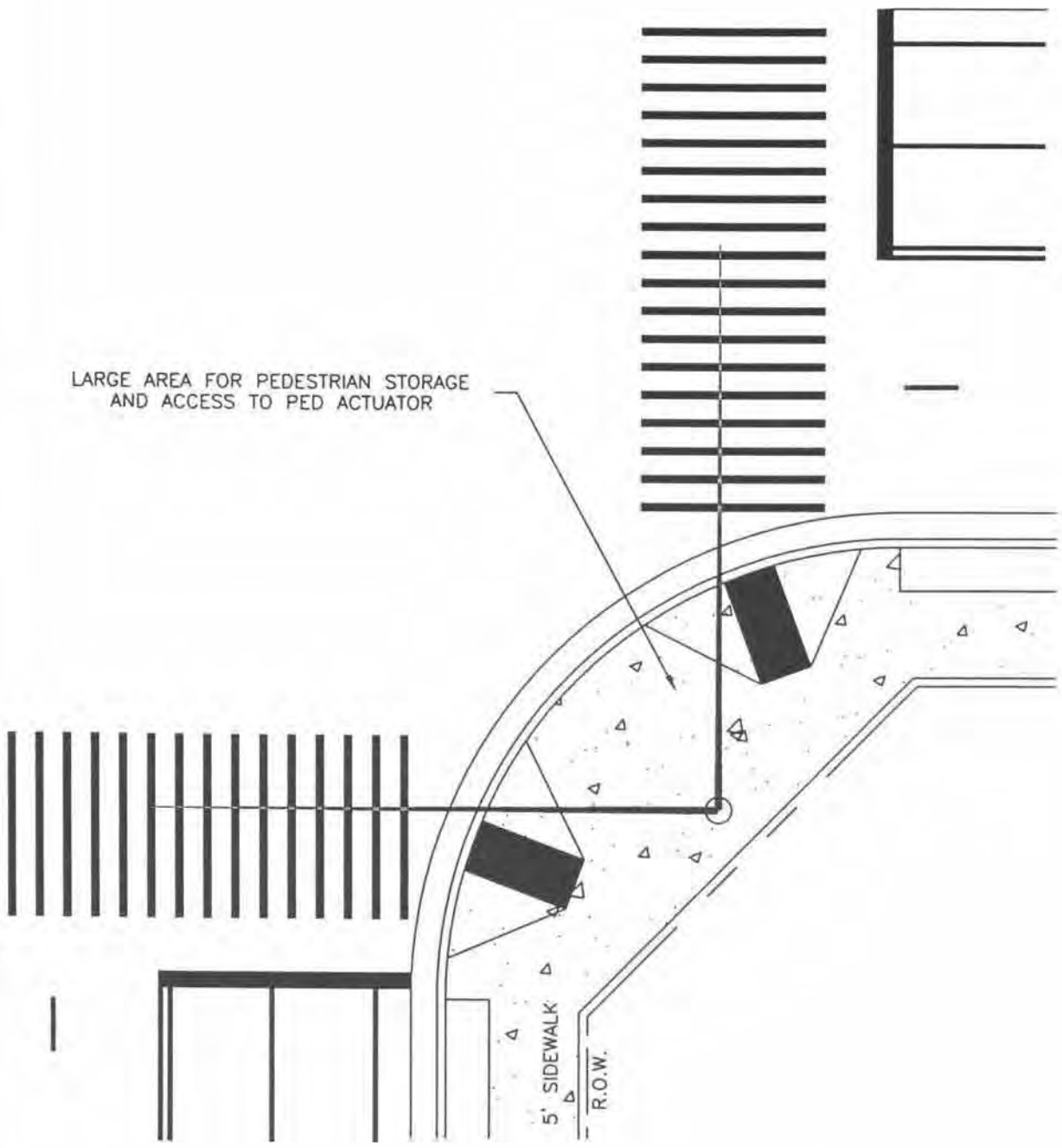

SIDEWALK CORNER AT SIGNALIZED INTERSECTIONS

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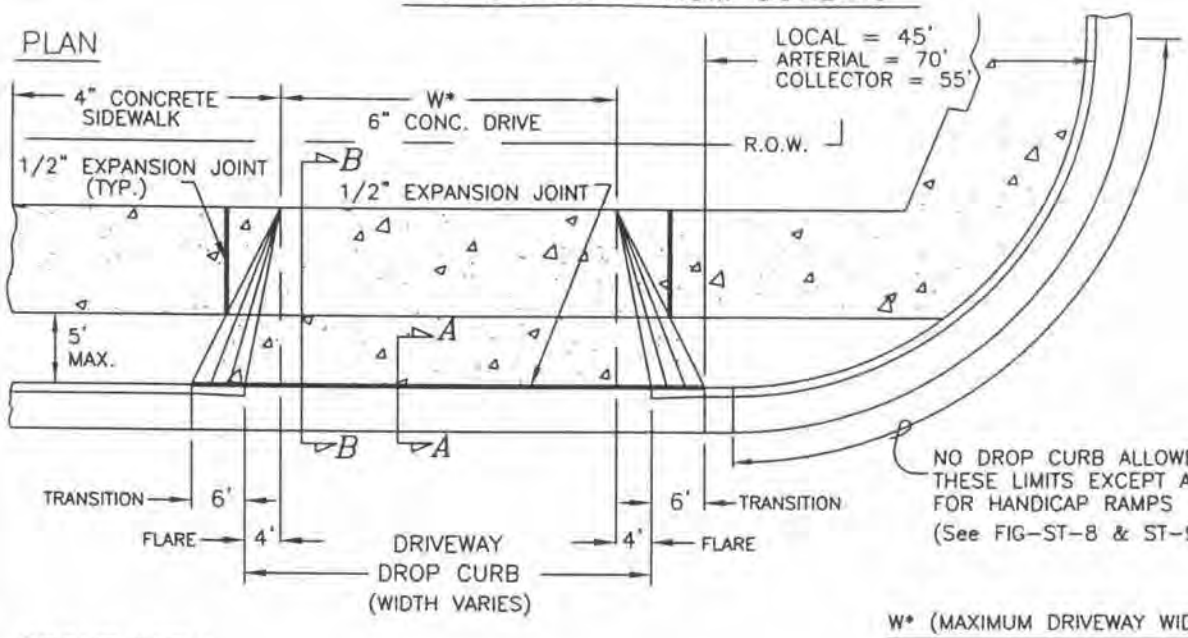
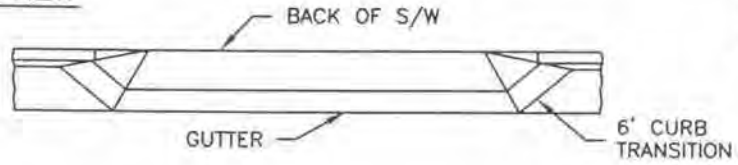
ALTERNATE #1 WITH SIDEWALK 5' OR LESS FROM CURBING

PLAN



FRONT VIEW

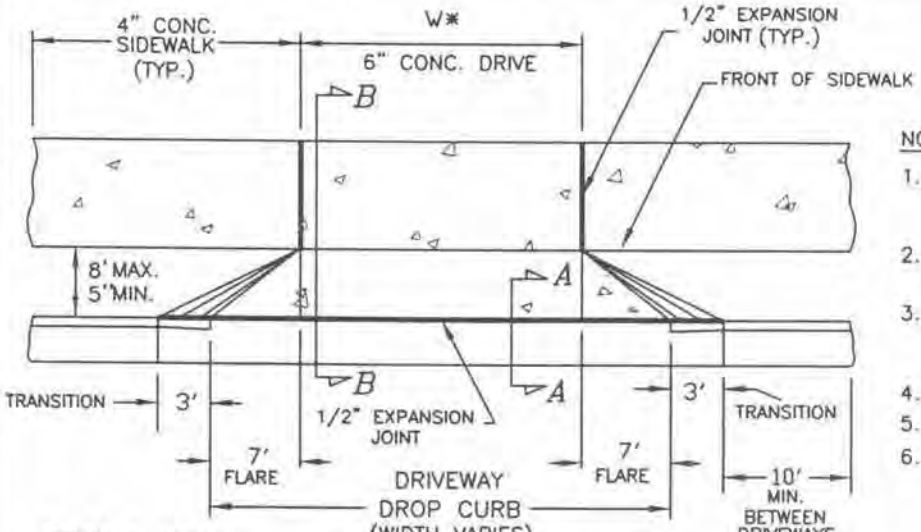


W* (MAXIMUM DRIVEWAY WIDTH)

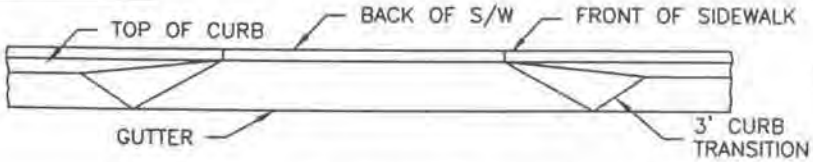
SINGLE FAMILY DWELLING = 20'
MULTIFAMILY, COMMERCIAL = 36'
INDUSTRIAL, ONE WAY = 24'
INDUSTRIAL, TWO WAY = 48'

ALTERNATE #2 WITH NO SIDEWALK OR SIDEWALK 5' OR MORE FROM CURBING

PLAN



FRONT VIEW



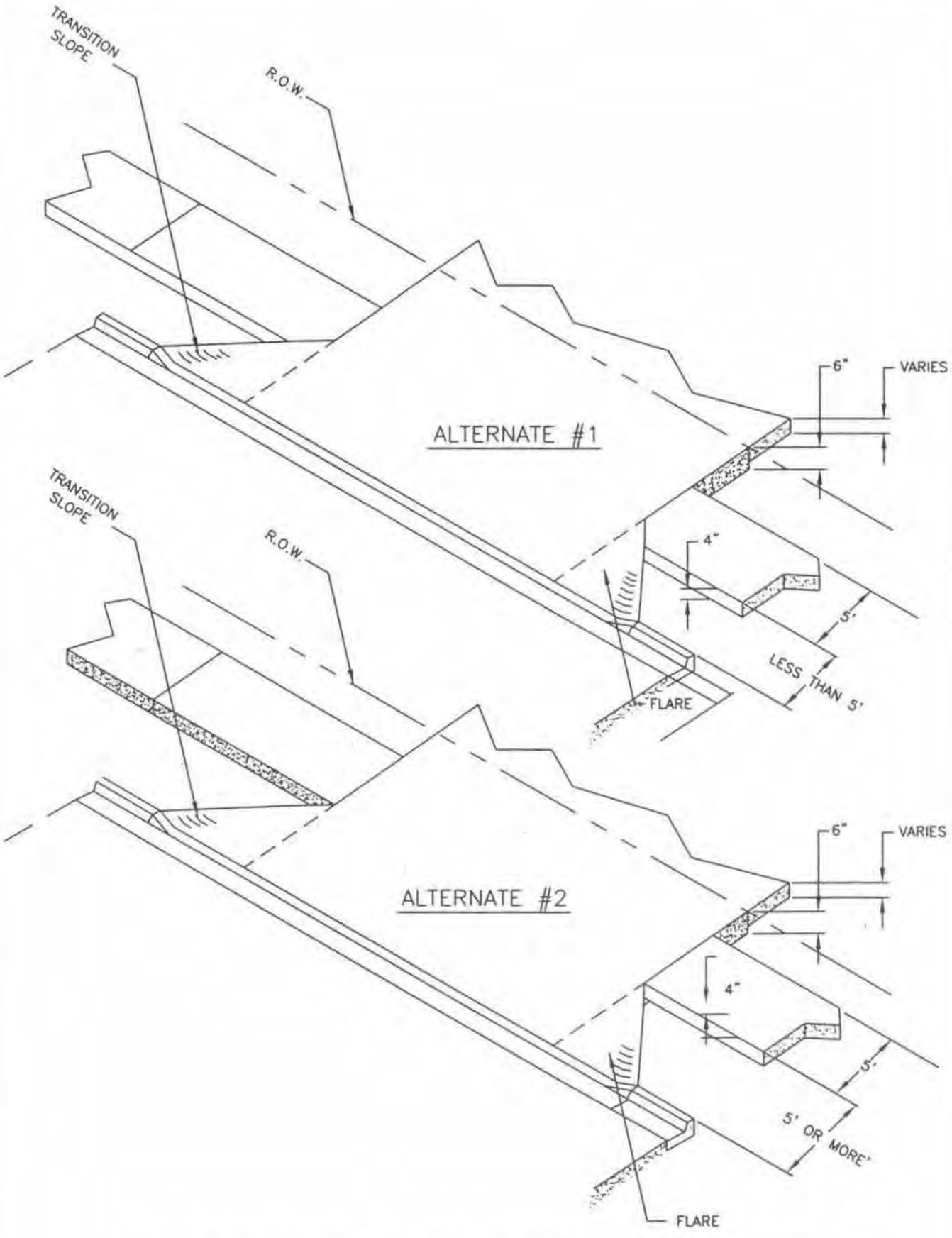
NOTES:

1. SIDEWALK AND RAMP THICKNESS AT DRIVEWAY SHALL BE 6", CLASS I (ⓒ) CONCRETE 3000 PSI.
2. ON SINGLE FAMILY DWELLING, THE FLARE MAY BE ELIMINATED.
3. IF CURVALINEAR WARP-EDGE IS DESIRED, THEN STANDARDS FOR INTERSECTING STREETS SHALL APPLY.
4. FOR SECTION A-A, SEE FIG. ST-3.
5. FOR SECTION B-B, SEE FIG. ST-13.
6. CONCRETE PAVER BLOCKS MAY BE USED IN LIEU OF CONCRETE, HOWEVER THE TOTAL THICKNESS SHALL BE 6". A BOND BAND SHALL BE 6". A BOND BAND SHALL BE INSTALLED ON ALL OUTSIDE EDGES INCLUDING THE INTERFACE WITH THE CURB.
7. SEE FIG. ST-12 FOR PICTORIAL VIEW.

STANDARD DRIVEWAY

N.T.S.

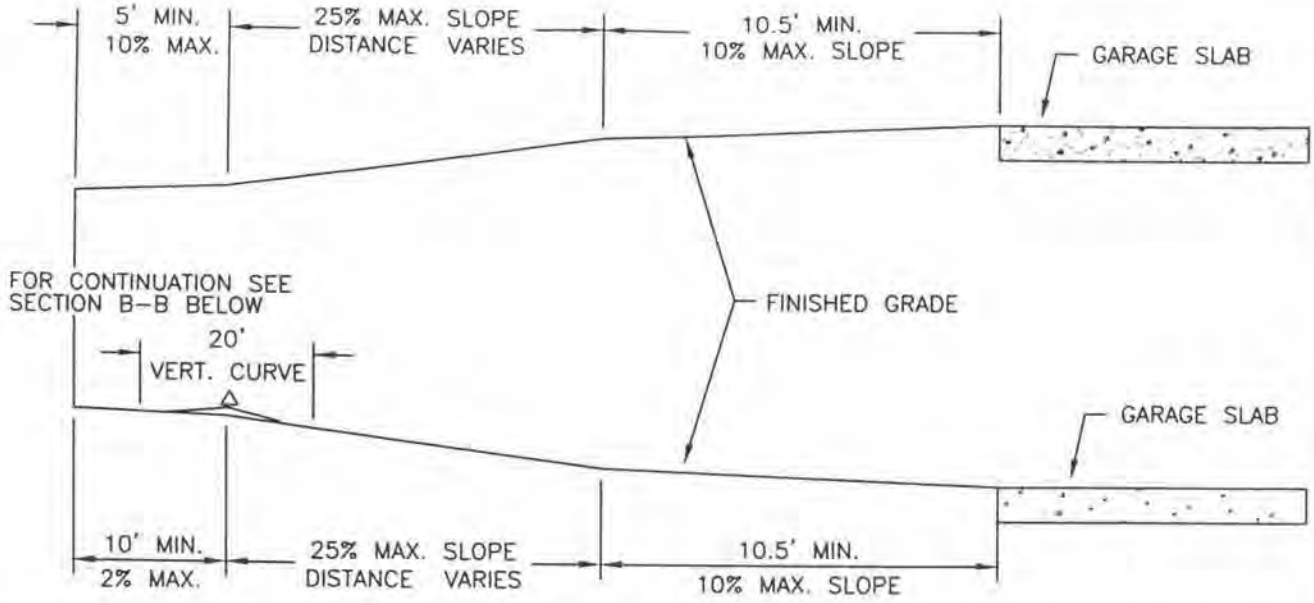
CITY OF SARASOTA



STANDARD DRIVEWAY PICTORIAL

N.T.S.

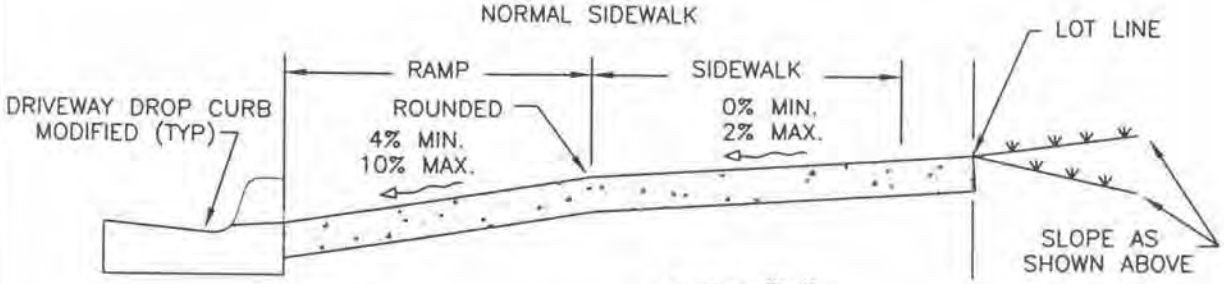
CITY OF SARASOTA



SECTIONS B-B

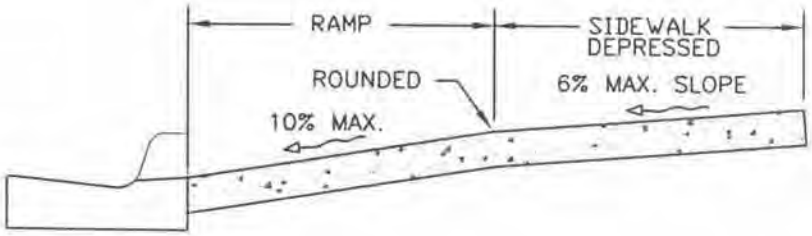
CASE "A"

NORMAL SIDEWALK



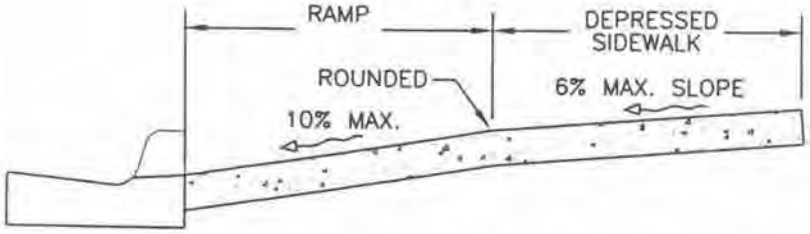
CASE "B"

(DEPRESS ONE EDGE OF SIDEWALK)



CASE "C"

(DEPRESS ENTIRE SIDEWALK)



NOTES:

1. CASE "A" NORMALLY APPLIES.
2. USE CASE "B" WHEN RAMP SLOPES WOULD EXCEED 10% IN CASE "A".
3. USE CASE "C" WHEN SIDEWALK SLOPE WOULD EXCEED 6% IN CASE "B". LONGITUDINAL SLOPE OF WARPED AREA ADJACENT TO DRIVEWAY SHALL NOT VARY MORE THAN 6% FROM THE LONGITUDINAL GRADE LINE OF THE SIDEWALK.

DRIVEWAY CENTERLINE PROFILE

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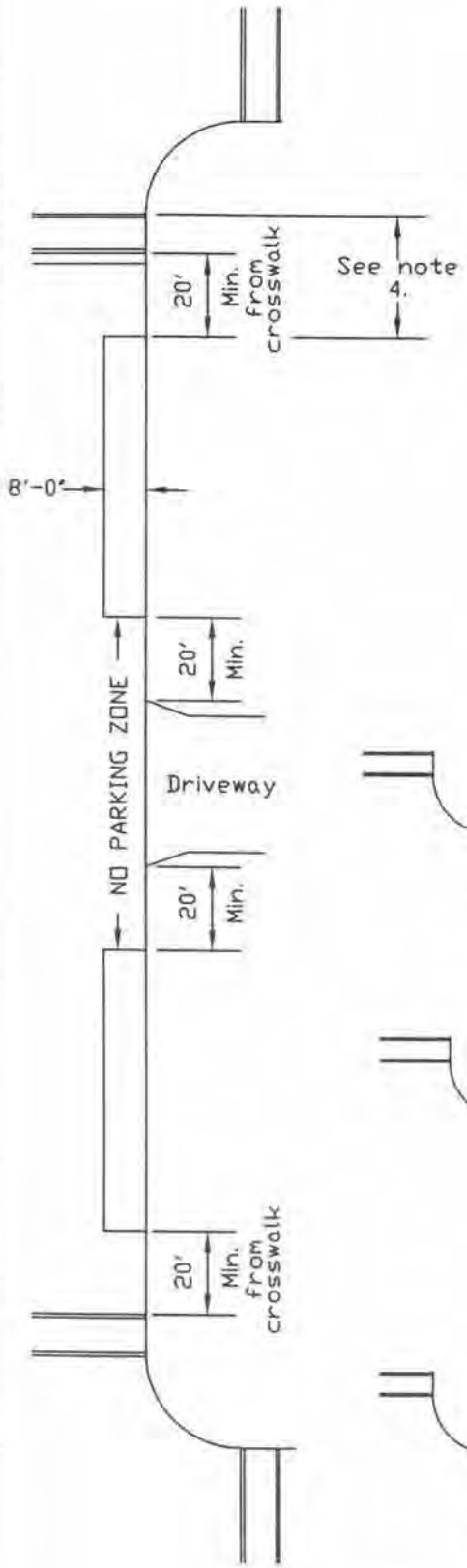
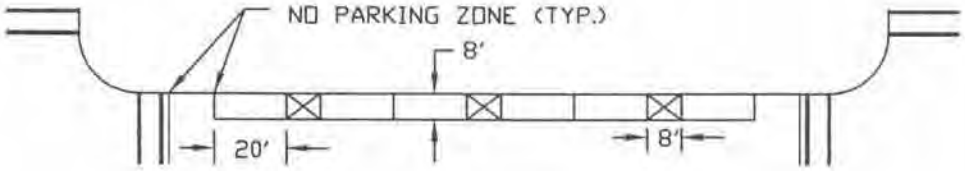
CITY OF SARASOTA



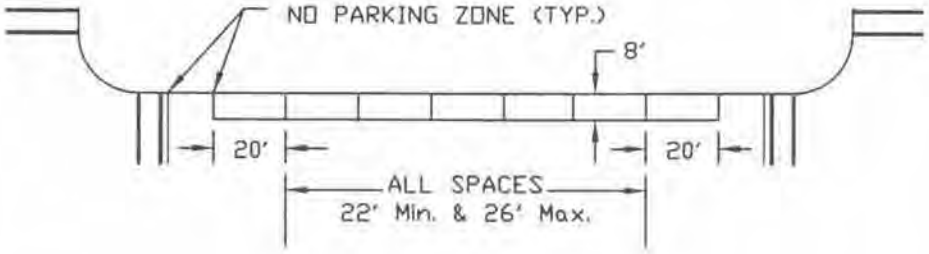
GENERAL NOTES

1. ON STREET PARKING SPACES WILL NOT BE MARKED UNLESS DESIGNATED BY THE CITY ENGINEER.
2. WHEN DESIGNATED, ON STREET PARKING SPACES WILL BE MARKED WITH 4" WHITE THERMOPLASTIC AND IN THE CONFIGURATION BELOW WITH TYPE III PREFERRED.
3. CLEARANCE (NO PARKING ZONE) FROM ESTABLISHED PEDESTRIAN CROSSWALKS SHALL BE AS SHOWN.
4. FOR STREETS WITH NO PEDESTRIAN CROSS-WALK, THE CLEAR ZONE SHALL BE TWENTY-FIVE (25) FEET FROM THE POINT OF TANGENCY OF THE CURB RADIUS WHEN THE INTERSECTION IS NOT SIGNALIZED. IF SIGNALIZED, THE CLEAR ZONE SHALL BE THIRTY (30) FEET.
5. CLEARANCE FOR MID-BLOCK DRIVEWAYS SHALL BE TWENTY (20) FEET FROM THE DRIVEWAY CURB TRANSITION TO THE PARKING STALL
6. ON ONE-WAY SREETS, THE SIGHT DISTANCE REQUIREMENT APPLIES ONLY TO THE APPROACHING DIRECTION.
7. WHERE CURB AND GUTTER IS USED, THE GUTTER PAN WIDTH MAY BE INCLUDED AS PART OF THE MINIMUM WIDTH OF PARKING LANE.

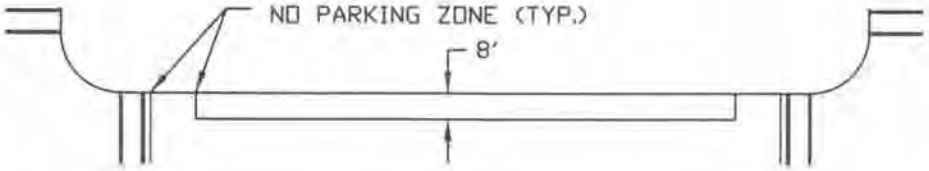
TYPE I



TYPE II



TYPE III



ON -STREET PARKING

N.T.S.

CITY OF SARASOTA

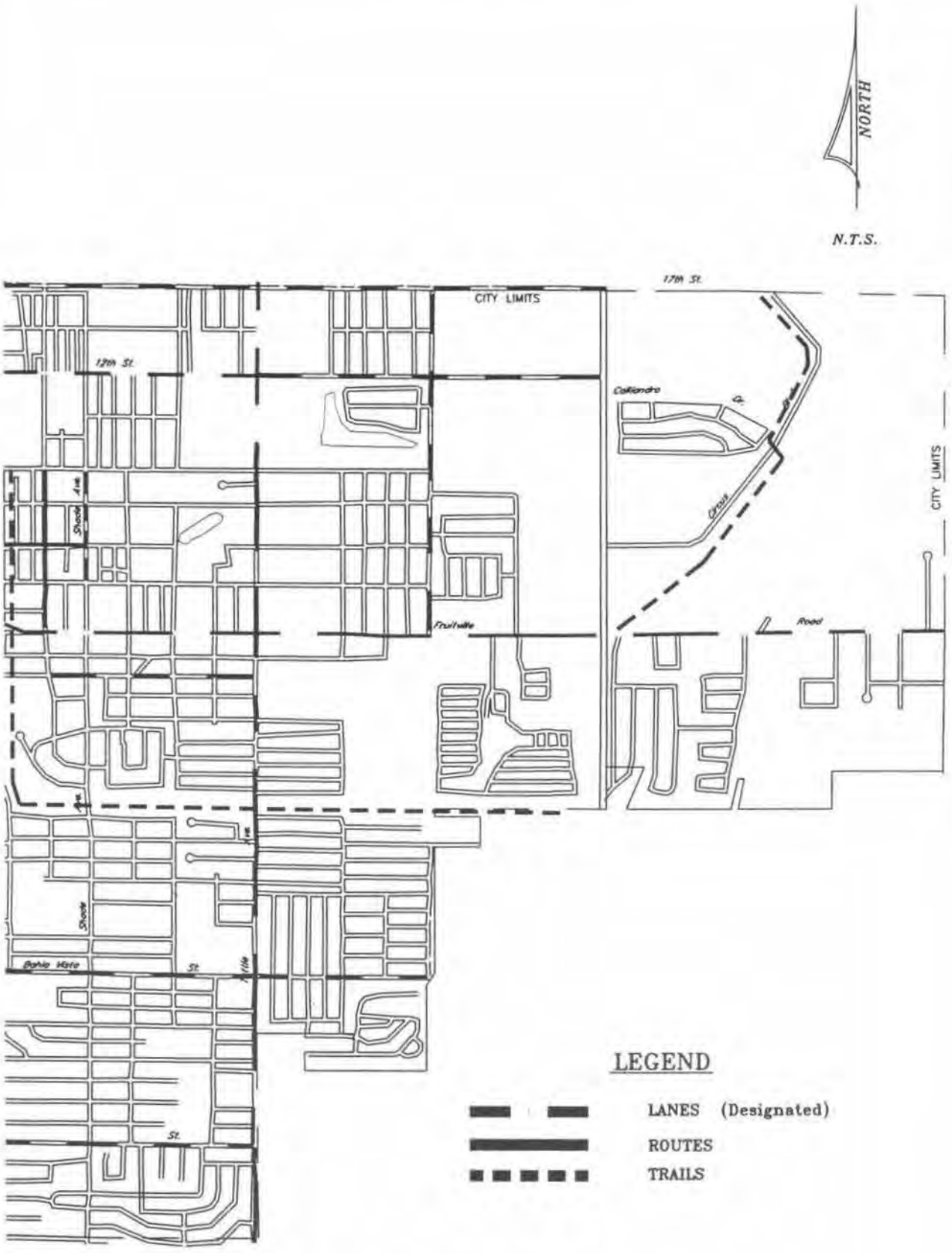
LEGEND

LANES

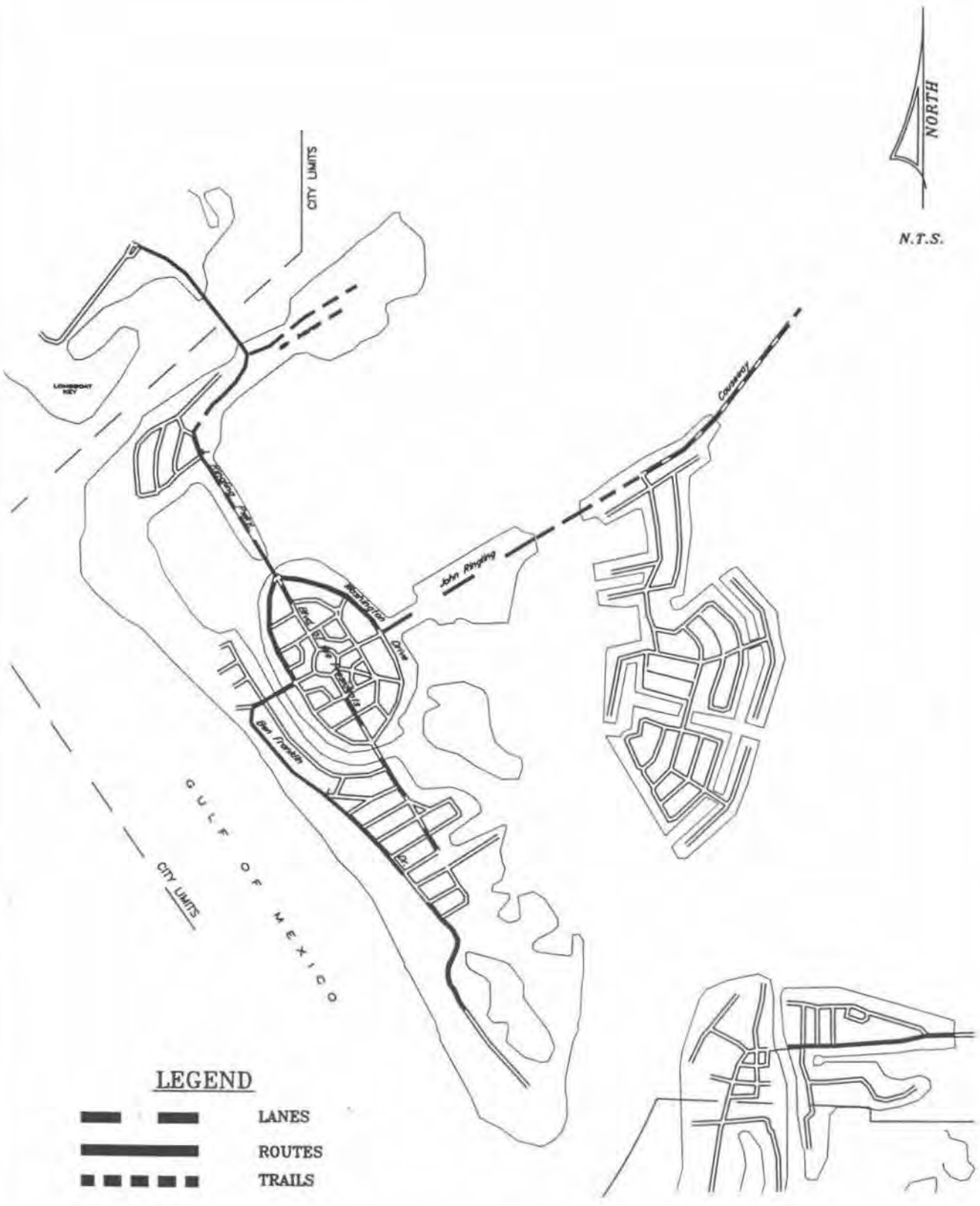
ROUTES

TRAILS

BICYCLE PLAN



BICYCLE PLAN



BICYCLE PLAN

NORTH

N.T.S.

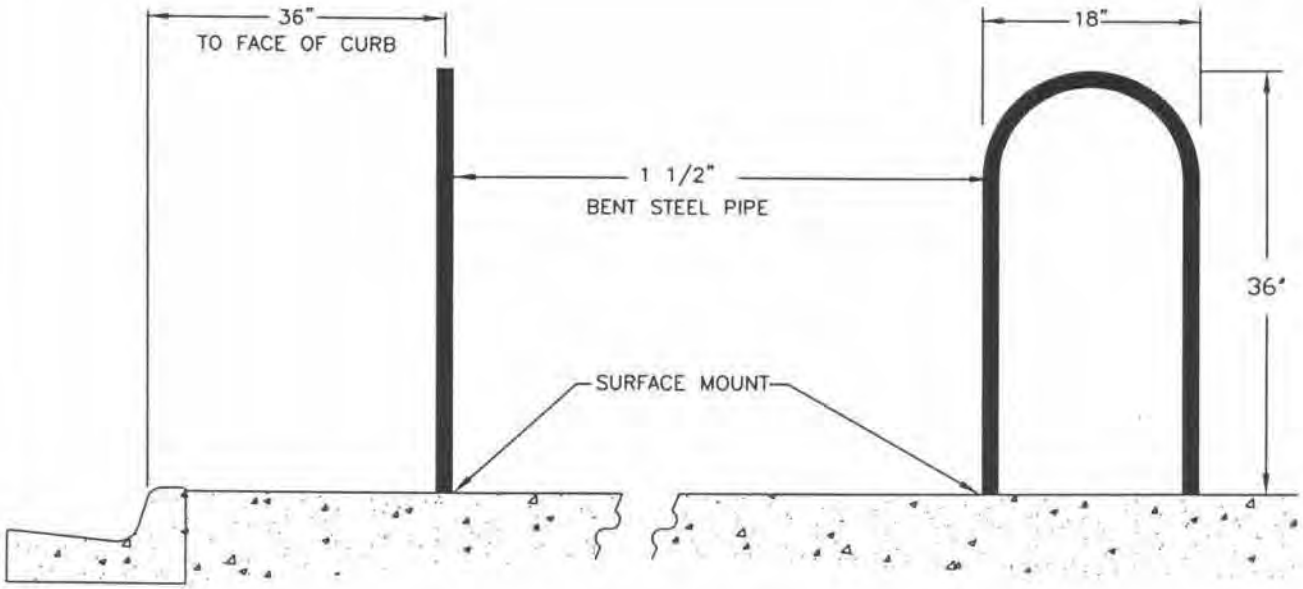
LEGEND

LANES

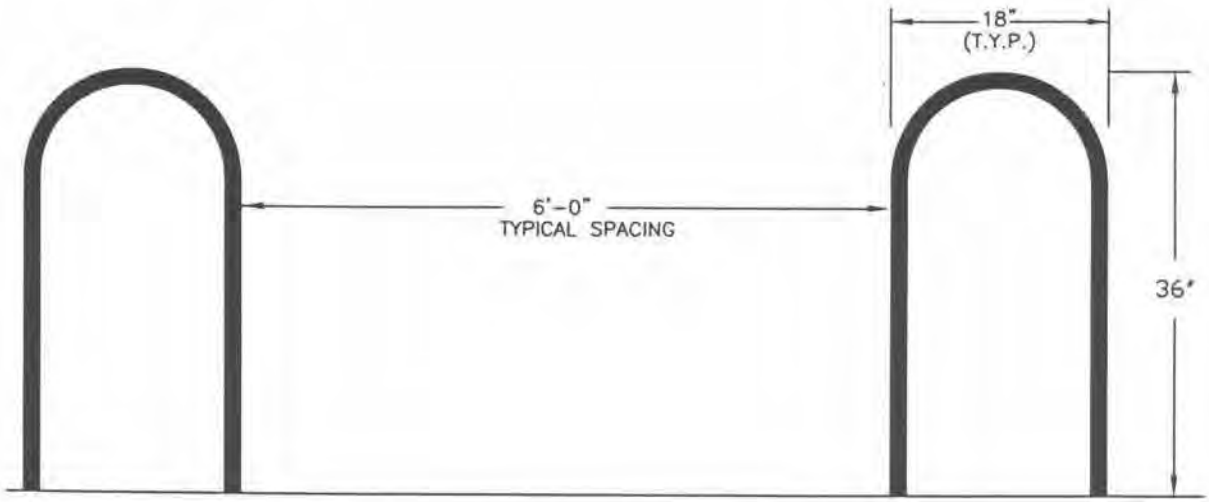
ROUTES

TRAILS

BICYCLE PLAN



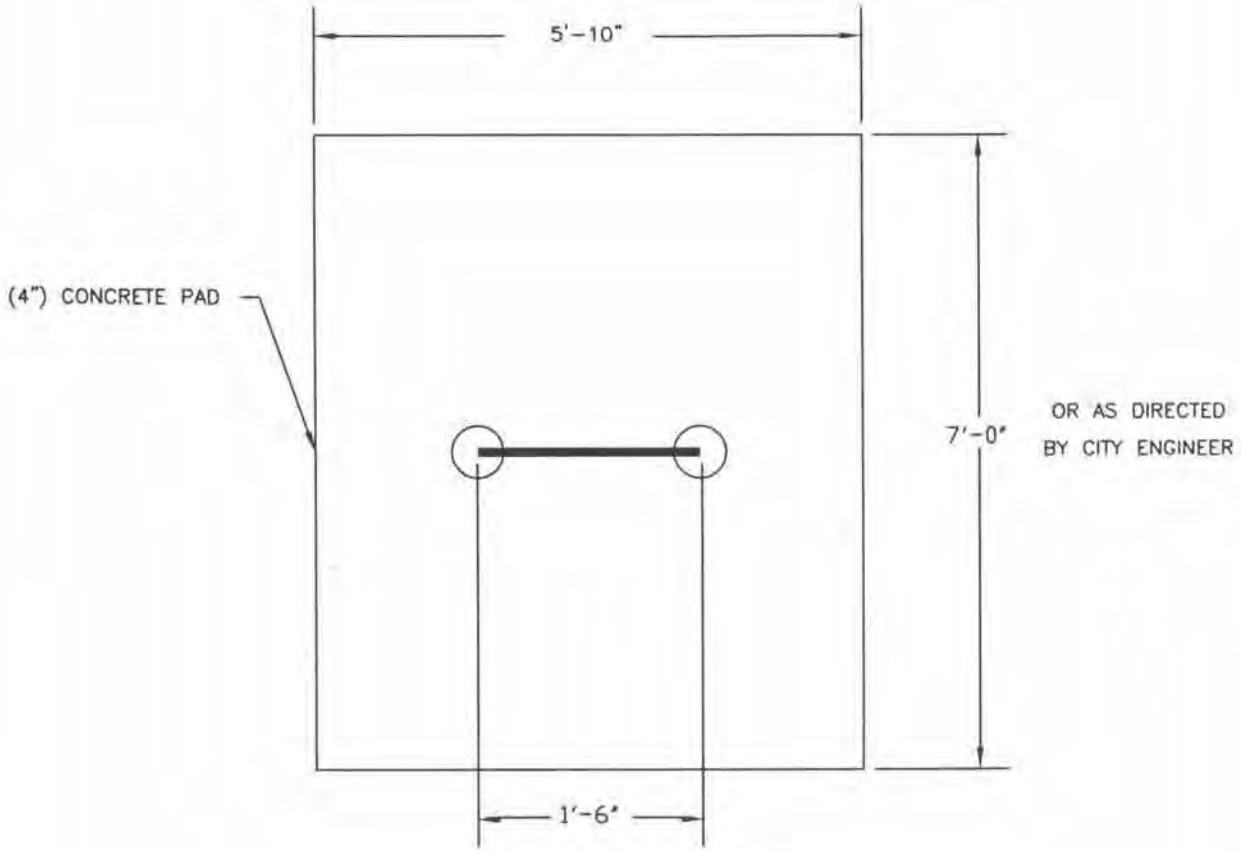
"INVERTED U" BICYCLE RACK



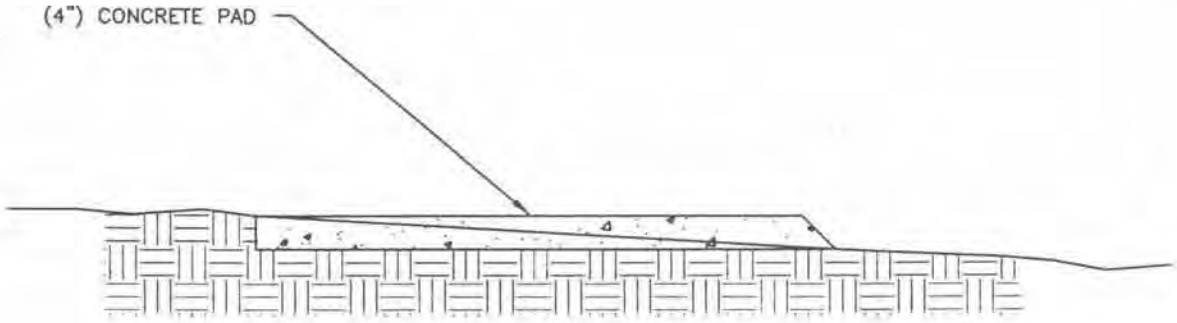
SPACE REQUIREMENTS

BICYCLE RACK

N.T.S.



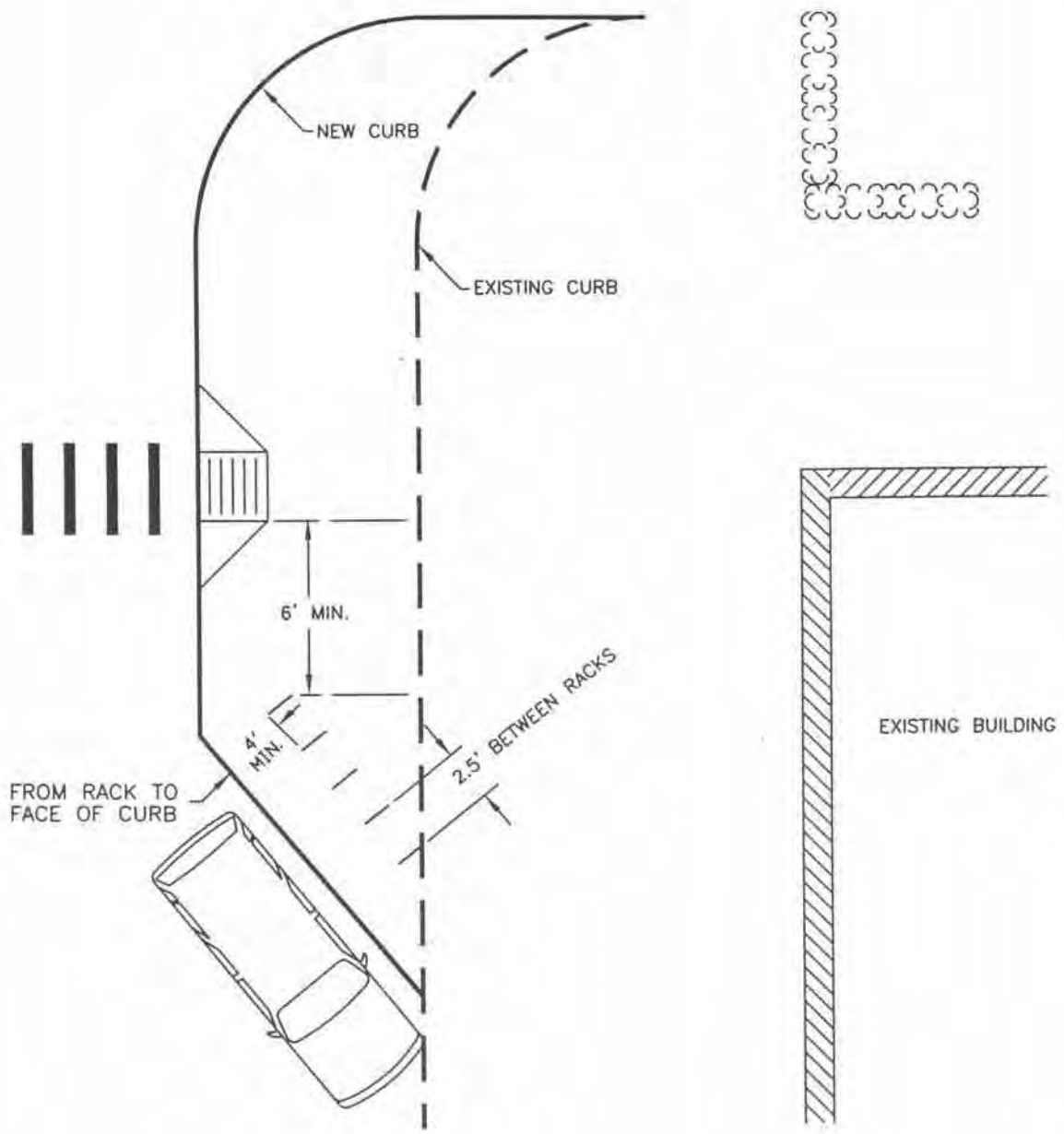
PLAN–CONCRETE PAD



ELEVATION

BICYCLE RACK

N.T.S.



INVERTED U RACKS ON CURB EXTENSION

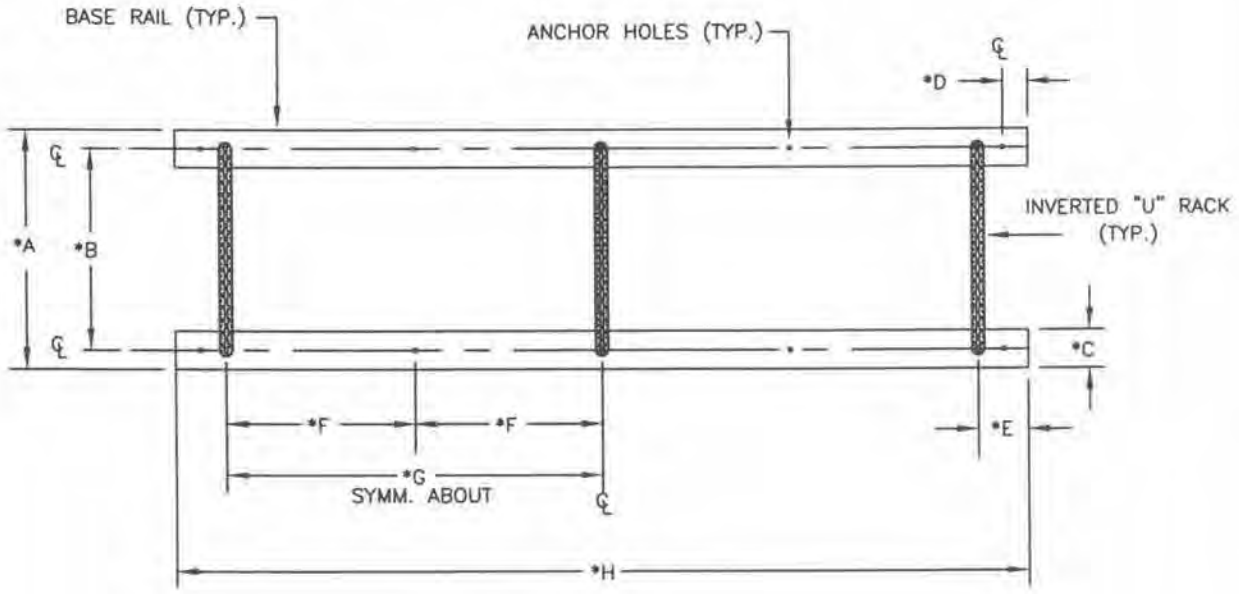
N.T.S.

RACK BASE RAIL LENGTH SCHEDULE								
DESCRIPTION OF UNITS REQ'D	A	B	C	D	E	F	G	H
2X ARRAY INVERTED "U" RACKS	19.1"	16.1"	3.0"	1.50"	4"	15"	30"	38"
3X ARRAY INVERTED "U" RACKS **	19.1"	16.1"	3.0"	1.50"	4"	15"	30"	68"
4X ARRAY INVERTED "U" RACKS	19.1"	16.1"	3.0"	1.50"	4"	15"	30"	98"
5X ARRAY INVERTED "U" RACKS	19.1"	16.1"	3.0"	1.50"	4"	15"	30"	128"

NOTES:

* REFER TO SCHEDULE ABOVE

** INVERTED "U" ARRAY SHOWN

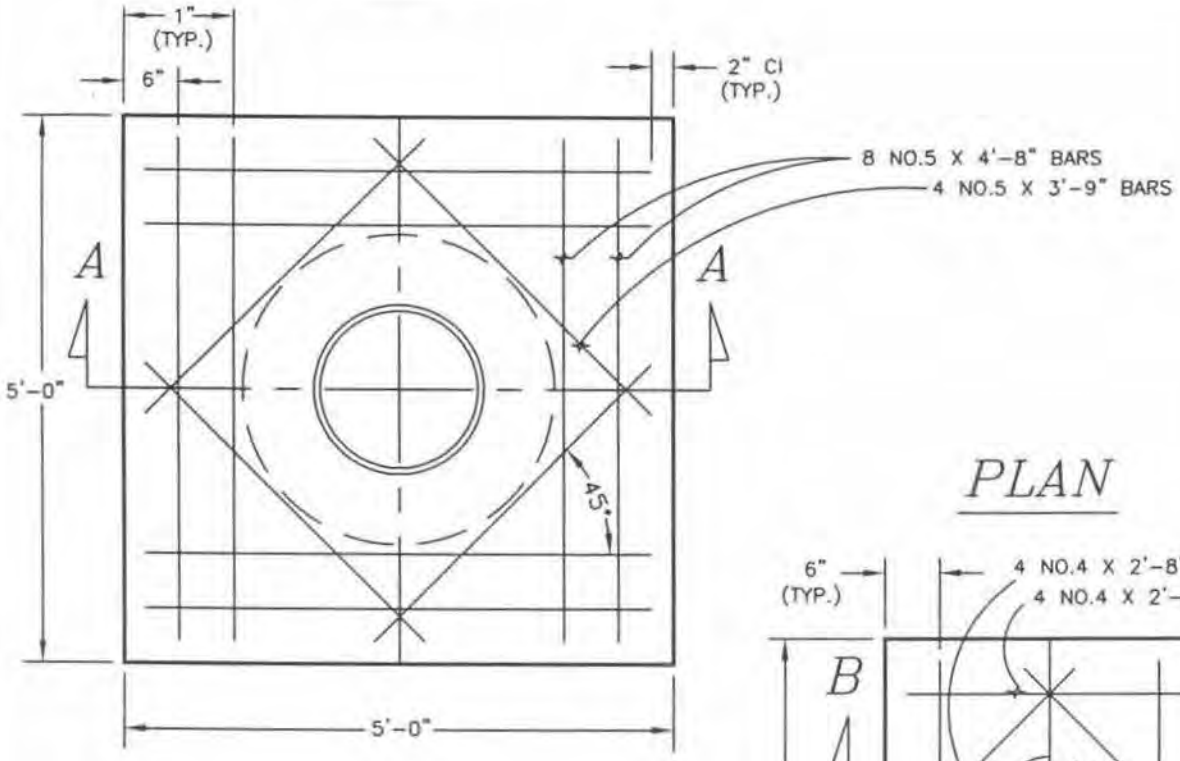


PLAN VIEW BASE RAIL ARRAY

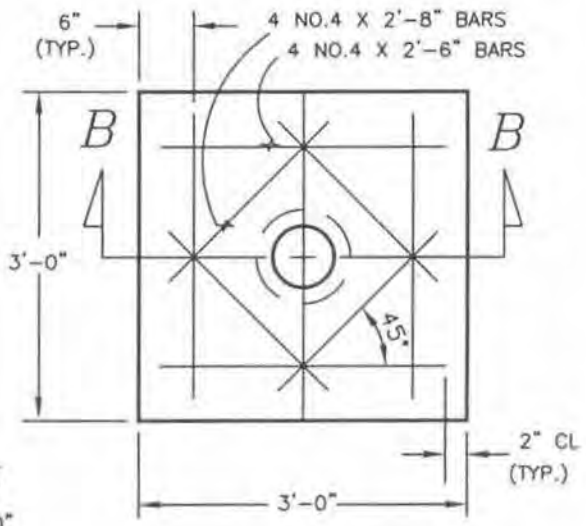
BICYCLE RACK

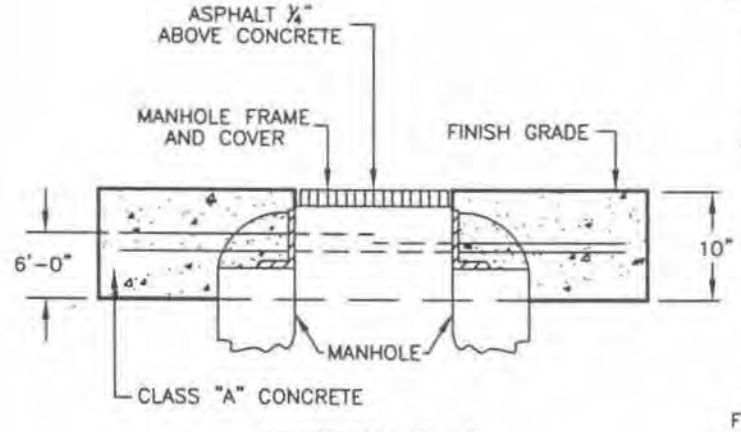
N.T.S.

PLAN

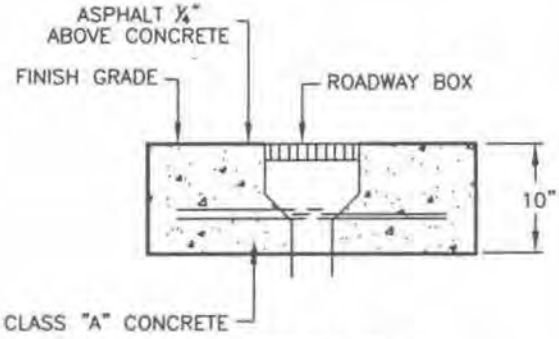


PLAN





SECTION A–A



SECTION B–B

REINFORCED CONCRETE COLLARS FOR CASTING IN ROADWAYS

N.T.S.

CITY OF SARASOTA

POST–MOUNT

Install on same post, above R1–L reflective white text on reflective green background.

Street designations, for all numbered street and street names with four characters or less, shall be full size; otherwise, street designations shall be minimum 2" text and placed above block numbers. Refer to Fig "A" "B" & "D"

A. Audubon Pl 600 D-3-4

B. Bay St 3600 D-3-6

C. Bay Shore Rd E 3900

D. 6th St 2100 NO OUTLET D-3-N

E. Ringling Plaza 600 D-3-CDM

A. Roadways with speed limits of 25 MPH or less 4" upper and lower–case text, 6" X 24" (+/–) plaque, no border

B. Roadways with speed limit of 30 MPH and up 6" upper–case letters with 4.5" lower–case text, 8" X 24" (+/–) plaque, no border

C. Directionally designated roadway – same as above, with direction above block range, to the right of the street designation

D. No outlet roadway same as above, 2" block text on yellow reflective box "No Outlet" extension facing street termination

E. Commemorative street name sign to identify high visibility locals, CBD, parks, St. Armand's Museum, & City Commission commemorative named streets 4" text, double–spaced, 1/2" reflective white border multicolored City Logo

F. Where streets change names or directions, all signs shall be posted on opposite corners of the intersection as applicable.

OVERHEAD–MOUNT

Mount on overhead signal wires & mast arms, between thru signal heads.

Refer to FDOT Road Way & Traffic Design Standards Index 17356 for span wire mounted details

If sign exceeds mast arm original sign design, approval from Structural Engineer shall be required

10" reflective white text on reflective green background

12" reflective City Logo to left of street name

1" reflective border

18" X 64" (+/–) single–sided plaque (blank on reverse side)

1. City / County roadway – no route number
2. Federal / State roadway – combination of 6" route number / street designation
3. Where street names change at an intersection, both streets shall be named. That to the left shall be indicated above that to the right. If space permits spell out street designation.

1. Tuttle Ave D-3-DHD

2 Fruitville Rd S.R. 780 D-3-DHD-HY

2 N Tamiami Tr U.S. 41

3 ← Main Street / Marina Plaza → D-3-C

Approved Abbreviations		
Ave	–	Avenue
Cswy	–	Causeway
Blvd	–	Boulevard
Cr	–	Circle
Ct	–	Court
Dr	–	Drive
Hwy	–	Highway
Ln	–	Lane
Pk	–	Park
Pkwy	–	Parkway
Pl	–	Place
Plz	–	Plaza
Pt	–	Point
Rd	–	Road
Sq	–	Square
St	–	Street
Ter	–	Terrace
Tr	–	Trail
Way	–	Way

STREET NAME SIGN CRITERIA

N.T.S.

CITY OF SARASOTA

ENGINEERING DESIGN CRITERIA MANUAL

PART 5

STREET DESIGN

Within the Downtown and Environs Area

PART 5. STREET DESIGN WITHIN THE DOWNTOWN AND ENVIRONS AREA (DEA)

Section A - General.

1. Part 5. of this Engineering Design Criteria Manual shall apply to all roadways within the Downtown and Environs Area (DEA). See Figure DE-1 on page 5-11 for a map of the boundaries of the DEA.
2. The City Manager, or his designee, may issue written technical deviations from this Part 5. Such deviations must be based upon review of a detailed study, prepared by a Professional Engineer for the applicant, which demonstrates that the performance of designs proposed for deviation will perform at the same or higher level than those specified in this Manual and will result in greater walkability.
3. Existing rights-of-way within, or the half of the existing right-of-ways adjacent to, the site development, without regard for whether or not such streets provide access to the development, shall be improved by constructing roadway, and/or bicycle lanes, and/or curb and gutter, and/or sidewalk. All Primary "A" Streets shall conform to these Downtown and Environs Area (DEA) street design standards. Primary "A" Streets are shown on Figure D-2, page 5-12. All Secondary "B" Streets shall conform to the requirements of Part 4 of this Manual.
4. The *"Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Street and Highways"* (*"Greenbook"*) 2001 or later edition and the *"Bicycle Facilities Planning and Design Handbook"* 1998 or later edition, both prepared by Florida Department of Transportation, Tallahassee, Florida and the *"Manual on Uniform Traffic Control Devices"* ("*MUTCD*") 2001 or later edition, and the *Roundabouts: An Informational Guide* June 2000 or later edition, both prepared by U. S. Department of Transportation, Federal Highway Administration and *"A Policy on Geometric Design of Highways and Street"* 2001 or later edition, prepared by American Association of State Highway Officials (AASHTO) shall be used as a guide in the design of all public streets.
5. For streets designed to maintain lower speeds for the express purpose of enhancing pedestrian comfort and increasing walkability and livability of DEA neighborhoods (see Figure DE-21), reference to *"Traditional Neighborhood Development Street Design Guidelines: Recommended Practice"* 1999 or later edition prepared by Institute of Transportation Engineers, *"Residential Streets"* 2001 or later edition, prepared by ULI/NAHB/ASCE/ITE shall guide the design. Copies of all of the above documents are on file at the office of the City Engineer. In case of conflict, the criteria established in this Engineering Design Criteria Manual shall supersede.

Section B - Designated Street Types within the Downtown and Environs Area

(Also see Figures DE-3 through DE-24, pages 5-13 through 5-34)

a. Lane (LA)
b. Alley (AL)
c. Residential Street (ST)
d. Commercial Street (CS)
e. Commercial Avenue (AV)
f. Commercial Boulevard (BV)

Note: The terms "Lane", "Alley", "Street", "Avenue" and "Boulevard" in this case refer to street type, rather than direction.

[see Part 3, "Subdivision Regulations", D.3.(c) Street Design].

Section C - Street Design Standards for Designated Street Types

1. All streets within the Downtown and Environs Area (DEA) shall conform to the design standards shown in Table 5-1 and Figures DE-3 through DE-24, pages 5-13 through 5-34.

2. Curb and gutter shall be in accordance with Figures ST-3 and ST-4. Also see Figures DE-3 through DE-24, pages 5-13 through 5-34.

Section D - Street Alignment and Grades.

1. Street grades. Street grades on all streets and roads shall be at the sole discretion of the City Engineer and shall not exceed six percent (6%), nor be less than three-tenths percent (0.3%).

2. Intersection grades: The gradient of the street entering an intersection shall not be more than three percent (3.0%) within a distance of twenty feet (20 ft.) from the gutter flow line of the intersected street. A grading plan may be required by the City Engineer to ensure that there are no flat areas and/or dips created by the design.

3. Vertical curves: Vertical curves shall be provided for all grade breaks of one-percent or more.

4. Horizontal curves. Where a center-line deflection angle of more than ten degrees (10°) in the alignment of a street occurs, a horizontal curve of reasonable long radius shall be introduced. Residential streets having a right angle change in alignment shall provide a minimum centerline right-of-way turning radius of seventy-five feet (75 ft.).

5. Reverse curves. A center-line tangent of at least two hundred feet (200 ft.) shall be introduced between reverse horizontal curves on Commercial Streets, Avenues and Boulevards. On Residential Streets, the transition rate angle, to connect offsetting centerlines of the road, shall not exceed five degrees (5.0°).

6. Superelevation. Streets within the Downtown and Environs Area shall not be superelevated.

7. Crown. Crown of a street shall normally be at the center-line, but may be shifted to eight feet (8 ft.) from the edge of pavement, subject to the approval of the City Engineer.

8. Intersection. Street intersections shall be designed and constructed as follows:

   a. Angle of intersection: Street intersections shall be as nearly as possible at right angles and no angle of intersection between streets or between a street and an alley shall vary more than thirty degrees (30°) from a right angle. Angles other than ninety degrees (90°) may require the use of setback lines, special rounding of corners, or other devices to assure desirable results as to traffic movements, visibility and safety.

   ~~b.~~

TABLE 5-1
Street Design Standards for the Downtown and Environs Area

Street Type	Design Speed	Right-of-Way Width	Pavement Width	Traffic Flow	On-Street Parking	Driveway Sight Distance	CurbType/ Radius (per Sect D., 8., d)	Sidewalk Width / Placement	Bikeway Type
Lane (LA-20-8)	15 mph	20 ft.	8 ft.	One Way	None	None	Swale /15 ft.	None	Route
Alley (AL-20-20)	20 mph	20 ft.	20 ft.	Two Ways	None	5 ft.	None /15 ft.	None	Route
Residential Street (ST-20-20)	20 mph	20 ft.	20 ft.	Two Ways	None	5 ft.	None /15 ft.	None	Route
Residential Street (ST-40-24)	15 mph	40 ft.	24 ft.	Two Ways	One side	5 ft.	"F" Type /15 ft.	6 ft. /both sides	Route
Residential Street (ST-50-24-a)	15 mph	50 ft.	24 ft.	Two Ways	Both sides, alternating	5 ft.	"F" Type /15 ft.	6 ft. /both sides	Route or path
Residential Street (ST-50-24-b)	20 mph	50 ft.	24 ft.	Two Ways	One side	5 ft.	"F" Type /15 ft.	6 ft. /both sides	Route or path
Residential Street (ST-50-27)	30 mph	50 ft. min.	27 ft.	Two Ways	One side	10 ft.	"F" Type /15 ft.	5 ft. /both sides	Route
Residential Street (ST-60-34)	30 mph	58 ft. min.	34 ft.	Two Ways	Both sides	10 ft.	"F" Type /15 ft.	6 ft. /both sides	Route
Commercial Street (CS-60-42)	20 mph	60 ft.	42 ft.	Two Ways	One side	10 ft.	"F" Type /15 ft.	6 ft. /both sides	Route
Commercial Street (CS-80-40)	20 mph	80 ft.	40 ft.	Two Ways	Both sides	10 ft.	"F" Type /15 ft.	12 ft. /both sides	Route
Commercial Street (CS-80-56)	20 mph	80 ft.	56 ft.	Two Ways	Both sides	10 ft.	"F" Type /15 ft.	12 ft. /both sides	Route
Commercial Street (CS-80-60)	35 mph	80 ft.	60 ft.	Two Ways & 4 Lanes	Both sides	20 ft.	"F" Type /15 ft.	10 ft. /both sides	Lane/4 ft.
Commercial Avenue (AV-68-34)	30 mph	68 ft. min.	17 ft. and 17 ft.	One Way Each Side	Each side	20 ft.	"F" Type /15 ft.	12 ft. /both sides	Route or 4 ft. lane
Commercial Boulevard (BV-84-58)	20 mph	84 ft.	18 ft. and 18 ft.	One Way Each Side	Each side	10 ft.	"F" Type /15 ft.	6 ft. /both sides	Route or 4 ft. lane
Commercial Boulevard (BV-110-60)	35 mph	110 ft.	30 ft. and 30 ft.	One Way Each Side & 4 Lanes	Each side	20 ft.	"F" Type /15 ft.	12 ft. /both sides	Route or 4 ft. lane

c. Visibility at intersections: On a corner zoning in any district, no fence, wall, hedge or other planting or structure shall be erected, placed or maintained in a manner that it will obstruct sight visibility on the streets. Site visibility requirements, specific to any corner shall be in conformance with Figures III-8 through III-11, inclusive, of Chapter III of the Florida Department of Transportation's *"Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways (Greenbook)"*, 2001 or later edition. The sight distance required for the safe execution of a crossing or turning maneuver is

dependent on the acceleration capabilities of the vehicle, the crossing distance, and the design speed of the street to be crossed. The minimum design speed for this analysis shall be twenty miles per hour (20 mph). For design speeds below those available in the Florida *Greenbook*, specific calculations will be required to justify an exception. This minimum sight distance should be provided for a given vehicle class (trucks) if it constitutes five percent (5%) or more of the total crossing traffic or experiences thirty (30) or more crossings or left turn movements per day.

(1) Street signs and/or plant material may encroach in this sight triangle, except between the heights of two and a half feet (2 ½ ft.) and eight feet (8 ft.) from normal ground surface.

d. Limited access streets: Intersections with Commercial Streets, Avenues and Boulevards shall be at the approval of the City Engineer based on public safety and proximity of other intersecting streets.

e. Corner radii: Curb return radii, at corners, measured at edge of pavement, shall be provided at all intersections. Curb return radii shall be at least fifteen feet (15 ft.) as required in Table 5-1 and for the following:

(1) a Single Unit Truck or Bus Design Vehicle (AASHTO Designation = SU or BUS) to turn the corner while staying within the designated lane and,

(2) a Semitrailer Combination Design Large Vehicle (AASHTO Designation = WB-50) to turn the corner while staying in the left lane of a multiple-lane road being entered or traveling into the oncoming lane or on a two-lane road being entered. On streets classified as Commercial Street, Avenue or Boulevard as shown in Figures DE-3 through DE-24, pages 5-13 through 5-34, this vehicle shall stay within the designed lane and,

(3) a bicycle lane and the gutter portion of curb and gutter may be utilized for the truck turn.

(4) a minimum pavement width as specified in Table 5-1. Where parallel parking is present on one or both streets and an adequate "effective" turning radius is increased by the parking lanes, the curb return radii can be reduced to 15 feet.

f. Corner right-of-way: A radius or diagonal cutoff shall be provided at the street-side property lines for right-of-way on all intersections. The amount of right-of-way shall be in accordance with Part 5, Section C above and Figures DE-3 through DE-24, pages 5-13 through 5-34, along with the provision for parkway, sidewalk and utility strip. The City Engineer may require a greater radius or diagonal cutoff at the intersection of any street with a Commercial Street, Avenue, or Boulevard dependent on visibility requirements and truck traffic volume, as long as walkability is not compromised. Right-of-Way radius may be provided by dedication as a portion of the street right-of-way or as an easement for street purposes.

g. Cross-Gutter: Concrete cross-gutter shall be in accordance with Figure ST-5.

9. No-outlet: Dead-end streets shall be prohibited, except where appropriate to permit future extension into adjoining unsubdivided tracts. When a street is designed as a cul-de-sac, having one end permanently closed, it shall terminate in a circular area of public right-of-way having a

minimum property line radius of fifty feet (50 ft.) with a minimum edge-of-pavement radius of thirty-six feet (36 ft.) shown in Figure ST-6. A "T" type turnaround may be allowed in accordance with Section A. 2. above. A no-outlet street shall not exceed five hundred feet (500 ft.) in length except for finger island projections.

10. Pavement cross slope shall be adequate to provide proper drainage. The recommended cross slope is 0.02 feet per foot. The cross slope shall not be less than 0.015 feet per foot or greater than 0.04 feet per foot. The change in cross slope between adjacent through travel lanes should not exceed 0.04 feet per foot as described in the FDOT *"Greenbook"*.

Section E - Structural Section.

1. Structural section of any Alley, Commercial Street, Avenue, or Boulevard shall be in accordance with Florida Department of Transportation *"Flexible Pavement Design Manual"*.

2. Structural section of any Residential Street shall be as follows:

   a. Surface Course: 1 ½ inches of asphaltic concrete plant mix (High stability Type S-III or S-I).

   b. Base Course: One of the following:

      (1) 3 inches of Asphalt Base Course Type 3 (ABC 3)
      (2) 6 inches of Cement-Stabilized Base (Shell Base or Crushed Concrete)

   c. Sub-base Course: LBR 30, 8 inches of stabilized subgrade compacted to 95% density; unless Shell Cement-Stabilized Base is used, then use LBR 40, 8 inches of stabilized subgrade compacted to 95% density.

3. Soil borings shall be furnished to determine the structural sub-base and base course requirements.

4. Pavement resurfacing and/or overlay of any street or alley shall be as follows:
   a. The material used for leveling course shall be Type II or type III asphaltic concrete.
   b. The material used for resurfacing course shall be type III asphaltic concrete.
   c. Any asphaltic concrete mix used shall consist of no more than twenty-five percent (25%) recycled materials.

Section F - Alleys.

1. Alleys shall conform with AL-20-20 design standards (see Table 5-1).

2. Alleys shall be paved to the full width of the right-of-way unless.

3. Alley intersections and sharp changes in alignment shall be avoided, but where necessary, corners shall be cut off sufficiently to permit safe vehicular movement.

4. No dead-end alleys shall be permitted unless provided with a turn-around, which meets the minimum cul-de-sac standards.

Section G - Sidewalks.

1. Sidewalks shall conform to the street standards listed in Table 5-1 with widths shown as minimum. The pitch shall be 1/4 inch per foot (2.0%) toward the street as shown in Figure ST-7.

2. Handicap ramps, as shown in Figures ST-8 and ST-9 shall be placed at all street corners and as otherwise required by the City Engineer (i.e., near handicap parking).

3. At signalized intersections, sidewalks shall be in accordance with Figure ST-10.

4. For sidewalks at driveways, see Figure ST-11, 12 and 13.

5. The City Engineer may grant relief from this section on the basis of unique conditions and may review and set specific alignment for sidewalks within rights-of-way in relation to unique conditions such as topography or unusually large trees.

6. Mid-block pedestrian crossings may be approved by the City Engineer for Primary "A" Streets specified in the on Figure DE-2 page 5-12, where such crossings are warranted by high pedestrian volumes. Mid-block pedestrian crossings shall be placed a minimum of three hundred feet (300 ft.) from the nearest traffic signal.

7. "Pedestrian Sleeves" shall be located where a Primary "A" Street crosses a high-capacity thoroughfare as shown on Figure DE-2 and DE-25, pages 5-12 and 5-35. These sleeves shall be designed to provide a comfortable crossing for pedestrians and typically should include such features as buildings drawn up to the sidewalk, clearly marked crosswalks with appropriate lighting and different paving materials, "neckdowns" to reduce the crossing distance across the major thoroughfare, and landscaping to indicate the importance of the intersection.

Section H - Driveways.

Driveways shall be minimized to enhance the walkability of all thoroughfares. Off street parking access should be via alleys where possible. Where driveways must be constructed or reconstructed they should be designed as shown on Figures ST-11, 12 and 13. In addition, the following specifications shall be complied with:

1. Driveways shall not interfere with a legal encroachment or create a hazard or nuisance and shall be spaced to make maximum street parking available. Driveways onto Commercial Streets, Avenues, and Boulevards shall be kept to minimum.

2. A plan, drawn to a scale of 1" = 10', and a profile, drawn to scale of 1" = 10' horizontal and 1" = 1.0' vertical, must be submitted for approval prior to the issuance of a driveway permit. The plan shall show the driveway location relative to property lines, streets, and to other driveways on the property or adjacent thereto.

3. A common driveway will be allowed if access rights-of-way over both properties are granted to each property owner.

4. Driveway sight distance shall be as shown in Table 5-1. On one-way streets, the sight distance requirement applies only to the approaching direction. Sight distance is not required if the driveway is "entrance only", i.e., leaving from the street only.

5. Driveways shall intersect streets as nearly as possible at right angles and no angle of intersection shall be less than sixty degrees (60°) from the street.

6. Driveway width shall be measured at the throat as shown on Figure ST-11. Maximum driveway widths "W" shall be:

Single family dwelling	=	20 feet
Multifamily or Commercial	=	24 feet
Industrial, one-way	=	24 feet
Industrial, two-way	=	48 feet

7. The driveway flare (curb transition) shall be a straight line. If curvilinear warp-edge is desired, then standards for intersecting streets shall apply.

8. No part of any driveway for a corner property shall be constructed closer than shown in Figure ST-11. No part of any driveway for a non-corner property shall extend beyond the intersection of the curb line and the extension of the adjacent property line except where common driveways are permitted. No driveway shall be closer than one hundred feet (100 ft.) from a rail of an active railroad track.

9. Trees or shrubbery may only be removed to provide vehicular access where no suitable alternate exists and in accordance with the supervision and direction of the City Engineer.

10. Subdivision plans shall show a driveway design for each lot conforming to these regulations, unless the City Engineer approves delay of the design is appropriate due to construction phasing of the project.

Section I – Street and Right-of-Way Lighting.

1. Lighting designs shall be based on standards established by the *"American National Standard Practice for Roadway Lighting"*, sponsored by the Illuminating Engineering Society, and approved by the American National Standards Institute, a copy of which is on file at the office of the Director of Public Works.

2. All street lighting illumination sources shall be High Pressure Sodium Vapor (HPSV).

3. All circuits shall be multiple.

4. Refractor shall provide an IES Type III pattern.

5. Horizontal Foot Candles Required:

Street Type	Zoning Classification		
	Commercial	Multi-Family	Residential
Avenue/Boulevard	2.0	1.4	1.0
Commercial Street	1.2	0.9	0.6
Residential Street	0.9	0.6	0.4
Alley	0.6	0.4	0.2

6. Luminaires, poles, brackets, and circuitry shall be as approved by the Director of Public Works. In general, poles and brackets shall be aluminum; luminaires shall be "Cobra Head" type.
7. Decorative lighting within right-of-ways shall meet all applicable portions of the above, and be approved by the Director of Public Works before installation.
8. Street light spacing shall conform with the following:
   a. Alleys: As necessary to meet requirements in paragraph 5, above
   b. Residential streets: As necessary to meet requirements in paragraph 5, above
   c. Commercial Streets: 30 foot to 50 foot intervals
   d. Commercial Avenues: 30 foot to 50 foot intervals
   e. Commercial Boulevards: 30 foot to 50 foot intervals

J – On-Street Parking.

1. On-street parking shall be provided according to Table 5-1.
2. On-street parking spaces shall not be marked unless designated by the City Engineer because of the demand for significant parking.
3. Where marked, on-street parking spaces shall be marked with thermoplastic and in the configuration of FDOT "Standard 17346, Special Marking Areas (Parking", and Type III preferred. Type II, if used, shall have a middle stall length of at least twenty-two feet (22 ft.). See Figure ST-14.
4. Clearance (No Parking Zone) from established pedestrian crosswalks shall be as shown on Figure 3-16, *"Manual on Uniform Traffic Control Devices"* (MUTCD). See Figure ST-14.
5. For streets with no pedestrian cross-walk, the clear zone shall be twenty-five feet (25 ft.) from the point of tangency of the curb radius, when the intersection is not signalized. The clear zone shall be thirty feet (30 ft.) when the intersection is signalized.
6. Clearance for mid-block driveways shall be fifteen feet (15 ft.) from the driveway curb transition to the parking stall. See Figure ST-14.

Section K – Bicycle Network.

1. Bicycle facilities shall be provided according to Table 5-1, Figure DE-26, the manuals named in Section A. 3. above, on page 5-1 and the following.

2. "Bike Lanes" are defined as a portion of the roadway that has been designated by striping, signing, and/or pavement markings for the preferential or exclusive use of bicyclists.

3. "Bike Routes" are defined as a portion of the right-of-way that has been designated by striping, signing, and/or pavement markings for the joint, but not exclusive, use of bicyclists.

4. "Multi-Use Recreational Trails" are defined as a path open for shared public use (including bicyclists) physically separated from motor vehicle traffic by an open space or barrier and usually on exclusive right-of-way.

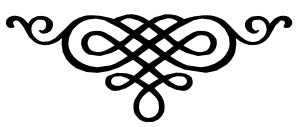
5. Bicycle racks shall be the "Inverted U" type (or equivalent) and shall conform to Figures ST-19 through ST-22, pages 4-28 through 4-31, and the following, unless otherwise approved by the City Engineer.
   a. Bicycle racks shall not be located within bus stops, loading zones, or other areas where on-street parking is permitted.
   b. Bicycle racks shall be placed a minimum of four feet (4 ft.) from existing street furniture.
   c. Bicycle racks shall have a twelve foot (12 ft.) clearance from the edge of fire hydrants.
   d. Bicycle racks shall be placed a minimum of six feet (6 ft.) from each other.
   e. Bicycle racks shall only be installed on sidewalks with a width of ten feet (10 ft.) or greater and shall allow a minimum six feet (6 ft.) wide clear, unobstructed path for pedestrians.
   f. Bicycle racks shall be installed three feet (3 ft.) back of the face of curb.

Section L – Miscellaneous.

1. Concrete Collars: Reinforced concrete collars shall be installed around all storm drain and sanitary manhole frame and covers, and around all water valve boxes in accordance with Figure ST-20.

2. Traffic Sign Preservation: All public property along the line of work or which is in the vicinity of the work shall be preserved. All existing roadside traffic signs for which permanent removal is not indicated shall be protected against damage or displacement. Whenever such signs lie within the limits of construction or wherever so directed by the City Engineer due to exigencies of construction operations, the existing roadside signs shall be taken up by the Contractor, and delivered to City Public Works Department. At the Contractor's option, Public Works Department will remove the signs at the expense of the Contractor.

3. Street Name Sign: Street name signs shall be in accordance with Part 4, Figure ST-21, or as otherwise approved by the City Engineer.



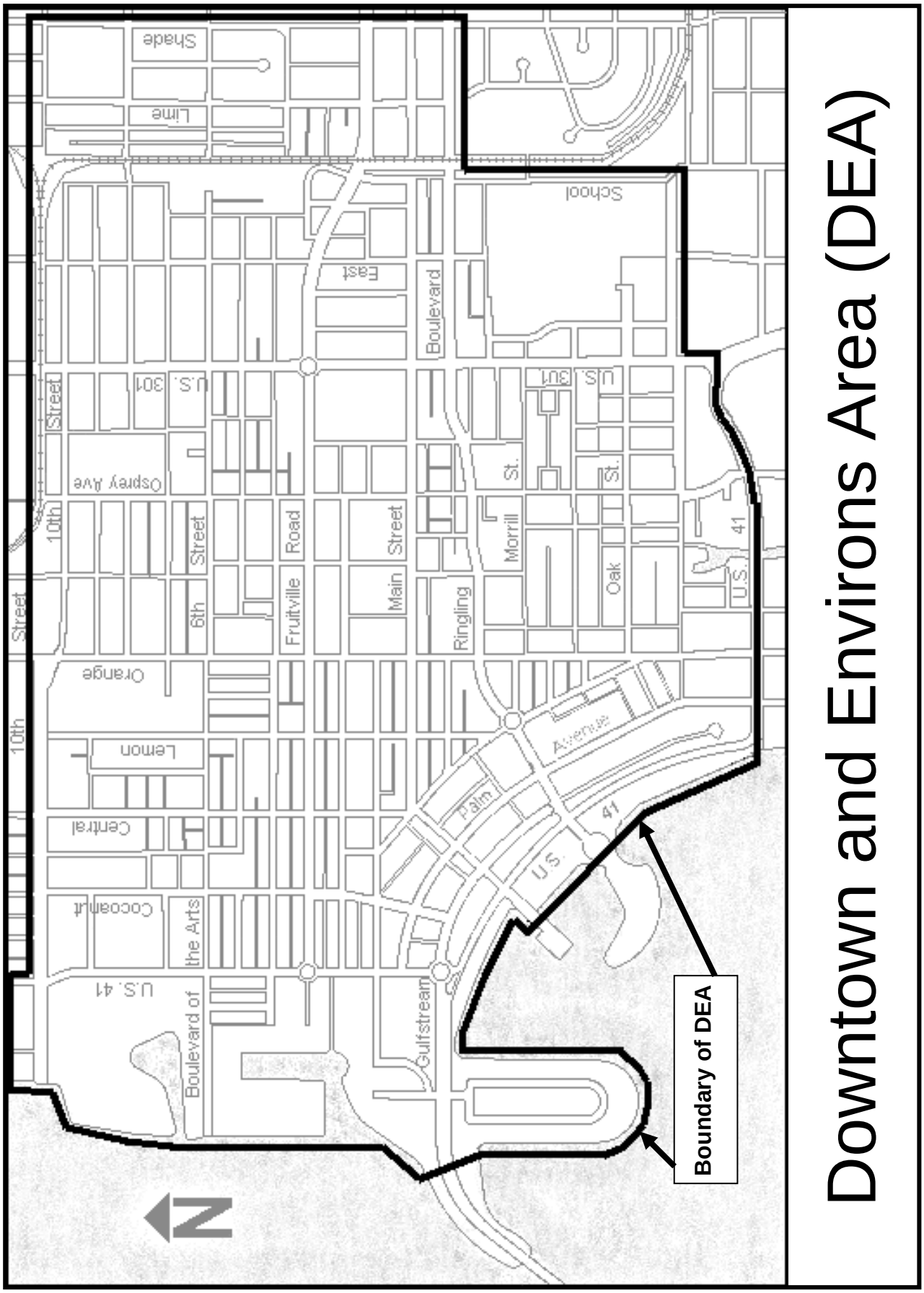

Downtown and Environs Area (DEA)
Boundary of DEA
Shade
Lime
School
East
Boulevard
U.S. 301
Street
Osprey Ave
10th
Street
Road
Fruitville
6th
Main
Street
Ringling
Morrill
St.
Oak
U.S. 41
Orange
Lemon
Central
Cocoanut
the Arts
U.S. 41
Boulevard of
Gulfstream
Palm
Avenues
N

Fig. DE - 1

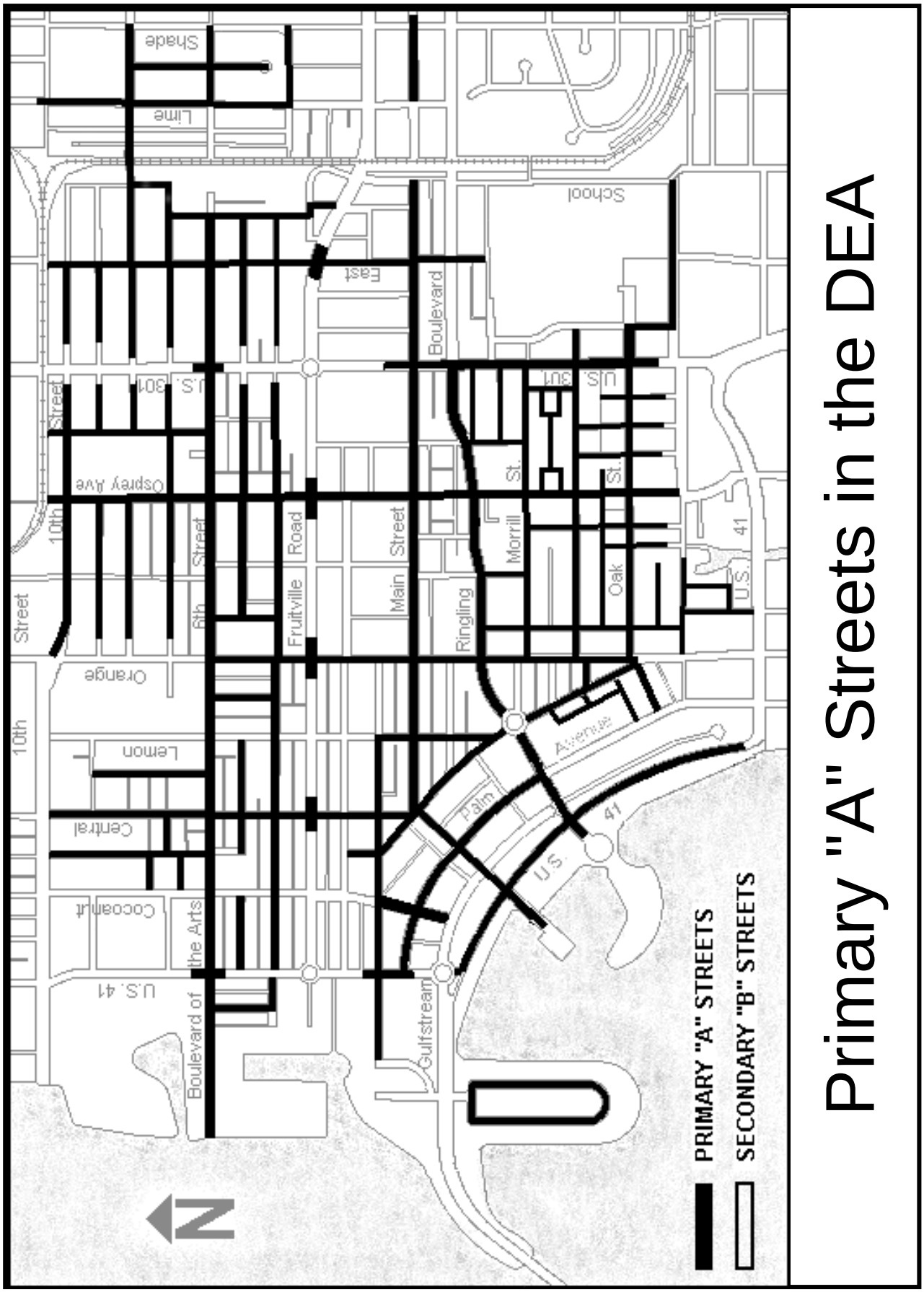
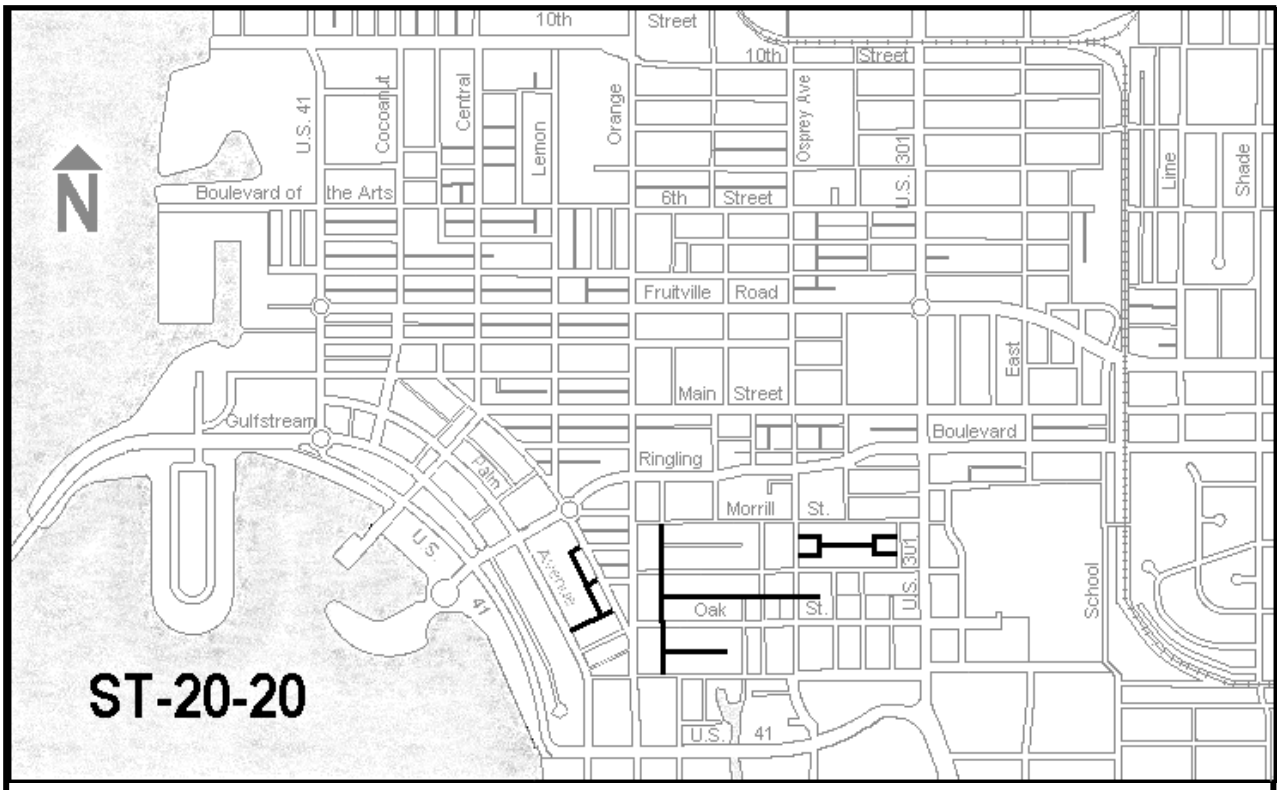
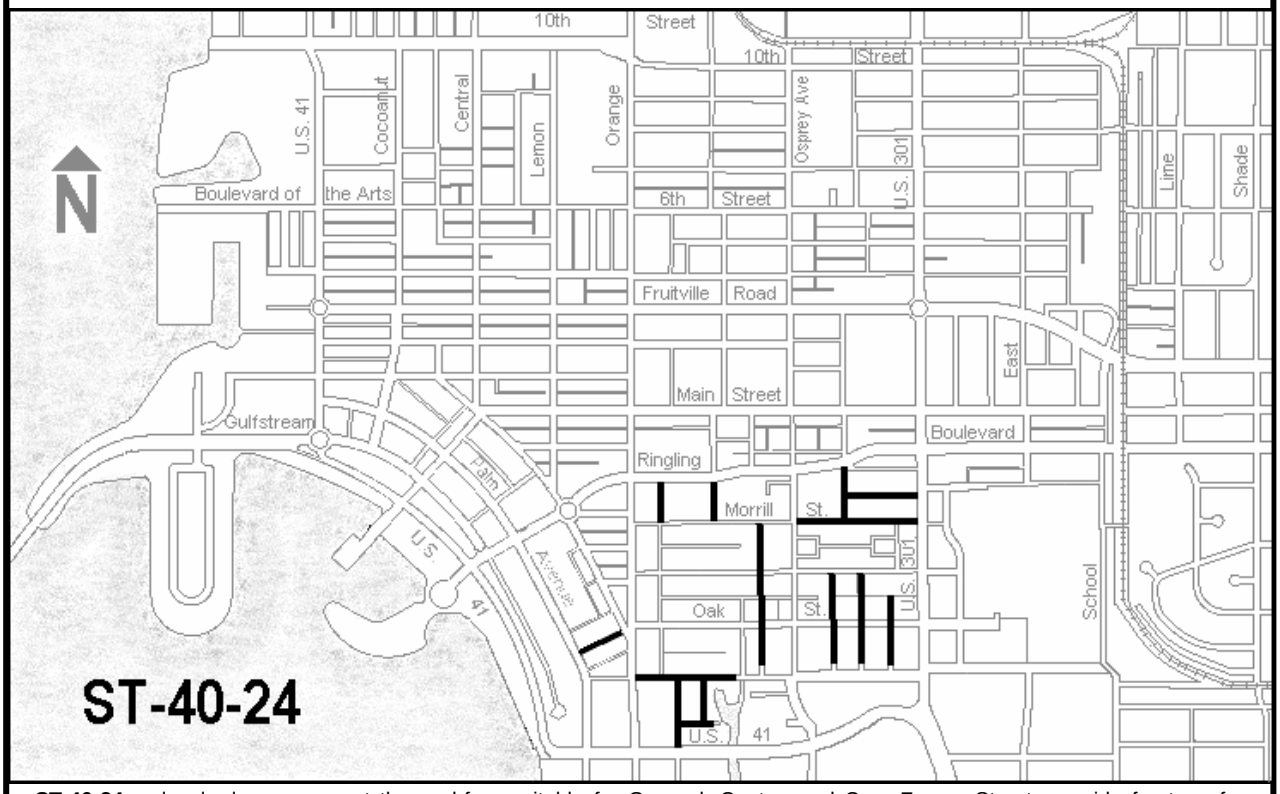

Primary "A" Streets in the DEA
PRIMARY "A" STREETS
SECONDARY "B" STREETS
Shade
Lime
School
East
Boulevard
U.S. 301
Street
Osprey Ave
10th
Street
8th
Road
Fruitville
Main
Street
Ringling
St.
Morrill
St.
Oak
U.S. 41
Orange
Lemon
Central
Cocoanut
the Arts
Boulevard of
U.S. 41
Gulfstream
Avenue
Palm
U.S. 41
N

Fig. DE - 2

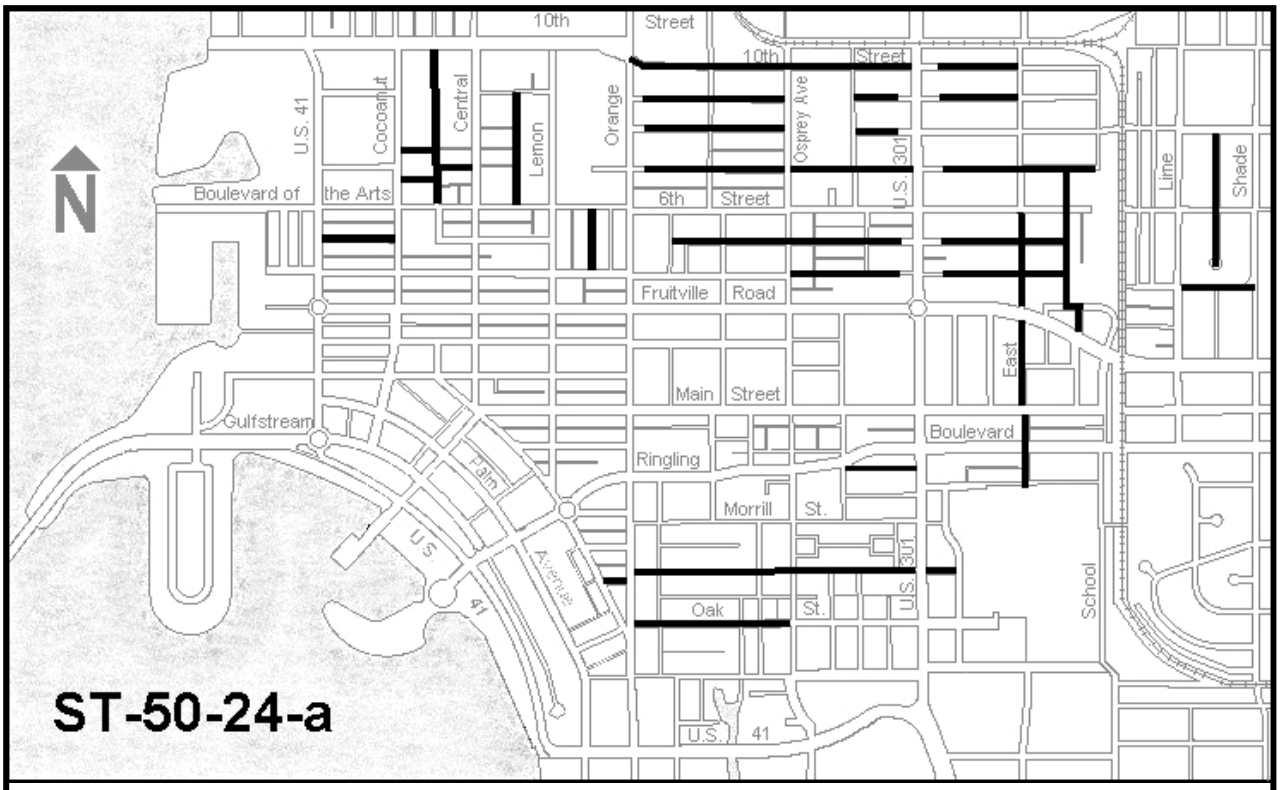


ST-20-20: a local, slow-movement thoroughfare suitable for General, Center, and Core Zones. Streets provide frontage for higher-density buildings such as apartment buildings and rowhouses. A street is urban in character, paved from property line to property line, with drainage by inverted crown at the center. Character may vary somewhat, however, responding to the enfronting commercial or residential uses.

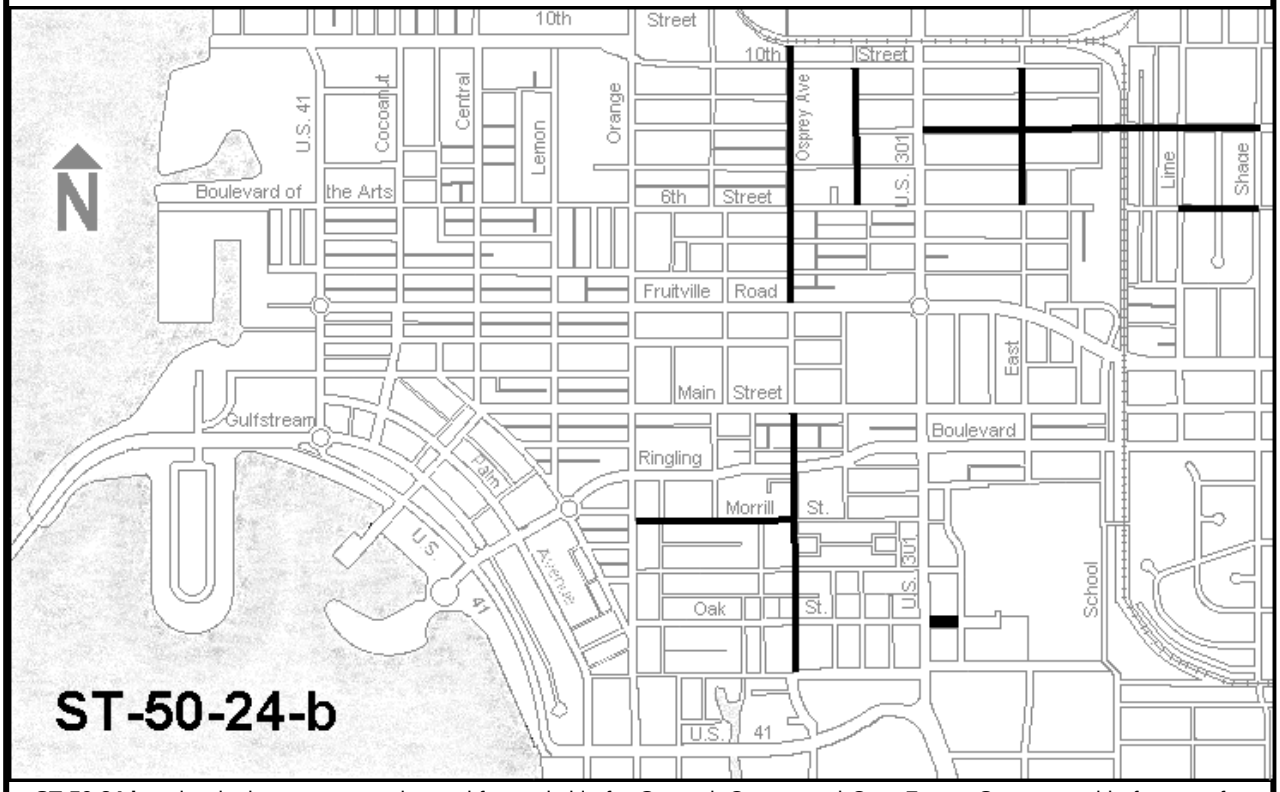


ST-40-24: a local, slow-movement thoroughfare suitable for General, Center, and Core Zones. Streets provide frontage for higher-density buildings such as apartment buildings and rowhouses. A street is urban in character, with raised curbs, closed drainage, wide sidewalks, parallel parking, and trees in continuous planting areas. Character may vary somewhat, however, responding to the enfronting commercial or residential uses.

Fig. DE - 3

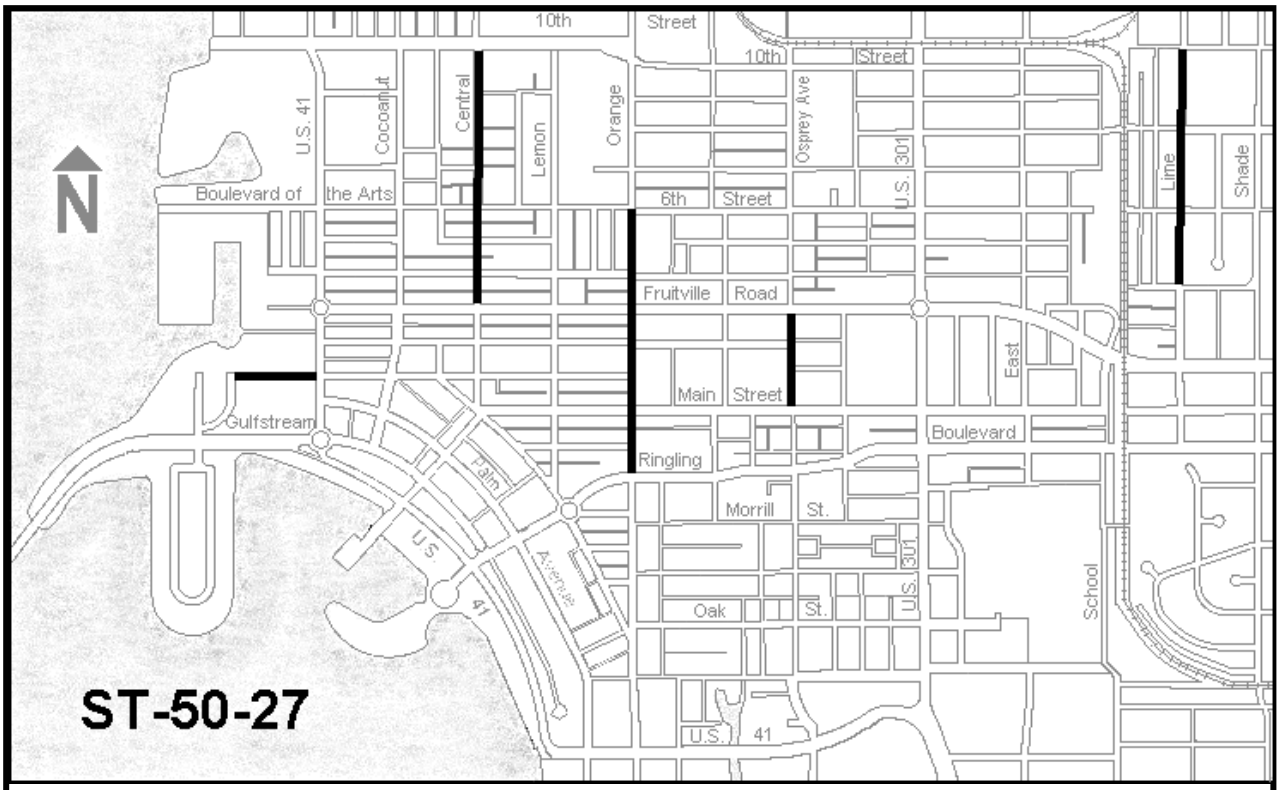


ST-50-24-a: a local, yield-movement thoroughfare suitable for General, Center, and Core Zones. Streets provide frontage for higher-density buildings such as apartment buildings and rowhouses. A street is urban in character, with raised curbs, closed drainage, wide sidewalks, parallel parking, and trees in continuous planting areas. Character may vary somewhat, however, responding to the enfronting commercial or residential uses.

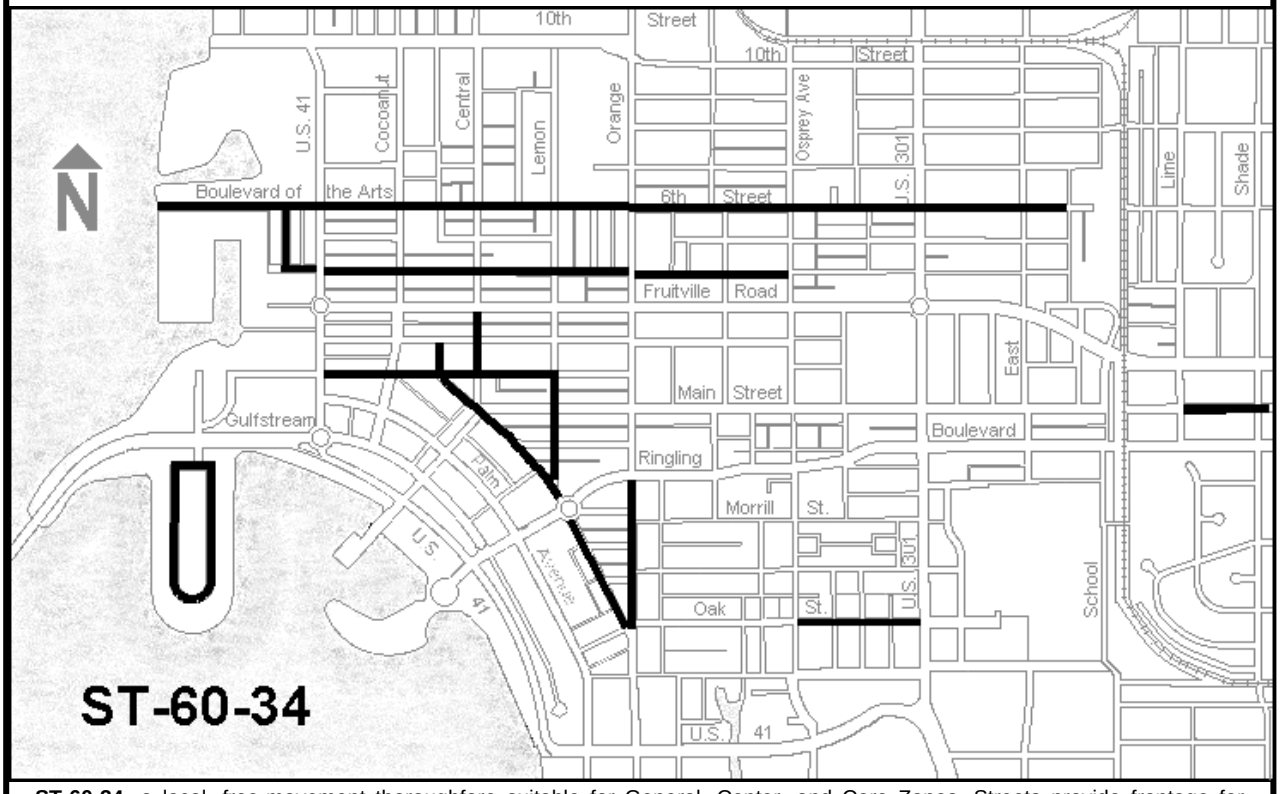


ST-50-24-b: a local, slow-movement thoroughfare suitable for General, Center, and Core Zones. Streets provide frontage for higher-density buildings such as apartment buildings and rowhouses. A street is urban in character, with raised curbs, closed drainage, wide sidewalks, parallel parking, and trees in continuous planting areas. Character may vary somewhat, however, responding to the enfronting commercial or residential uses.

Fig. DE - 4

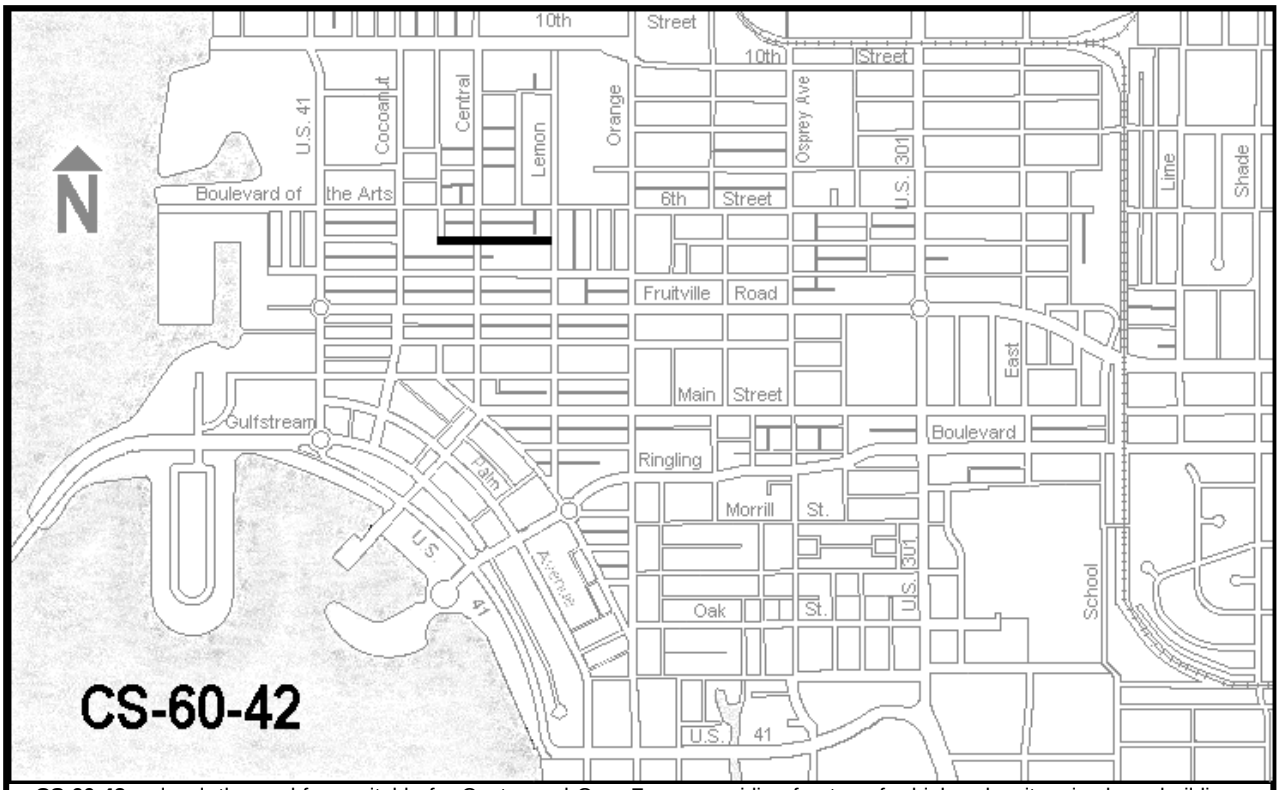


ST-50-27: a local, free-movement thoroughfare suitable for General, Center, and Core Zones. Streets provide frontage for higher-density buildings such as apartment buildings and rowhouses. A street is urban in character, with raised curbs, closed drainage, wide sidewalks, parallel parking, and trees in continuous planting areas. Character may vary somewhat, however, responding to the enfronting commercial or residential uses.

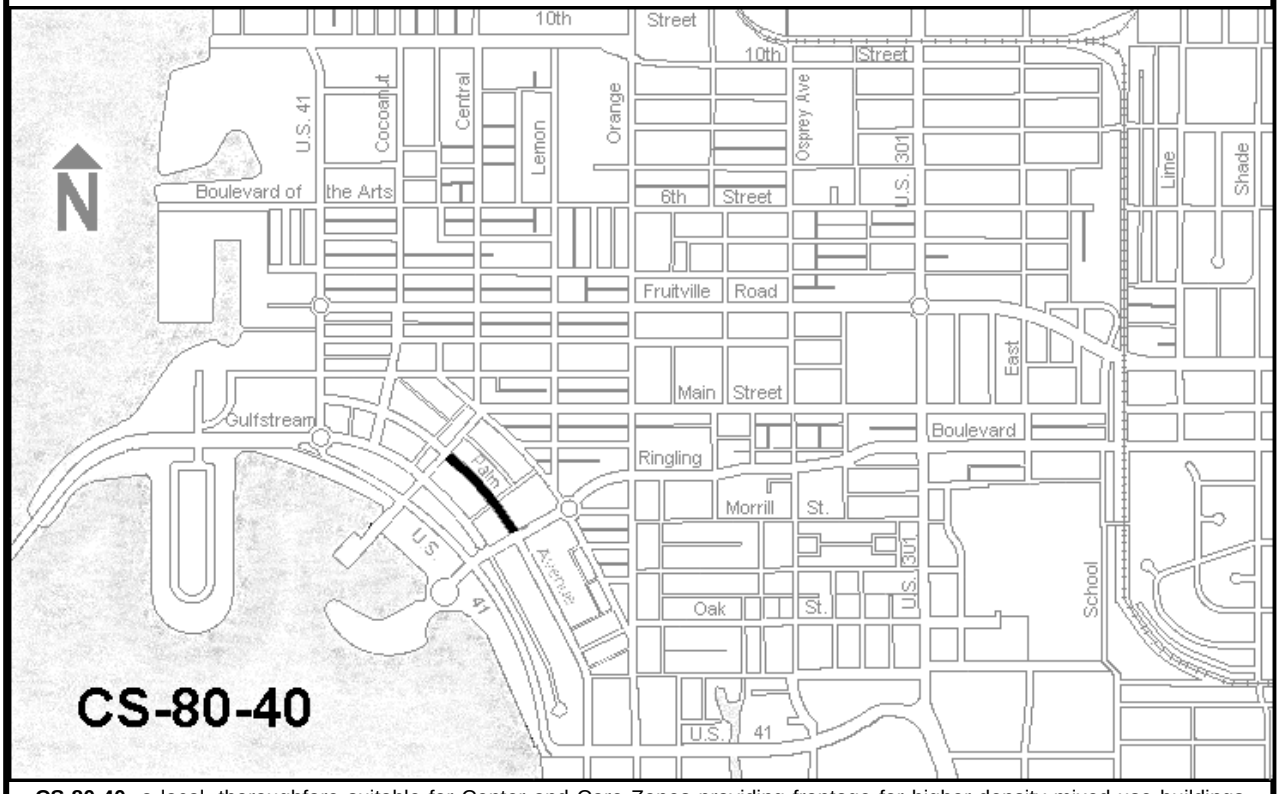


ST-60-34: a local, free-movement thoroughfare suitable for General, Center, and Core Zones. Streets provide frontage for higher-density buildings such as apartment buildings and rowhouses. A street is urban in character, with raised curbs, closed drainage, wide sidewalks, parallel parking, and trees in continuous planting areas. Character may vary somewhat, however, responding to the enfronting commercial or residential uses.

Fig. DE - 5

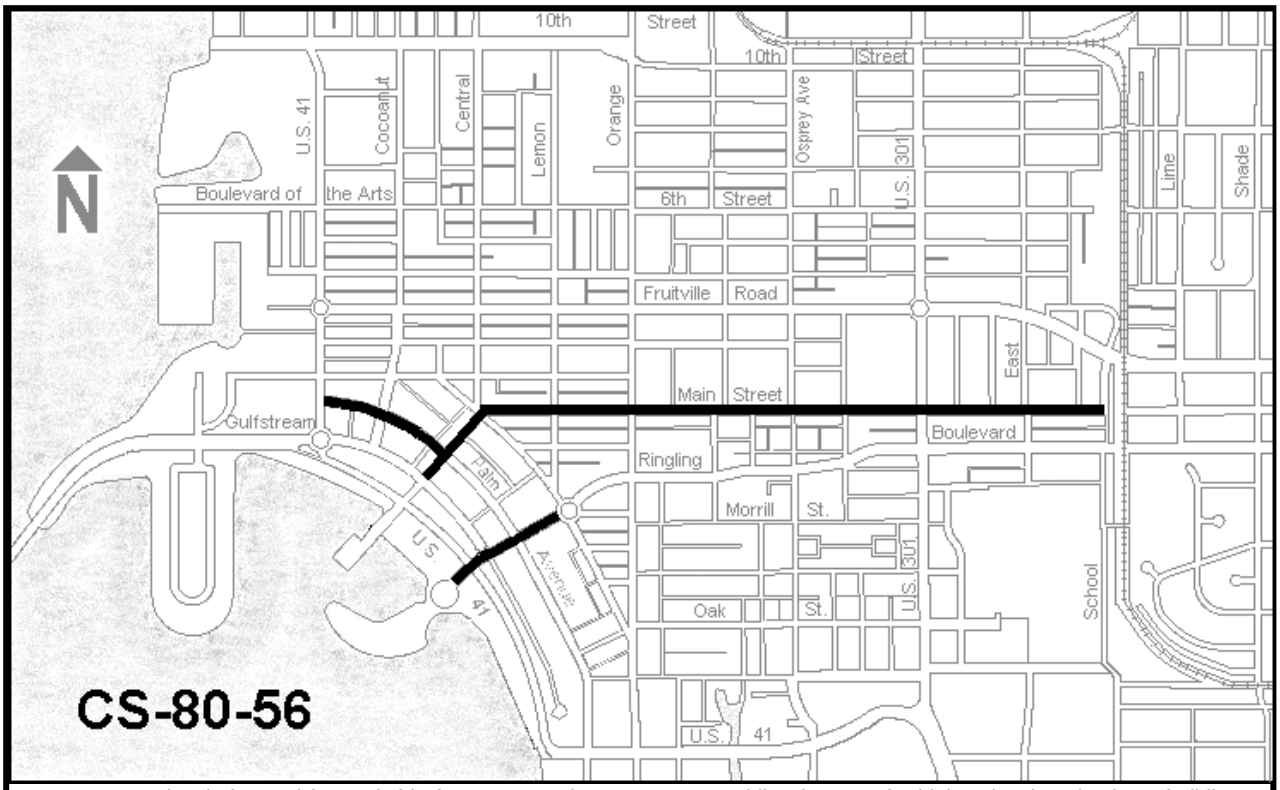


CS-60-42: a local, thoroughfare suitable for Center and Core Zones providing frontage for higher-density mixed-use buildings such as flexhouses, shops, and offices. It is urban in character, with raised curbs, storm-drain inlets, and striped on-street parking. A single species of tree is planted in individual planters creating a sidewalk of maximum width, with areas accommodating street furniture. Clear trunks and high canopies are necessary to avoid shopfronts, signage, and awnings.

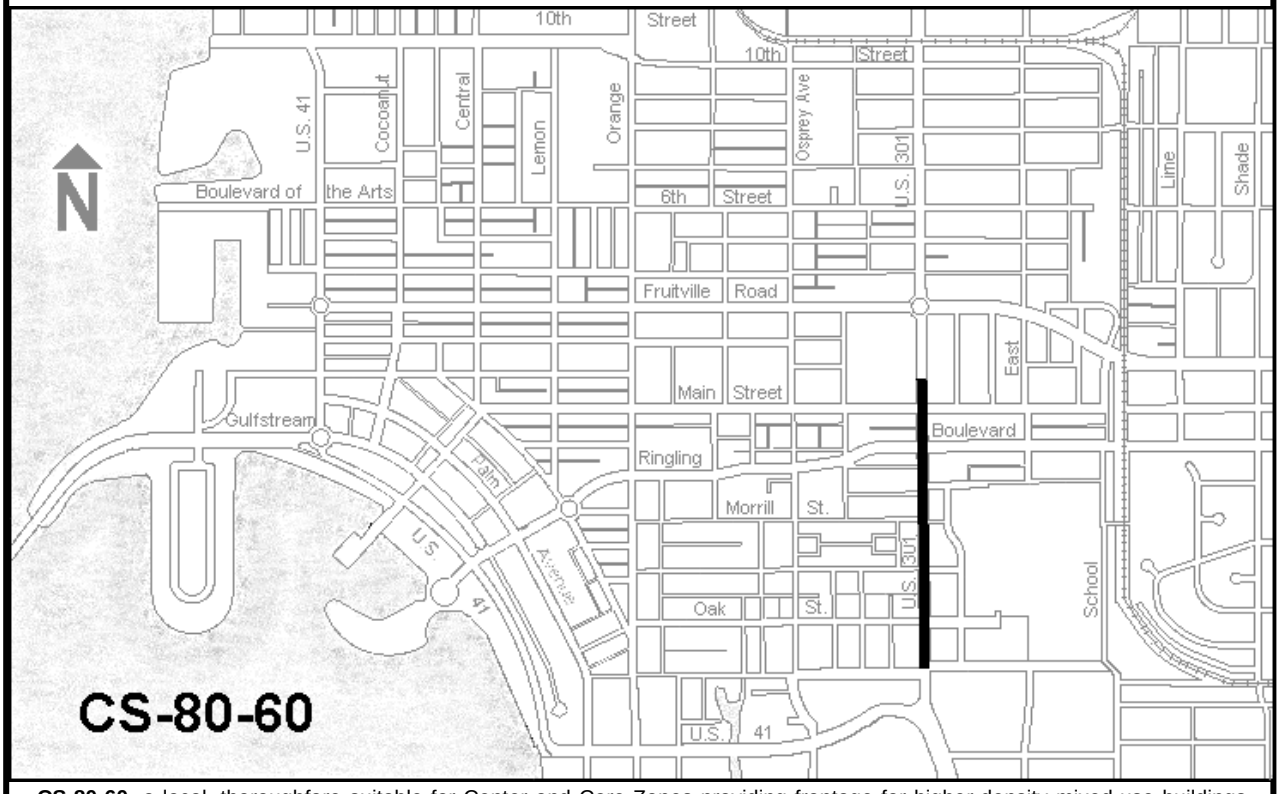


CS-80-40: a local, thoroughfare suitable for Center and Core Zones providing frontage for higher-density mixed-use buildings such as flexhouses, shops, and offices. It is urban in character, with raised curbs, storm-drain inlets, and striped on-street parking. A single species of tree is planted in continuous planters creating a sidewalk of maximum width, with areas accommodating street furniture. Clear trunks and high canopies are necessary to avoid shopfronts, signage, and awnings.

Fig. DE - 6

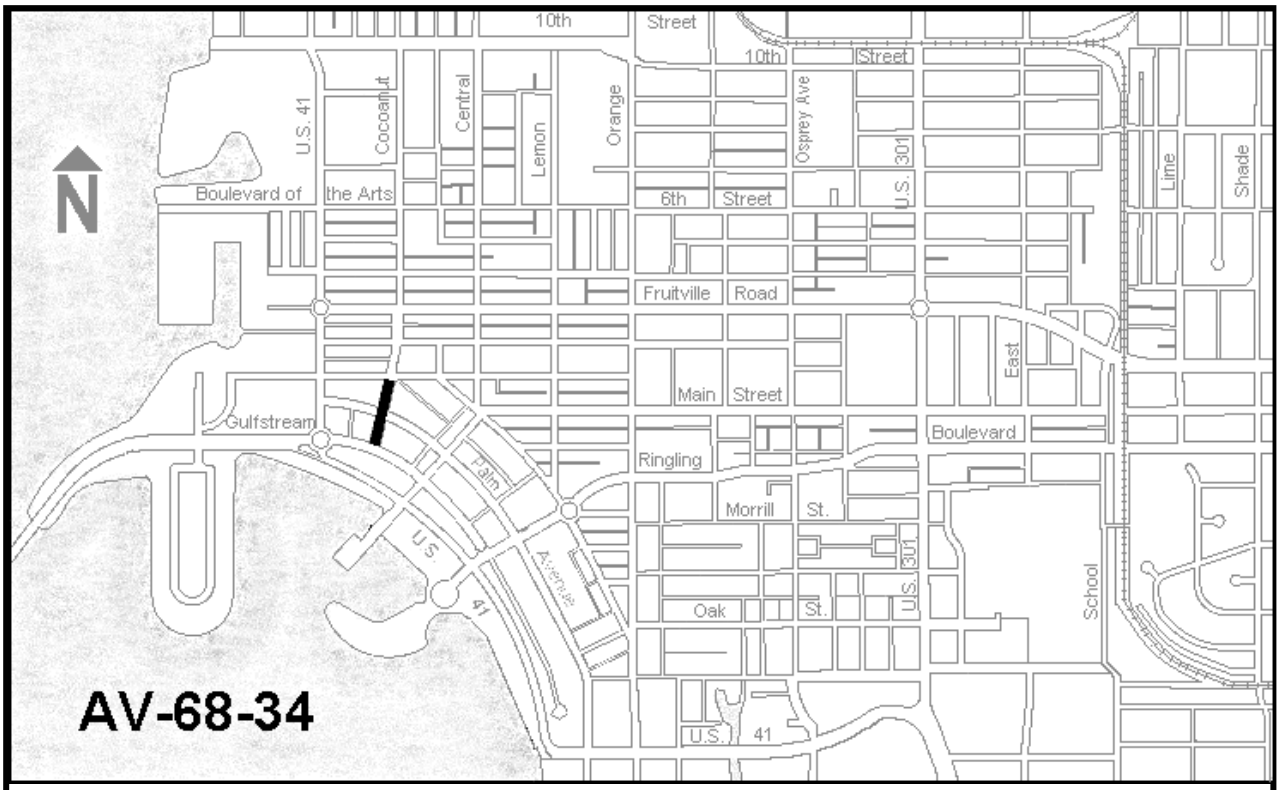


CS-80-56: a local, thoroughfare suitable for Center and Core Zones providing frontage for higher-density mixed-use buildings such as flexhouses, shops, and offices. It is urban in character, with raised curbs, storm-drain inlets, and striped on-street parking. A single species of tree is planted in individual planters creating a sidewalk of maximum width, with areas accommodating street furniture. Clear trunks and high canopies are necessary to avoid shopfronts, signage, and awnings.



CS-80-60: a local, thoroughfare suitable for Center and Core Zones providing frontage for higher-density mixed-use buildings such as flexhouses, shops, and offices. It is urban in character, with raised curbs, storm-drain inlets, and striped on-street parking. A single species of tree is planted in individual planters creating a sidewalk of maximum width, with areas accommodating street furniture. Clear trunks and high canopies are necessary to avoid shopfronts, signage, and awnings.

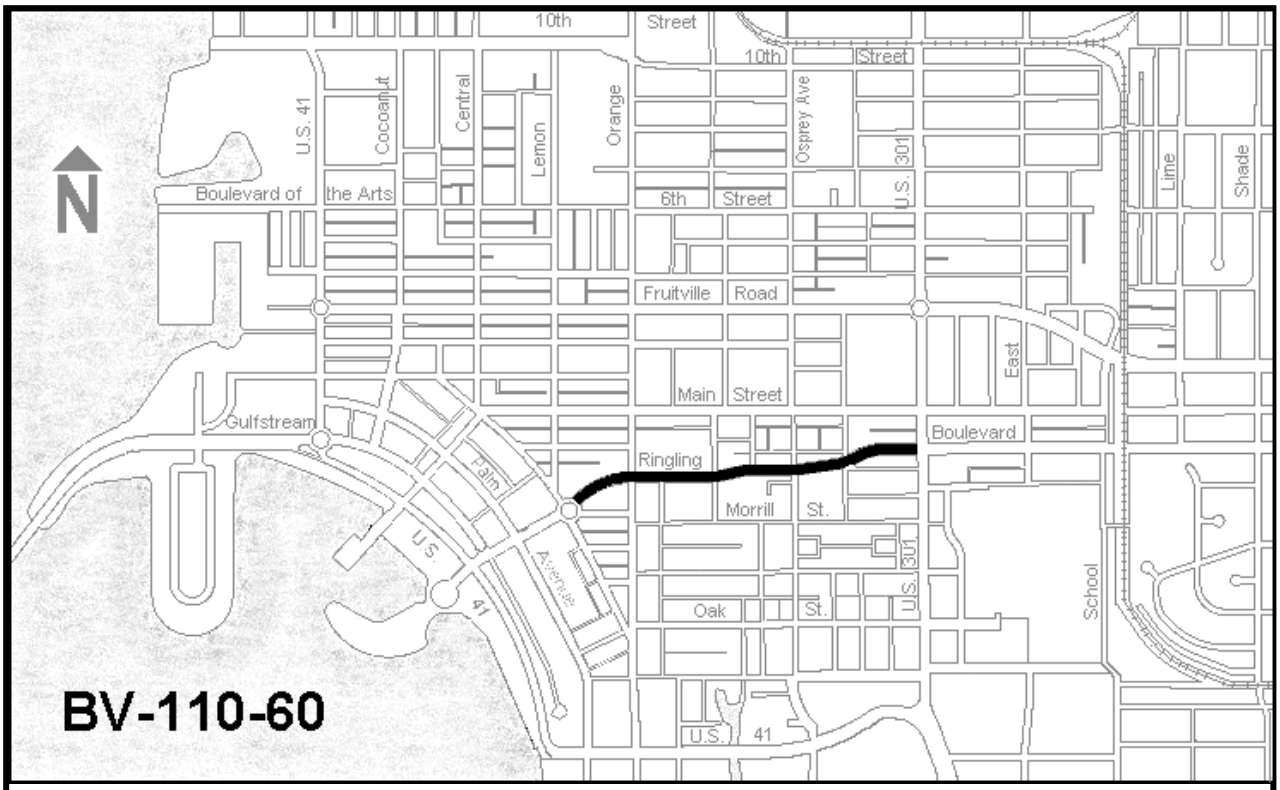
Fig. DE - 7



AV-68-34: a short, axial, free-movement thoroughfare with its axis usually terminated. An Avenue may be conceived as an elongated square.

BV-84-58: a long-distance, slow-movement thoroughfare traversing an urbanized area. A Boulevard is flanked by parking, sidewalks, and planters buffering the buildings along the sides.

Fig. DE - 8



BV-110-60: a long-distance, speed-movement thoroughfare traversing an urbanized area. A Boulevard is flanked by parking, sidewalks, and planters buffering the buildings along the sides.

Fig. DE - 9

Type = Lane
Movement = Yield Movement
Design Speed = 15 MPH
R.O.W. Width = 20 ft.
Pavement Width = 8 ft.
Traffic Flow = One Way
Parking Lanes = None
Curb Type = Swale
Curb Radius = 15 ft. or per Section D, 8.,d.
Planter Width = 6-7.5 ft. each
Planter Type = Continuous
Planting Pattern = None
Tree Type = See Landscape Standards
Street Light Spacing = See Page 5-10
Bike Way Type = Bike Route
Bike Way Width = N/A
Sidewalk = None
Sidewalk Width = N/A

Lane: a vehicular access way located to the rear of more rural lots providing access to parking, outbuildings and utility easements. Lanes are paved as lightly as possible and may be just gravel or left unpaved and should be as rural as possible in character.

Street Type: Lane (LA-20-8)

Fig. DE - 10

Type = Alley
Movement = Slow Movement
Design Speed = 20 MPH
R.O.W. Width = 20 ft.
Pavement Width = 20 ft.
Traffic Flow = Two Ways
Parking Lanes = None
Curb Type = None
Curb Radius = 15 ft. or per Section D, 8.,d.
Planter Width = None
Planter Type = None
Planting Pattern = None
Tree Type = None
Street Light Spacing = See Page 5-10
Bike Way Type = Bike Route
Bike Way Width = N/A
Sidewalk = None
Sidewalk Width = N/A

Alley: a narrow vehicular access way located to the rear of more urban lots providing service areas, parking access, and utility easements. Alleys, as they are used by trucks and must accommodate dumpsters, should be paved from building face to building face, with drainage by inverted crown at the center.

Street Type: Alley (AL-20-20)

Fig. DE - 11

Type = Residential Street
Movement = Slow Movement
Design Speed = 20 MPH
R.O.W. Width = 20 ft.
Pavement Width = 20 ft.
Traffic Flow = Two Ways
Parking Lanes = None
Curb Type = None
Curb Radius = 15 ft. or per Section D, 8.,d.
Planter Width = None
Planter Type = None
Planting Pattern = None
Tree Type = None
Street Light Spacing = See Page 5-10
Bike Way Type = Bike Route
Bike Way Width = N/A
Sidewalk = None
Sidewalk Width = N/A

Residential Street: a local, slow-movement thoroughfare suitable for General, Center, and Core Zones. Streets provide frontage for higher-density buildings such as apartment buildings and rowhouses. A street is urban in character, paved from property line to property line, with drainage by inverted crown at the center. Character may vary somewhat, however, responding to the enfronting commercial or residential uses.

Street Type: ST-20-20 (ST-20-20)

Street Type: Residential Street (ST-40-24)

Type =	Residential Street
Movement =	Slow Movement
Design Speed =	20 MPH
R.O.W. Width =	40 ft.
Pavement Width =	24 ft.
Traffic Flow =	Two Ways
Parking Lanes =	Parallel , One Side
Curb Type =	"F" Type
Curb Radius =	15 ft. or per Section D, 8.,d.
Planter Width =	2 ft.
Planter Type =	Continuous
Planting Pattern =	Allee 30 ft. o.c.
Tree Type =	See Landscape Standards
Street Light Spacing =	See Page 5-10
Bike Way Type =	Bike Route
Bike Way Width =	N/A
Sidewalk =	Both sides
Sidewalk Width =	6 ft. Minimum

Residential Street: a local, slow-movement thoroughfare suitable for General, Center, and Core Zones. Streets provide frontage for higher-density buildings such as apartment buildings and rowhouses. A street is urban in character, with raised curbs, closed drainage, wide sidewalks, parallel parking, and trees in continuous planting areas. Character may vary somewhat, however, responding to the enfronting commercial or residential uses.

Fig. DE - 13

Type = Residential Street
Movement = Yield Movement
Design Speed = 15 MPH
R.O.W. Width = 50 ft.
Pavement Width = 24 ft.
Traffic Flow = Two Ways
Parking Lanes = Parallel, Both sides, alternating
Curb Type = "F" Type
Curb Radius = 15 ft. or per Section D, 8.,d.
Planter Width = 7 ft.
Planter Type = Continuous
Planting Pattern = Allee 30 ft. o.c.
Tree Type = See Landscape Standards
Street Light Spacing = See Page 5-10
Bike Way Type = Bike Route, Optional Bike Path
Bike Way Width = 6 ft.
Sidewalk = Both sides
Sidewalk Width = 6 ft. Minimum

Residential Street: a local, yield-movement thoroughfare suitable for General, Center, and Core Zones. Streets provide frontage for higher-density buildings such as apartment buildings and rowhouses. A street is urban in character, with raised curbs, closed drainage, wide sidewalks, parallel parking, and trees in continuous planting areas. Character may vary somewhat, however, responding to the enfronting commercial or residential uses.

Street Type: Residential Street (ST-50-24-a)

Fig. DE - 14

Street Type: Residential Street (ST-50-24-b)

Type =	Residential Street
Movement =	Slow Movement
Design Speed =	20 MPH
R.O.W. Width =	50 ft.
Pavement Width =	24 ft.
Traffic Flow =	Two Ways
Parking Lanes =	Parallel , One Side
Curb Type =	"F" Type
Curb Radius =	15 ft. or per Section D, 8.,d.
Planter Width =	7 ft.
Planter Type =	Continuous
Planting Pattern =	Allee 30 ft. o.c.
Tree Type =	See Landscape Standards
Street Light Spacing =	See Page 5-10
Bike Way Type =	Bike Route, Optional Bike Path
Bike Way Width =	6 ft.
Sidewalk =	Both sides
Sidewalk Width =	6 ft. Minimum

Residential Street: a local, slow-movement thoroughfare suitable for General, Center, and Core Zones. Streets provide frontage for higher-density buildings such as apartment buildings and rowhouses. A street is urban in character, with raised curbs, closed drainage, wide sidewalks, parallel parking, and trees in continuous planting areas. Character may vary somewhat, however, responding to the enfronting commercial or residential uses.

Street Type: Residential Street (ST-50-27)

Type =	Residential Street
Movement =	Free Movement
Design Speed =	30 MPH
R.O.W. Width =	50 ft.
Pavement Width =	27 ft.
Traffic Flow =	Two Ways
Parking Lanes =	Parallel, One Side
Curb Type =	"F" Type
Curb Radius =	15 ft. or per Section D, 8.,d.
Planter Width =	6.5 ft.
Planter Type =	Continuous
Planting Pattern =	Allee 40 ft. o.c.
Tree Type =	See Landscape Standards
Street Light Spacing =	See Page 5-10
Bike Way Type =	Bike Route
Bike Way Width =	N/A
Sidewalk =	Both sides
Sidewalk Width =	5 ft. Minimum

Residential Street: a local, free-movement thoroughfare suitable for General, Center, and Core Zones. Streets provide frontage for higher-density buildings such as apartment buildings and rowhouses. A street is urban in character, with raised curbs, closed drainage, wide sidewalks, parallel parking, and trees in continuous planting areas. Character may vary somewhat, however, responding to the enfronting commercial or residential uses.

Residential Street: a local, free-movement thoroughfare suitable for General, Center, and Core Zones. Streets provide frontage for higher-density buildings such as apartment buildings and rowhouses. A street is urban in character, with raised curbs, closed drainage, wide sidewalks, parallel parking, and trees in continuous planting areas. Character may vary somewhat, however, responding to the enfronting commercial or residential uses.

Type = Residential Street
Movement = Free Movement
Design Speed = 30 MPH
R.O.W. Width = 60 ft.
Pavement Width = 34 ft.
Traffic Flow = Two Ways
Parking Lanes = Parallel, Both Sides
Curb Type = "F" Type
Curb Radius = 15 ft. or per Section D, 8.,d.
Planter Width = 7 ft.
Planter Type = Continuous
Planting Pattern = Allee 40 ft. o.c.
Tree Type = See Landscape Standards
Street Light Spacing = See Page 5-10
Bike Way Type = Bike Route
Bike Way Width = N/A
Sidewalk = Both Sides
Sidewalk Width = 6 ft. Minimum

Street Type: Residential Street (ST-60-34)

Fig. DE - 17

Type = Commercial Street
Movement = Slow Movement
Design Speed = 20 MPH
R.O.W. Width = 60 ft.
Pavement Width = 42 ft.
Traffic Flow = Two Ways
Parking Lanes = Angle, One Side
Curb Type = "F" Type
Curb Radius = 15 ft. or per Section D, 8.,d.
Planter Width = 6 ft.
Planter Type = Continuous
Planting Pattern = Allee 30 ft. o.c.
Tree Type = See Landscape Standards
Street Light Spacing = 30 ft. to 50 ft. intervals
Bike Way Type = Bike Route
Bike Way Width = N/A
Sidewalk = Both sides
Sidewalk Width = 6 ft. Minimum

Commercial Street: a local, thoroughfare suitable for Center and Core Zones, providing frontage for higher-density mixed-use buildings such as flexhouses, shops and offices. It is urban in character with raised curbs, storm-drain inlets, and striped on-street parking. A single species of tree is planted in opportunistic alignment and confined by individual planters creating a sidewalk of maximum width, with areas accommodating street furniture. Clear trunks and high canopies are necessary to avoid shopfronts, signage, and awnings.

Street Type: Commercial Street (CS-60-42)

Fig. DE - 18

Street Type: Commercial Street (CS-80-40)

Type =	Commercial Street
Movement =	Slow Movement
Design Speed =	20 MPH
R.O.W. Width =	80 ft.
Pavement Width =	40 ft.
Traffic Flow =	Two Ways
Parking Lanes =	Parallel, Both Sides
Curb Type =	"F" Curb
Curb Radius =	15 ft. or per Section D, 8.,d.
Planter Width =	8 ft.
Planter Type =	Continuous
Planting Pattern =	Allee 30 ft. o.c.
Tree Type =	See Landscape Standards
Street Light Spacing =	30 ft. to 50 ft. intervals
Bike Way Type =	Bike Route
Bike Way Width =	N/A
Sidewalk =	Both Sides
Sidewalk Width =	12 ft. Minimum

Commercial Street: a local, thoroughfare suitable for Center and Core Zones, providing frontage for higher-density mixed-use buildings such as flexhouses, shops, and offices. It is urban in character with raised curbs, storm-drain inlets, and striped on-street parking. A single species of tree is planted in opportunistic alignment and in continuous planters creating a sidewalk of maximum width, with areas accommodating street furniture. Clear trunks and high canopies are necessary to avoid shopfronts, signage, and awnings.

Street Type: Commercial Street (CS-80-56)

Type = Commercial Street
Movement = Slow Movement
Design Speed = 20 MPH
R.O.W. Width = 80 ft.
Pavement Width = 56 ft.
Traffic Flow = Two Ways
Parking Lanes = Angle, Both Sides
Curb Type = "F" Curb
Curb Radius = 15 ft. or per Section D, 8.,d.
Planter Width = 4 ft.
Planter Type = Individual
Planting Pattern = Allee 30 ft. o.c.
Tree Type = See Landscape Standards
Street Light Spacing = 30 ft. to 50 ft. intervals
Bike Way Type = Bike Route
Bike Way Width = N/A
Sidewalk = Both Sides
Sidewalk Width = 12 ft. Minimum

Commercial Street: a local, thoroughfare suitable for Center and Core Zones, providing frontage for higher-density mixed-use buildings such as flexhouses, shops, and offices. It is urban in character with raised curbs, storm-drain inlets, and striped on-street parking. A single species of tree is planted in opportunistic alignment and confined by individual planters creating a sidewalk of maximum width, with areas accommodating street furniture. Clear trunks and high canopies are necessary to avoid shopfronts, signage, and awnings.

Street Type: Commercial Street (CS-80-60)

Type = Commercial Street
Movement = Speed Movement
Design Speed = 35 MPH
R.O.W. Width = 80 ft.
Pavement Width = 60 ft.
Traffic Flow = Two Ways
Parking Lanes = Parallel, Both Sides
Curb Type = "F" Curb
Curb Radius = 15 ft. or per Section D, 8.,d.
Planter Width = 4 ft.
Planter Type = Individual
Planting Pattern = Allee 30 ft. o.c.
Tree Type = See Landscape Standards
Street Light Spacing = 30 ft. to 50 ft. intervals
Bike Way Type = Designated Bike Lane
Bike Way Width = 4 ft.
Sidewalk = Both Sides
Sidewalk Width = 10 ft. Minimum

Commercial Street: a local, speed-movement thoroughfare suitable for Center and Core Zones, providing frontage for higher-density mixed-use buildings such as flexhouses, shops, and offices. It is urban in character with raised curbs, storm-drain inlets, and striped on-street parking. A single species of tree is planted in opportunistic alignment and confined by individual planters creating a sidewalk of maximum width, with areas accommodating street furniture. Clear trunks and high canopies are necessary to avoid shopfronts, signage, and awnings.

Commercial Avenue: a short, axial, free-movement thoroughfare with its axis usually terminated. An Avenue may be conceived as an elongated square.

Type = Commercial Avenue
Movement = Free Movement
Design Speed = 30 MPH
R.O.W. Width = 68 ft.
Pavement Width = 17 ft. and 17 ft.
Traffic Flow = One Way each side
Parking Lanes = Parallel, Both Sides
Curb Type = "F" Curb
Curb Radius = 15 ft. or per Section D, 8.,d.
Planter Width = 4 ft.
Planter Type = Individual
Planting Pattern = Allee 30 ft. o.c.
Tree Type = See Landscape Standards
Street Light Spacing = 30 ft. to 50 ft. intervals
Bike Way Type = Bike Route, Optional Bike Lane
Bike Way Width = 4 ft.
Sidewalk = Both Sides
Sidewalk Width = 12 ft. Minimum

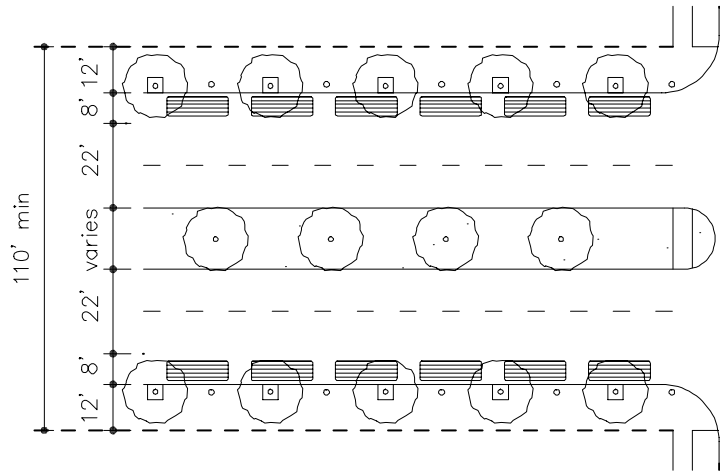
Street Type: Commercial Avenue (AV-68-34)

Fig. DE - 22

Street Type: Commercial Boulevard (BV-84-58)

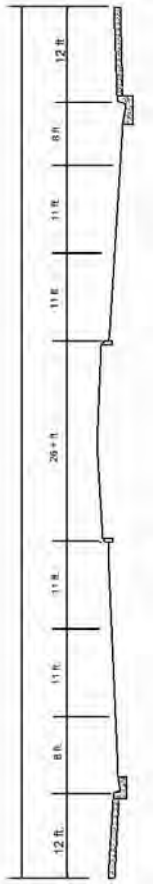
Type = Commercial Boulevard
Movement = Slow Movement
Design Speed = 20 MPH
R.O.W. Width = 84 ft.
Pavement Width = 18 ft. and 18 ft.
Traffic Flow = One Way each side
Parking Lanes = Parallel, Both Sides
Curb Type = "F" Curb
Curb Radius = 15 ft. or per Section D, 8.,d.
Planter Width = 7 ft. each side, 22 ft. center
Planter Type = continuous
Planting Pattern = Allee 30 ft. o.c.
Tree Type = See Landscape Standards
Street Light Spacing = 30 ft. to 50 ft. intervals
Bike Way Type = Bike Route, Optional Bike Lane
Bike Way Width = 4 ft.
Sidewalk = Both Sides
Sidewalk Width = 6 ft. Minimum

Commercial Boulevard: a long-distance, slow-movement thoroughfare traversing an urbanized area. A Boulevard is flanked by parking, sidewalks, and planters buffering the buildings along the sides.



Commercial Boulevard: a long-distance, speed movement thoroughfare traversing an urbanized area. A Boulevard is flanked by parking, sidewalks, and planters buffering the buildings along the sides.

Type = Commercial Boulevard
Movement = Speed Movement
Design Speed = 35 MPH
R.O.W. Width = 110 ft.
Pavement Width = 30 ft. and 30 ft.
Traffic Flow = One Way each side
Parking Lanes = Parallel, Both Sides
Curb Type = "F" Curb
Curb Radius = 15 ft. or per Section D, 8.,d.
Planter Width = 4 ft. each side, 26+ ft. center
Planter Type = Individual, continuous in center
Planting Pattern = Allee 30 ft. o.c.
Tree Type = See Landscape Standards
Street Light Spacing = 30 ft. to 50 ft. intervals
Bike Way Type = Bike Route, Optional Bike Lane
Bike Way Width = 4 ft.
Sidewalk = Both Sides
Sidewalk Width = 12 ft. Minimum



Street Type: Commercial Boulevard (BV-110-60)

Fig. DE - 24

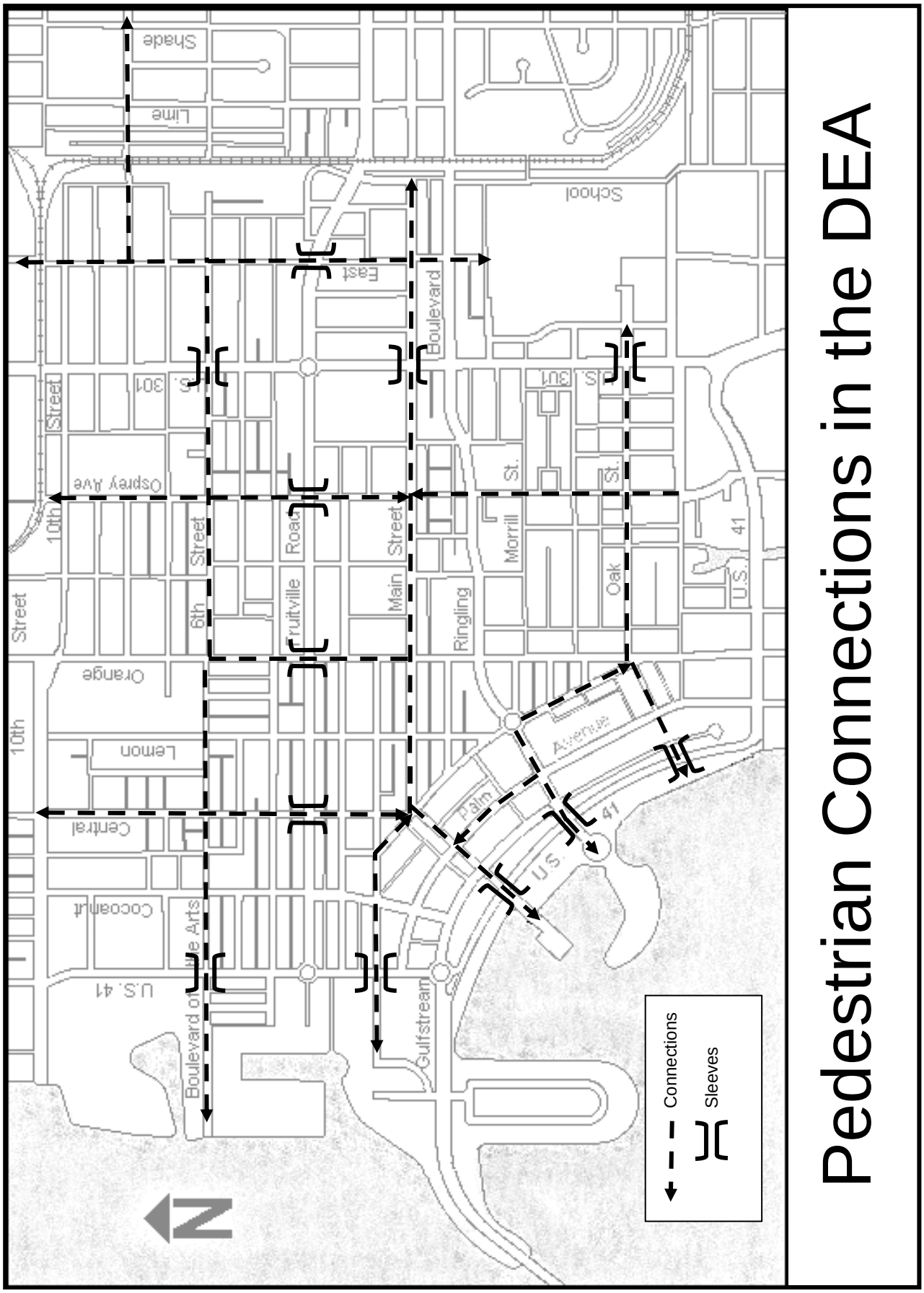

Pedestrian Connections in the DEA
Connections
Sleeves
Shade
Lime
School
East
Boulevard
U.S. 301
Osprey Ave
10th
Street
Road
Fruitville
Main
Ringling
Morrill
Oak
U.S. 41
Orange
Lemon
Central
Cocoanut
Boulevard of the Arts
Gulfstream
Palm
Avenue
N

Fig. DE - 25

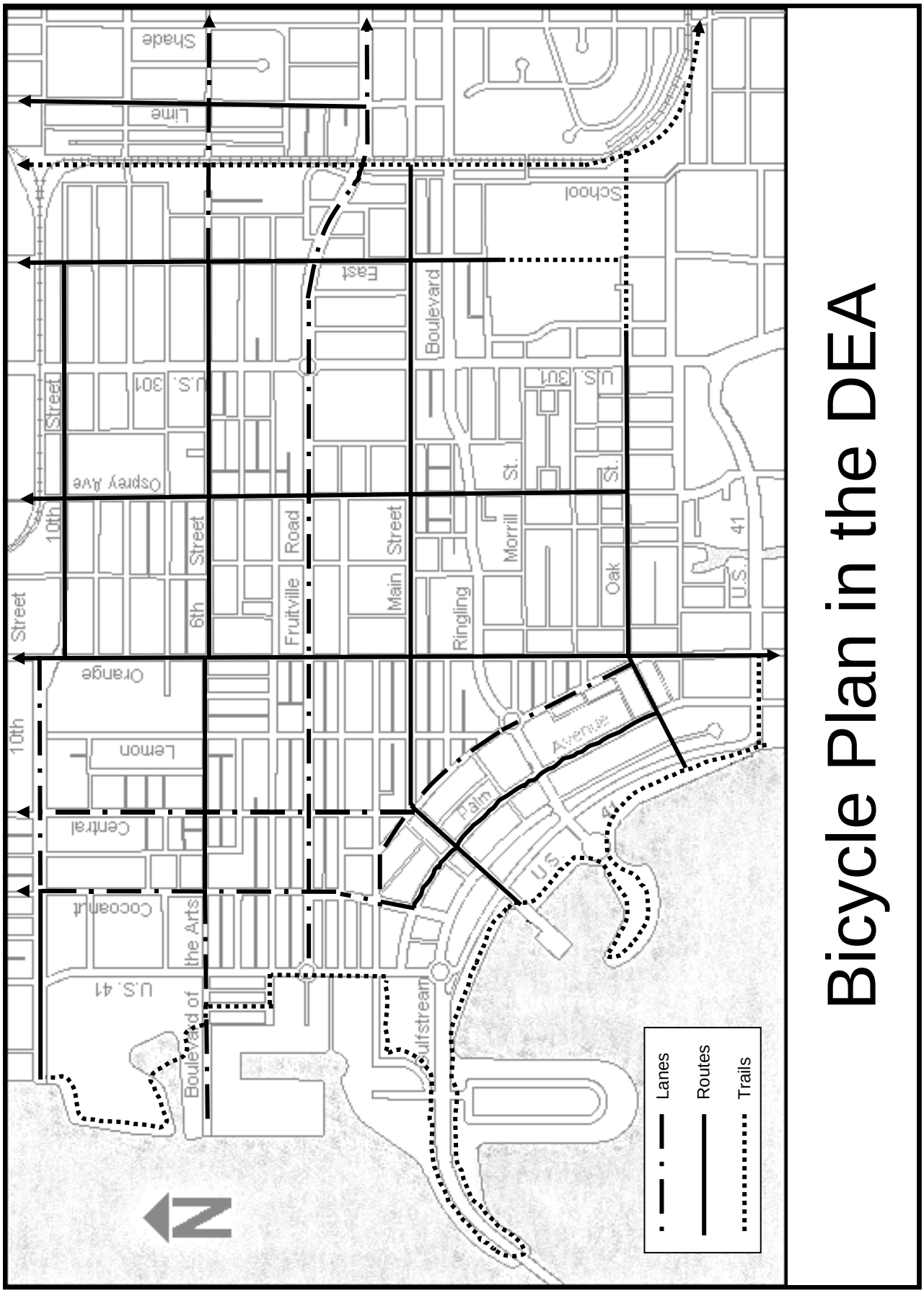

Bicycle Plan in the DEA
Lanes
Routes
Trails
Shade
Lime
School
East
Boulevard
U.S. 301
Street
Osprey Ave
10th
Street
6th
Street
Fruitville
Road
Main
Street
Ringling
Morrill
St.
St.
Oak
U.S. 41
Orange
Lemon
Central
Cocoanut
the Arts
Boulevard of
U.S. 41
Gulfstream
Palm
Avenue
U.S.
41
N

Fig. DE - 26

ENGINEERING DESIGN CRITERIA MANUAL

PART 6

STORM DRAIN DESIGN

PART 6. STORM DRAIN DESIGN

Section A - Submittal Requirements.

1. General: Storm water runoff is collected, attenuated/filtered and then conveyed in closed conduit systems (inlets, inlet connections, and drains) and open channel systems. The Sarasota City Drainage Maps show existing drainage facilities within the City.

   The design for storm drainage facilities shall conform to standard accepted engineering practices. Common reference texts are:
   a. Handbook of Hydraulics; Brater and King,
   b. Open-Channel Hydraulics; V.T. Chow,
   c. Standard Handbook for Civil Engineers; Frederick S. Merritt, Editor,
   d. Data Book for Civil Engineers Design; Elwyn E. Seeyle,
   e. Drainage Manual and the Manual of Uniform Minimum Standards for Design Construction and Maintenance for Streets and Highways; Florida Department of Transportation,
   f. Practices in Detention of Urban Stormwater Runoff, Special Report No. 43; American Public Works Association,
   g. ASCE Manual of Engineering Practice No. 37; American Society of Civil Engineers.

   Copies of the above publications are on file at the office of the City Engineer. Requirements set forth in this Engineering Design Criteria Manual, shall prevail over those set forth in the above or any other publications.

2. Certification Required: Prior to development or grading and land balancing of any land specified in "PART 2. EROSION AND SILTATION CONTROL" of this Manual, certification of a drainage plan shall be obtained from the City Engineer. The City Engineer shall not be required to certify such a plan until site plan certification and, as required, plat approval has been obtained. Issuance of this certification is contingent upon the following:

   a. Submission of a Drainage Plan: The developer shall submit the required number of copies of a Site Drainage Plan as discussed in PART 1. GENERAL of this Manual.

   b. Drainage Plan Requirements: The drainage plan shall provide up-to-date (not more than 6 months prior to submittal) boundary and topographic survey of the proposed land to be developed, redeveloped or graded and land balanced showing the number of location of existing trees; adequate elevations or contours, based on City Datum and showing a minimum grid detail of twenty-five (25) feet (including 25 feet outside the perimeter of the property) to determine the existing and proposed drainage patterns; and all ditches, canals, streams, storm sewers, and all other key topographic features located within or directly adjacent to or serving the land to be developed or cleared. The plan shall show drainage basins' boundaries, roof runoff pattern and downdrain points, along with surface flow direction. The calculations for runoff, attenuation, and pipe sizes shall be submitted. The City Engineer may require such additional information as he deems necessary, to determine if the plans meet the requirements of this regulation. The drainage plans shall also contain the following:

(1) The name, address, and telephone number of the owner and the developer;
(2) The legal description of the property.

c. Southwest Florida Water Management District (SWFWMD): Copies of permits and/or exemptions from SWFWMD must be submitted to the City Engineer prior to his certification of the drainage plan. Stormwater treatment methods shall be in compliance with SWFWMD requirements.

d. Sarasota County: Approval from Sarasota County (Stormwater Environmental Utility) must be submitted to the City Engineer whenever any direct connection is made to a County-maintained drainage facility.

3. Control Requirements for Storm Water Runoff: Drainage plans shall be certified only if they demonstrate that the proposed development or grading and land balancing has been planned and designed and will be constructed and maintained to meet the following standards:

> Any development or grading and land balancing shall not be allowed to shed storm water at a higher rate onto adjacent right-of-way or property than was discharged from the site in its prior existing state. The proposed development or grading and land balancing shall not allow erosion or flooding to effect any significant damage to adjacent areas during or after construction.

4. Flood Plain Encroachment: No net encroachment into the flood plain, equal to or less than that encompassed by the 100-year event will be allowed, if such encroachment will adversely effect either conveyance, storage, water quality or adjacent lands. Compensating volume can be provided for flood plain encroachment, however, it shall be equivalently provided between the seasonal high water level and the 100-year flood level to allow storage function during all lesser flood events.

Section B - Hydrology - Minimum Design Requirements.

1. The City of Sarasota is utilizing a 24-hour storm event as the standard storm duration for design and analysis purposes of a stormwater management system. All drainage improvements shall be designed to convey the peak design flows for the following storm return periods for the total tributary basin area with full build-out:

Tributary Drainage Area	Design Return Period
a) 0 - 200 Acres	25 Years
b) 200 Acres - 4 square miles	50 Years
c) Bridge Structures	100 Years or Greatest Flood of Record, whichever is greater.

In addition every development or project shall provide 100-year flood overflow analysis and protection where possible in accordance with these design criteria.

2. The method of calculating storm runoff shall be based on the size of the tributary basin. The Rational Method, Q = CIA, may be used for basins less than 100 acres. For larger areas, the Unit

Hydrograph, Soil Conservation Service Method, or other methods approved in advance by the City Engineer, may be required.

Q = Quantity of flow runoff, (cubic feet per second).
C = Runoff Coefficient (Ratio of runoff to rainfall).
I = Rainfall Intensity, (inches per hour).
A = Tributary Area, (acres).

a. Runoff Coefficient ("C"). The runoff coefficient, used in computing flow to a point under consideration, shall be a composite of the "C"factors, as hereinafter described in Table 6-1, for all the areas tributary to this point. In areas where the nature of future development is uncertain, design engineers shall consider future development in accordance with the "Comprehensive Plan."

TABLE 6 - 1

"C" FACTORS FOR VARIOUS SURFACES
ON FLAT, AVERAGE AND STEEP SLOPES

SURFACE TYPE	FLAT 2.0% or less	AVERAGE 2.1% to 7.0%	STEEP 7.1% or Steeper
Roofs	0.95	0.95	0.95
Asphalt, Concrete, Brick, etc.	0.95	0.95	0.95
Clay Soils (clay and loam)			
Sparse Vegetation (little loam)	0.40	0.55	0.70
Lawns	0.10	0.15	0.25
Dense Vegetation (weeds and brush)	0.10	0.15	0.20
Dense Wooded Area	0.07	0.12	0.17
Sandy Soils (sand and loam)			
Sparse Vegetation	0.20	0.30	0.40
Lawns	0.07	0.12	0.17
Dense Vegetation (weeds and brush)	0.05	0.10	0.15
Dense Wooded Area	0.03	0.08	0.13
Shell	0.35	0.40	0.45
Open Water(swim pools, attenuation pond)	1.00	1.00	1.00
Grass Parking Lots*	0.30	0.30	0.30
Wood Decking (open slat)	0.40	0.40	0.40
Porous Concrete	0.50	0.50	0.60
Turf Grid System Parking Lots* (for low-intensity use only)	0.60	0.60	0.60

Design Engineers shall determine "C" factors from a field inspection of the total site area, and consideration of type of soil and average slopes of tributary areas. "C" factors for developments shall represent a weighted average of the areas covered by the classifications in Table 6-1. Table 6-2 provides composite "C" factors as a guide for typical residential developments in sandy soils.

TABLE 6 - 2

COMPOSITE "C" FACTORS FOR VARIOUS SLOPES
AT TYPICAL DEVELOPMENTS
WHERE LAWNS ARE SAND AND LOAM SOILS

TYPE OF DEVELOPMENT	FLAT 2.0% or less	AVERAGE 2.1% to 7.0%	STEEP 7.1% or Steeper
Detached Houses			
(20,000 sq. ft. lots)	0.20	0.25	0.30
(6,000 sq. ft. lots)	0.30	0.35	0.40
Apartments			
(impervious area = 30%)	0.30	0.35	0.40
(impervious area = 45%)	0.45	0.50	0.55
Group Homes			
(3,000 sq. ft. lots, 6 in group)	0.45	0.50	0.55
(2,000 sq. ft. lots, 6 in group)	0.55	0.60	0.65

Runoff coefficients to be used with the Rational Method are given in Tables 6-1 and 6-2, or they may be calculated by the Engineer-of-Record subject to approval by the City Engineer. Antecedent moisture conditions shall be taken into account in using the Rational Method. Required antecedent moisture factors are given below in Table 6-3. The runoff coefficient cannot exceed 1.00:

TABLE 6 - 3

REQUIRED ANTECEDENT MOISTURE FACTORS
FOR THE RATIONAL METHOD

Recurrence Interval (Yrs.)	X_T
2 to 10	1.0
25	1.1
50	1.2
100	1.25

b. Rainfall Intensity ("I"). Rainfall intensity shall be determined from the rainfall intensity tables, (See Figure SD-1). These tables indicate design rainfall intensities for periods (times of concentration) from 5 minutes to 24 hours, occurring for storms with a recurrence interval of 2, 5, 10, 25, 50, and 100 years.

The time of concentration is the sum of the inlet time and the time of flow in through drains.

Inlet time (See Figures SD-2 thru SD-4) is the combined time of overland flow and flow in swales, gutters, and ditches. A minimum of 10 minutes shall be used for inlet time. Overland flow is sheet flow across lawns, graded areas, fields and paved areas. See Figure SD-2 to

determine overland flow time. A maximum overland flow distance of seventy-five feet (75 ft.) shall be used. Time of flow in gutters, swales, and ditches shall be determined from the relationship:

$$\text{Time} = \frac{\text{distance}}{\text{velocity}}$$

Velocity shall be determined by the Manning Formula:

$$V = \frac{1.486}{n} r^{2/3} s^{1/2}$$

c. Tributary Area ("A"). The area used in computations shall be the drainage basin area, which provides the greatest quantity of flow.

Section C - Attenuation.

1. General: Stormwater is attenuated for two reasons, viz: improve water quality and to reduce water quantity. The City accepts Southwest Florida Water Management District (SWFWMD) requirements for water quality. The City's requirements for water quantity are stated below.

   Attenuation is a design principle whereby the additional stormwater runoff created by the development is so controlled that the rate of stormwater runoff from the area prior to the development is not increased. The rate may not be higher than the previously approved value for the same property. Adequate attenuation facilities and controls shall be designed to be on-site on the development. They shall be so designed that the probability of flooding either the upstream or downstream property is not increased. Attenuation is not required for a development discharging stormwater directly to tidal waters.

   The primary purpose of attenuation is not to store water. The primary purpose is to increase the time of concentration. Storage areas and/or lakes without controlled outlets do not accomplish this purpose. When on-site attenuation is required, it is advisable to make such provisions in the preliminary planning of the site development and landscaping plans.

   For the purpose of this Manual, retention is defined as storing the water onsite with no water leaving the site. Detention is defined as storing the water onsite, allowing it to be discharged at a later time without controlling the rate of discharge.

2. Standard Attenuation Calculation Procedure: The procedure for calculating the attenuation requirements is shown as Figure SD-5 and SD-6. A 25-Year, 10-Minute storm event with a design rainfall intensity of 8.30 inches per hour (equal to a 25-Year, 24-Hour storm event with a design rainfall intensity of 10.00 inches per hour) shall be used for these calculations. The weighted "C_u" factor for the project area prior to development shall not exceed 0.40. The attenuation requirements may be modified or waived at the sole discretion of the City Manager, providing the Engineer-of-Record certifies the downstream facilities have adequate capacity to meet the City's level-of-service and providing post-development stormwater runoff is not higher than pre-development stormwater runoff.

3. Storm Water Attenuation: All proposed attenuation facilities shall be designed using the recommended criteria listed above and design calculations shall be submitted with the site plan. Attenuation facilities shall be designed, where possible, so that the volume can again be available

within thirty-six (36) hours.

"On-line Treatment Systems" (dry attenuation systems) should be completely drained by percolation and/or properly sized discharge pipes or structures that control the discharge flow rate to predevelopment rates (Q_u). They must be designed to minimize clogging and future maintenance. The use of pumps as the primary low flow bypass is not permitted.

Water bodies, "Wet Detention Systems", that continuously contain water for more than three (3) days following rain, shall be designed to the maximum extent possible to provide for maintenance of aquatic life for the purpose of destroying mosquito larvae.

4. Approved Methods of Water Attenuation: Design of proposed attenuation facilities shall in accordance with "best management practices" as outlined below:

   a. Swales - Shallow surface swales in landscaped areas are a common method, but consideration must be given so as to not allow plantings to create a negative affect on the attenuation facility, (i.e., blocking flow, clogging filtration systems, etc.)

   b. Attenuation Pond - Surface area, depth, bank slopes and outfall shall be designed according to site requirements and engineering standards. Side slope of attenuation facility shall be a minimum of six inches (6 in.) from the back of the property line and the top of the berm shall be a minimum of six inches (6 in.) wide as shown on Figure SD-7. Landscaping shall be designed in compliance with Figure SD-8.

   c. Subsurface drain or percolation field - Length, size and depth of drain pipe, size and type filter material and location of field shall be designed according to site requirements, and shall be subject to the review and approval of the City Engineer. Designs incorporating either one or both of these methods should be accompanied by test results signed and sealed by a Professional Engineer, and shall show the following:

      (1) Double Ring Infiltrometer Test results. The test should be taken at the proposed percolation site and at an elevation equal to the proposed pond bottom, and in native material (white sand layer).

      (2) Seasonal high ground water level as determined by the stain layer and information from U.S.D.A. Soil Conservation Service's Soil Survey for this area. Site-related specific information is required, and borings should be extended well into the water table or several feet below the proposed storage basin bottom if no water is encountered.

   d. Vehicular use areas designed with restrictive storm water inlets or restrictive pipe sizes - Parking areas shall be designed with sufficient attenuation facilities, that when used in conjunction with a restrictive storm sewer system, shall control the volume of water runoff to conform to this section. When used, flooded areas shall be clearly shown on the plan.

   e. Roof Attenuation - Storm water attenuation, or any portion thereof, is allowed and encouraged on the roof area of buildings.

f. Discharge controls are most easily obtained by openings in control boxes or in curbs. These openings shall take the form of broad-crested weirs used, unless otherwise authorized by the City Engineer. Section 5 of Brater and King gives the general form of the broad-crested weir equation as:

$$Q = CLH^{1.5}$$

Where Q = Discharge, (cfs.)
C = Weir Coefficient = 3.13
L = Weir Length, (ft.)
H = Head above weir crest, (ft.)

For such applications, this formula shall be used, unless otherwise authorized by the City Engineer, with a "C" value of 3.13. If more than one discharge point (weir) is used, the total discharge from all discharge points should not exceed the total allowable discharge from Step 4 of the Attenuation Calculation Procedure shown on Figure SD-5.

5. Where development has attenuation lakes or ponds as part of their storm water system, the development shall:

a. Incorporate these water areas in the internal irrigation system so the water may be utilized for irrigation purposes, when sufficient stored water is available.

b. Install internal fire hydrants adjacent to the lakes or ponds with a suction line to the attenuation facility and such screening device, as approved by the City Manager or his designee, for the purpose of drawing water for additional fire protection.

Section D - Hydraulic Requirements.

1. Generally, Mannings Equation shall be used to determine flows in pipes or channels. Values for Mannings Roughness Coefficient (n) shall be shown hereinafter in Table 6-4.

2. Pipe systems shall be used as the primary conveyance system in place of existing open channels.

3. 100-year flood overflow protection shall provide two feet (2.0 ft.) freeboard below the finish floor elevations of all affected existing and proposed habitable structures, and where possible, of all affected existing habitable structures. See Section VII-411 of the City's Zoning Code.

4. In providing for 100-year flood overflow protection, no roadway overflow will be permitted across sag locations on any road unless it can be shown, on private roads only, that such overflow will not create an unreasonably hazardous condition.

5. The water depth on on-site parking and driveway areas shall not exceed twelve inches (12 in.).

TABLE 6 - 4

VALUES FOR MANNINGS ROUGHNESS COEFFICIENT (n)

Type of Conduit or Channel	Roughness Coefficient
Concrete Gutters	.015
Corrugated metal pipe (annular corrugations)	.024
Corrugated Metal Pipe (CMP)	
Unpaved circular or arch pipe, plain or coated	.024
Circular pipe, 25% paved invert	.021
Circular pipe, 50% paved invert	.018
Circular pipe, 100% paved	.013
Arch pipe (CMAP), 40% paved invert	.019
Reinforced concrete pipe 12" to 21"	.015
Reinforced concrete pipe 24" to 33"	.013
Reinforced concrete pipe 36" & larger	.011
PVC Pipe	.009
ADS Pipe	.015
Lined channels	
Concrete - Trowel finish	.014
- Wood forms	.015
- Precast sections	.017
Air blown mortal (Gunite)	.018
Bituminous	.018
Sacked concrete	.025

6. To determine roughness coefficients for natural channels refer to Handbook of Hydraulics, Brater & King; or Open Channel Hydraulics, V. T. Chow, or use:

Wetland channel	0.10
Not well defined channel/ditch	
with overgrowth	0.09
without overgrowth	0.07
Defined channel	
with overgrowth	0.03

7. Culverts may be designed utilizing available head at the inlet provided adequate slope protection is placed to prevent scour at the inlet and outlet.

8. The peak design flow of drainage pipe systems shall allow for a minimum freeboard of seventy-five one hundredths foot (0.75 ft.) between the top of inlet grate or manhole cover and the design water surface elevations.

   Proper allowance for losses through junction structures, inlets, and manholes shall be made in determining the hydraulic grade line of water surface elevations. The hydraulic grade line shall be shown on the profile view.

The form recommended for tabulating the results of hydrologic calculations for storm drain systems is presented in Figure SD- 9 and SD- 10, or the form in the FDOT Drainage Manual may be used.

9. Maximum velocity at design flow shall be as shown below in Table 6-5.

TABLE 6 - 5

MAXIMUM PERMISSIBLE VELOCITY

Type of Soil	Permissible Velocity (Feet per Second)
Fine Soil (Noncolloidal)	2.0
Sandy Loam (Noncolloidal)	2.2
Silt Loam (Noncolloidal)	2.5
Firm Loam	3.0
Shell	3.0
Fine Gravel	3.3
Stiff Clay (Colloidal)	3.7
Graded Material (Noncolloidal)	
Loam to Gravel	4.0
Silt to Gravel	4.5
Gravel	5.0
Coarse Gravel	5.3
Gravel to Cobbles (Under 6 inches)	6.0
Hardpan	7.0

10. Gutter flow shall not exceed five inches (5 in.) in depth for 10-year design storms. See Figure SD-11.

11. The effect of debris, erosion, and channel bedload during flood flows shall be considered in the design of culverts and bridge structures.

Section E - Storm Drainage Facilities.

1. General: Concrete valley gutters will not be permitted across Collector or Arterial streets.

2. Pipe Systems:

   a. Minimum pipe size is fifteen inch (15 in.) within City rights-of-way, easements, and offers of dedication.
   b. Maximum spacing of access openings is five hundred feet (500 ft.).
   c. Access openings shall be provided at all horizontal angle points, changes in grade, and changes in pipe size.

3. Curves may be allowed in pipe systems only when the pipe diameter is thirty-six inch (36 in.) or larger.

4. Culverts:

   a. Minimum pipe size - eighteen inch (18 in.) for road culverts.
   b. Minimum pipe size - fifteen inch (15 in.) for driveway culverts.
   c. Minimum pipe size - fifteen inch (15 in.) for road cross drains with inlets on each end.
   d. As a general rule, a bridge structure or box culvert will be required at drainage channel crossings where the peak design flow dictates a culvert six feet (6 ft.) in diameter or greater.

5. Selection of Inlets:

   a. Type. Generally, Type 1, 2, 3, or 4 inlets (curb openings only) shall be used. Inlets with grates only may be used in alleys and inverted crown roads, or as approved by the City Engineer. Inlets with grates or deflectors shall not be depressed in high speed traffic lanes (where no parking along curb is permitted). See Figures SD- 12 through SD-19. See Figures SD-20 and SD-21 for frames and covers.

   b. Spacing. Inlets shall be constructed in all sumps and at all street intersections where conditions of street crown and/or quantity of flow so requires. Inlets shall be spaced so that a gutter flow limitation of five inch (5 in.) maximum depth for a 10-year storm is not exceeded.

      Inlets, where required at intersections, shall be five feet (5 ft.) upgrade from point of curvature (P.C.) of curb (or proposed curb). Inlets may be used on the curb return radius where the five feet (5 ft.) upgrade of P.C. is not practical.

6. Structural Considerations: The minimum and maximum permissible depth shall be in accordance with Pipe Loading Table for 110 lb./cu. ft. plus superload. See Figures SD-22 through SD-26.

7. Headwalls, down-drains, rip-rap and/or other adequate channel slope and bottom protection measures shall be required at the outlet of all proposed drainage facilities which produce velocities greater than those allowed by Table 6-5 above, for the corresponding soil type. Erosion protection facilities shall be designed for the 100-year storm flow conditions where reasonably possible. See Figure SD-27.

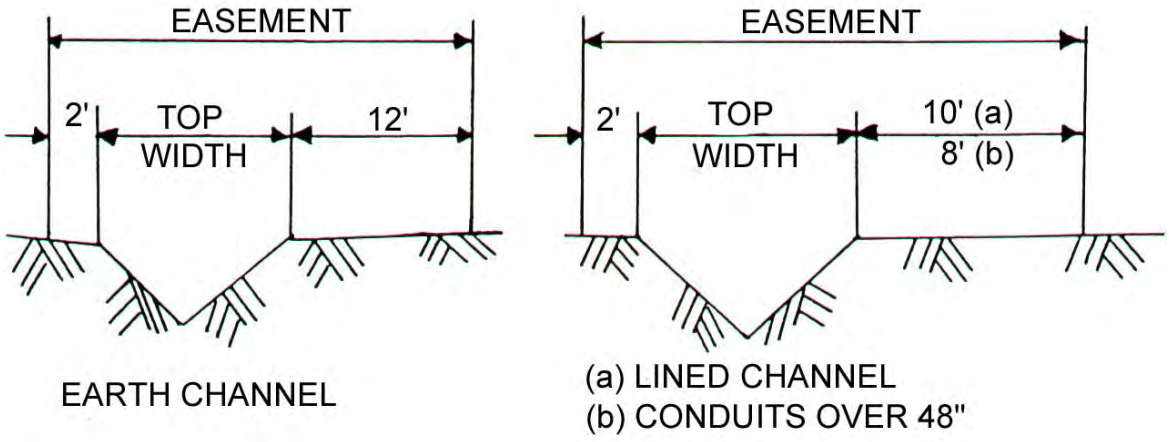
8. Grease and sand traps or special catch basins may be required by the City Engineer to control urban runoff pollution particularly from paved parking areas in commercial and multiple dwelling developments. Such facilities shall be designed to avoid permanently entrapped water by eventually draining by gravity or percolation and be adequately detailed on the plans. Grease and sand traps shall be located on private property and shall be the maintenance responsibility of the property owner(s).

9. Storm water will not be allowed to discharge over the top of the sidewalks or through sidewalks or through pipes directly through curbs. A standard Bubbler Box shall be used. See Figure SD-28.

Section F - Right-of-way and Easement Dedications.

1. The minimum width of right-of-way or easement to be dedicated for watercourses shall be:
   a. Conduits up to 48" diameter = 10 feet
   b. Conduits over 48" diameter = Pipe O.D. + 10 feet
   c. Earth channels = Top width + 14 feet
   d. Lined channels = Top width + 12 feet

   Earth and lined channels shall be located within easements as follows:



Section G - Stormwater Treatment/Attenuation Pond Landscaping.

1. General:

   a. All stormwater treatment/attenuation pond landscaping shall be designed in such a manner so as to be an amenity of the site. Care shall be taken to design the shape, size, and location of each pond so as to blend into the site and, to the extent possible, appear to be a naturally occurring feature.

2. Design Criteria:

   a. Shape: Rectilinear or other rigid geometric shapes shall be avoided. Free form naturalistic shapes are preferred.

   b. Slopes: All slopes shall be 4:1 or shallower to permit and promote safe access for maintenance.

   c. Fencing: Fences are discouraged and shall not be used unless there are extenuating circumstances.

   d. Planting: All ponds shall be landscaped with native species as follows:
      Trees: 1 per 50 linear foot of perimeter of water's surface.
      Plus: 1 tree for each 2,000 square foot of pond surface area.

e. Shrubs and Groundcover Plantings: All slopes and dry basin bottoms shall be sodded with solid sod from the average water level to ten feet (10 ft.) beyond top of bank, unless planted with shrubs or groundcovers. Shrubs and/or groundcovers shall be native, non-invasive species and shall be planted to cover not less than 15% of the surface area of the pond's slopes. Trees and shrubs may be grouped in clusters as massed plantings. (See Figure SD-8).

f. Irrigation: Irrigation shall be provided for establishment and maintenance of all sodded areas and those shrubs/groundcover areas requiring regular watering as long as is required to maintain them in a healthy state, normal to the species.

3. Plan Submittal:

a. A landscape plan shall be submitted, for approval by the City Engineer containing the following information:

b. Name of proposed development.

c. Name, location, quantity, size and type of existing and proposed vegetation and landscaping on the site, and its relation to all other site features such as existing and proposed buildings, utilities and easements.

d. Registered Florida Landscape Architect's license number, name, address, telephone number, signature, and seal who prepared plan.

e. Elevation and section drawings of any fencing proposed.

f. Installation schedule.

g. All trees four inches (4 in.) DBH (Diameter Breast Height) or greater to be retained and those proposed for removal.

h. All proposed building footprints, drives, walks, patios, parking areas, lighting, and other hardscape developments.

i. Scale, date, north arrow, and street names.

j. Plant list showing botanical and common name, size, and quantity of all proposed plantings.

k. Any other information that may be needed to show compliance with this Section.

l. Irrigation plans, showing head type and location, piping route and size, time clocks, water source, rain status and irrigation schedule.

DESIGN RAINFALL INTENSITY, IN/HR (VOLUME, IN.)

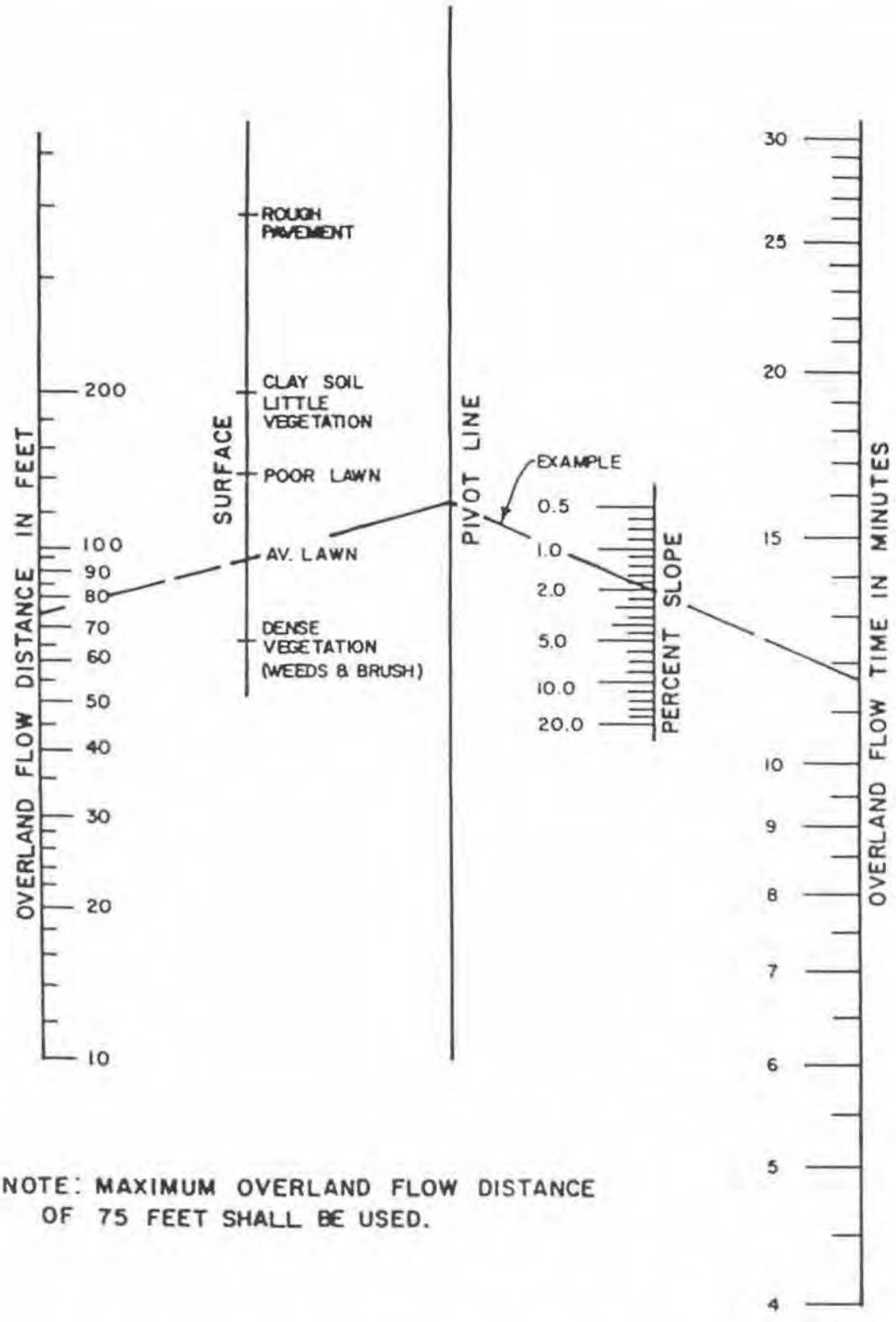
DURATION	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5-Min.	7.20 (0.60)	7.80 (0.65)	8.40 (0.70)	9.40 (0.78)	10.10 (0.84)	10.80 (0.90)
10-Min.	6.05 (1.01)	6.80 (1.13)	7.40 (1.23)	8.30 (1.38)	8.95 (1.49)	9.65 (1.61)
15-Min.	5.20 (1.30)	5.85 (1.46)	6.35 (1.59)	7.15 (1.79)	7.75 (1.94)	8.40 (2.10)
20-Min.	4.45 (1.48)	5.10 (1.70)	5.65 (1.88)	6.40 (2.13)	7.00 (2.33)	7.60 (2.53)
30-Min.	3.50 (1.74)	4.20 (2.09)	4.65 (2.33)	5.40 (2.70)	6.00 (3.00)	6.55 (3.28)
45-Min.	2.70 (2.02)	3.30 (2.48)	3.75 (2.81)	4.30 (3.22)	4.80 (3.60)	5.20 (3.90)
1-HR	2.20 (2.20)	2.75 (2.75)	3.10 (3.10)	3.65 (3.65)	4.10 (4.10)	4.50 (4.50)
1.5-HR.	1.70 (2.55)	2.15 (3.25)	2.45 (3.65)	2.85 (4.25)	3.15 (4.75)	3.45 (5.20)
2-HR.	1.40 (2.80)	1.80 (3.60)	2.05 (4.10)	2.35 (4.70)	2.60 (5.20)	2.90 (5.75)
3-HR.	1.05 (3.15)	1.30 (3.90)	1.50 (4.50)	1.75 (5.30)	1.95 (5.80)	2.15 (6.45)
4-HR.	0.85 (3.40)	1.08 (4.30)	1.24 (4.95)	1.45 (5.80)	1.60 (6.40)	1.80 (7.20)
6-HR.	0.64 (3.85)	0.82 (4.90)	0.94 (5.65)	1.10 (6.60)	1.20 (7.20)	1.35 (8.10)
9-HR.	0.47 (4.30)	0.61 (5.50)	0.71 (6.40)	0.83 (7.45)	0.92 (8.30)	1.04 (9.35)
12-HR.	0.38 (4.50)	0.50 (6.00)	0.58 (7.00)	0.68 (8.20)	0.77 (9.25)	0.85 (10.20)
18-HR.	0.28 (5.05)	0.37 (6.65)	0.44 (7.90)	0.51 (9.20)	0.57 (10.25)	0.64 (11.50)
24-HR.	0.23 (5.50)	0.30 (7.20)	0.36 (8.65)	0.42 (10.00)	0.46 (11.00)	0.52 (12.50)

SOURCES:

(1) NOAA Technical Memorandum NWS HYDRO-35, FIVE TO 60 MINUTE PRECIPITATION FREQUENCY FOR THE EASTERN AND CENTRAL UNITED STATES, 1977.

(2) Technical Paper No. 40, RAINFALL FREQUENCY ATLAS OF THE UNITED STATES FOR DURATIONS FROM 30 MINUTES TO 24 HURS AND RETURN PERIODS FROM 1 TO 100 YEARS, 1961.

(3) STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION, DRAINAGE MAUNAL, VOLUME 2 PROCEDURES, 1987.



NOTE: MAXIMUM OVERLAND FLOW DISTANCE OF 75 FEET SHALL BE USED.

OVERLAND FLOW TIME

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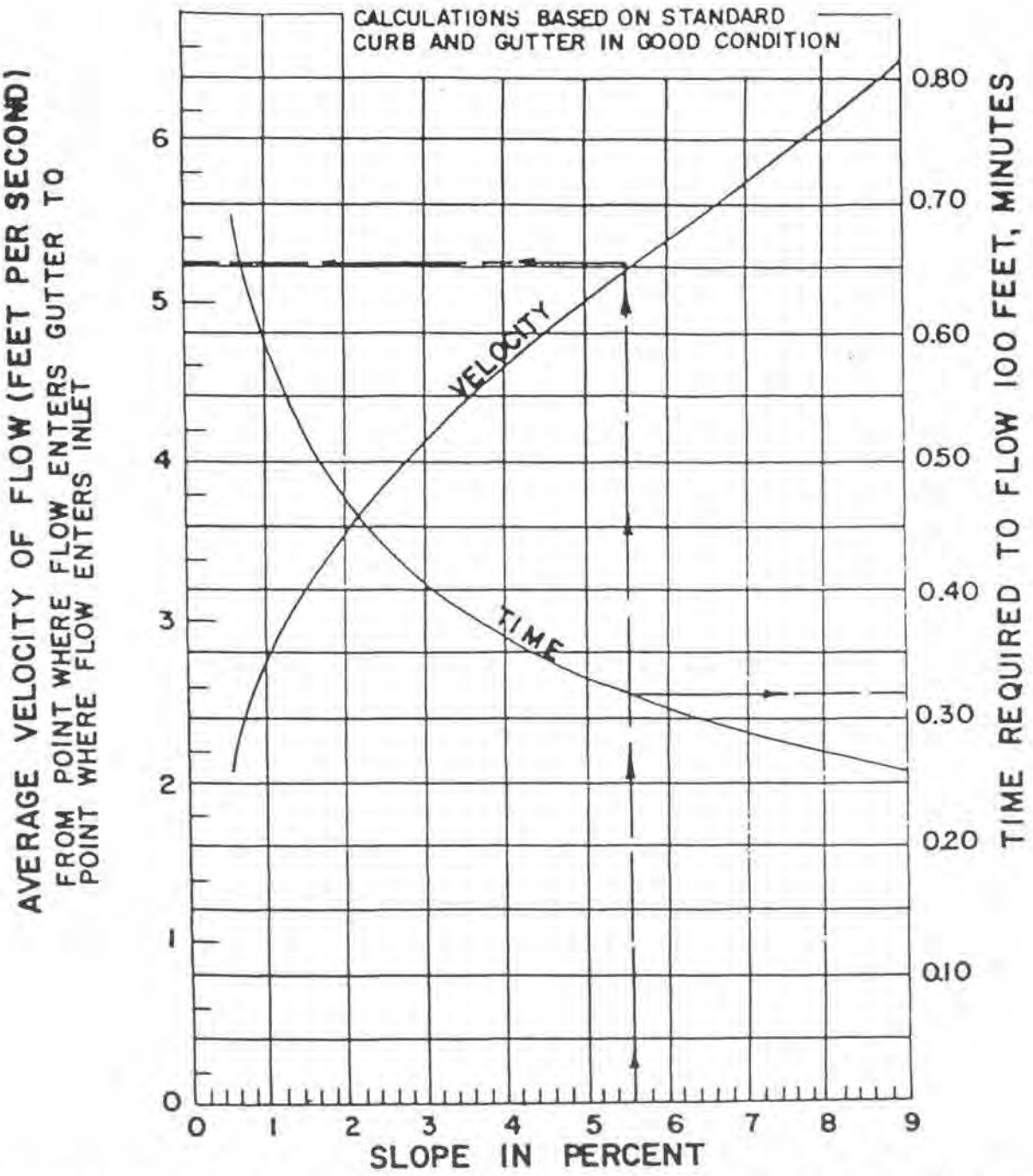
CITY OF SARASOTA



EXAMPLE GIVEN SLOPE = 5.6%, DISTANCE (BEGINNING OF GUTTER FLOW TO INLET)
DETERMINE AVERAGE VELOCITY AND TIME OF GUTTER FLOW.
SOLUTION AVERAGE VELOCITY = 5.22 f.p.s. TIME = 3.05 X .32 = 0.98 MINUTES

GUTTER FLOW VELOCITY & TIME

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INLET TIME SOLUTION

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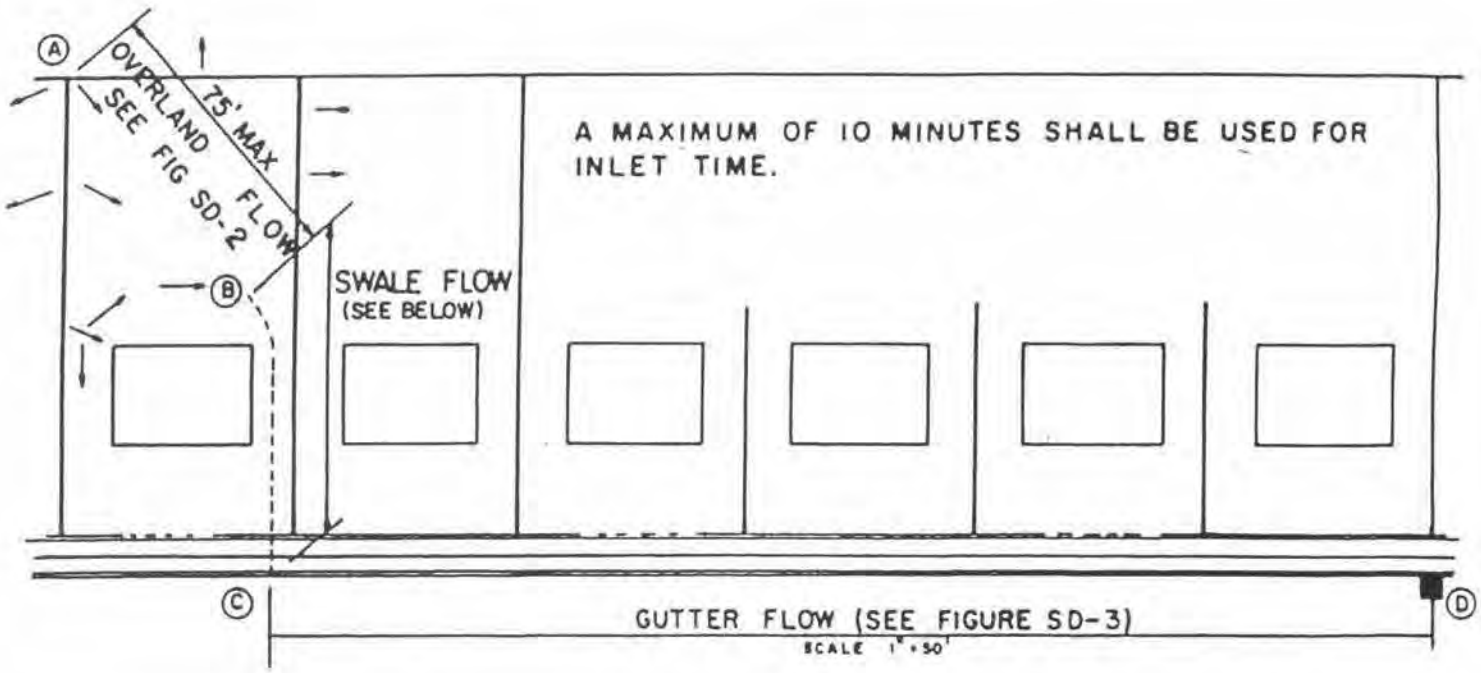


VELOCITY OF SWALE FLOW		
SLOPE OF LAWN	VELOCITY, FT. PER. SEC	
	CLAY LAWNS	SANDY LAWNS
0.5	0.5	0.3
1.0	0.6	0.4
2.0	0.8	0.6
3.0	1.0	0.8
4.0	1.2	1.0
5.0	1.3	1.1
6.0	1.4	1.2
8.0	1.6	1.4

SOLUTION

	SLOPE	DISTANCE	VELOCITY	TIME
A TO B	20%	75'		11.8 MIN
B TO C	20%	70'	0.8 f.p.s	1.5 MIN
C TO D	4.0%	305'	5.2 f.p.s	1.0 MIN

TOTAL = 14.3 MINUTES, USE 10 MINUTE INLET TIME.

FROM OVERLAND FLOW TIME CHART FIG SD-2
FROM VELOCITY OF SWALE FLOW SEE LEFT
FROM GUTTER FLOW CHART FIG SD-3

NOTE: VELOCITY OF SWALE FLOW CHART APPLIES ONLY TO GRADING PLAN SHOWN (APPROXIMATELY 0.1 c.f.s IN SWALE) FOR OTHER GRADING PLAN OR FOR SWALES CARRYING MORE THAN 0.1 c.f.s DIFFERENT VELOCITYS SHALL BE USED.

PROCEDURE FOR CALCULATING ATTENUATION REQUIREMENTS

STEP 1 Compute the total area (A) of the project in acres.

STEP 2 Compute, from existing topographic survey, individual areas according to at least the following four types of land surface. Additional types may be used as shown on Fig. SD-6.

Step 2.1 = Existing area in unimproved grass (acres).
Step 2.2 = Existing area in improved lawn (acres).
Step 2.3 = Existing area in shell (acres).
Step 2.4 = Existing area in buildings and pavements (acres).

STEP 3 $$\frac{[(\text{Step 2.1})(0.20) + (\text{Step 2.2})(0.10) + (\text{Step 2.3})(0.35) + (\text{Step 2.4})(0.95)]}{(\text{Step 1})}$$

Result from Step 3 is the weighted "C_u" factor for the area prior to development. The weighted "C_u" factor shall not exceed 0.40.

STEP 4 $Q_u = [(C_u)\,(i_u)\,(A)] = [(\text{Step 3})\,(8.3)\,(\text{Step 1})]$.

Result is the total allowable non-attenuated discharge (i.e., runoff before development). The "i" factor, based on 10 minute inlet time, shall be 8.30 inches per hour. "Q_u" is also the maximum allowable rate of runoff after the development is completed. This value may not be higher than a previously approved rate for the property.

STEP 5 Compute, from plan of proposed development, individual areas according to at least the following four types of land surface. Additional types may be used as shown on Fig. SD-6.

Step 5.1 = Existing area in unimproved grass (acres).
Step 5.2 = Existing area in improved lawn (acres).
Step 5.3 = Existing area in buildings and pavements (acres).
Step 5.4 = Existing area in ponded water (acres).

STEP 6 $$\frac{[(\text{Step 5.1})(0.20) + (\text{Step 5.2})(0.10) + (\text{Step 5.3})(0.95) + (\text{Step 5.4})(1.00)]}{(\text{Step 1})}$$

Result from Step 6 is the weighted "C_d" factor for the completed development.

STEP 7 $Q_d = [(C_d)\,(i_d)\,(A)]$ = Result is the rate of runoff after development.
Q_d = [(Step 6) ("i_d" factor from Table SD-2-25, below) (Step 1)]

Table SD-2-25

5 minutes = 9.40 inches/hour	2 hours = 2.35 inches/hour
10 minutes = 8.30inches/hour	3 hours = 1.75 inches/hour
15 minutes = 7.15 inches/hour	4 hours = 1.45 inches/hour
20 minutes = 6.40 inches/hour	6 hours = 1.10 inches/hour
30 minutes = 5.40 inches/hour	9 hours = 0.83inches/hour
45 minutes = 4.30 inches/hour	12 hours = 0.68 inches/hour
60 minutes = 3.65 inches/hour	18 hours = 0.51 inches/hour
90 minutes = 2.85 inches/hour	24 hours = 0.42 inches/hour

STEP 8 Retention required = [(Q_d) (time in minutes) (60 sec/min)]
- [(Q_u) (time in minutes – 10 minutes) (60 sec/min)].

STEP 9 Build a hydrograph for each time period in Table SD-2-25 using Step 7 and 8, the results of which will peak at some time period.

STEP 10 This peak must be multiplied by 1.20 to compensate for the fact that "Q_u" does not start flowing from the retention area the moment the storm starts. The resultant is the cubic feet of attenuation volume required.

CITY OF SARASOTA **ATTENUATION CALCULATION PROCEDURE**

Fig. SD - 5

Project: GR8 Development	Building Permit No. 987654321	Date: 25 March 2002
Engineer: I. B. Professional	Contractor: B. Good Builder	Calc. By: D. Daughters
Owner: I. M. Excited		Engr. File: 02-1003

	EXISTING					**16.61%**	**building coverage**		% of Area
Step 1	Building =	1,700	S.F. x	0.950			1,615		15.68%
thru	Other roof area =	100	S.F. x	0.950			95		0.92%
Step 3	Driveway =	220	S.F. x	0.950			209		2.03%
	Sidewalk =	120	S.F. x	0.950			114		1.11%
	Shell Surface =	0	S.F. x	0.350			0		0.00%
	Unimp. Vegetation =	8,700	S.F. x	0.200			1,740		80.26%
	Improved Lawn =	0	S.F. x	0.100			0		0.00%
	Pool or Water =	0	S.F. x	1.000			0		0.00%
	Other =	0	S.F. x	1.000			0		0.00%
	Total Area (A) =	10,840	S.F. =	0.249	Acres		3,773	= C_E	100.00%
			$C_u = C_E/A$ =	0.348		but	Max. C_u =	0.4	
Step 4	(Q_u) = 0.348	(C_U)	x	8.30	(id10) x	0.249	(A) =	0.719	

	PROPOSED					**73.15%**	**building coverage**		% of Area
Step 5	Building =	6,800	S.F. x	0.950			6,460		62.73%
and	Other roof area =	1,130	S.F. x	0.950			1,074		10.42%
Step 6	Driveway =	600	S.F. x	0.950			570		5.54%
	Sidewalk =	300	S.F. x	0.950			285		2.77%
	Shell Surface =	0	S.F. x	0.350			0		0.00%
	Unimp. Vegetation =	0	S.F. x	0.200			0		0.00%
	Improved Lawn =	1,750	S.F. x	0.100			175		16.14%
	Pool or Water =	260	S.F. x	1.000			260		2.40%
	Other =	0	S.F. x	1.000			0		0.00%
	Total Area (A) =	10,840	S.F. =	0.249	Acres		8,824	= C_E	100.00%
			$C_d = C_P/A$ =	0.814					
	(Q_d) = 0.814	(C_d)	x	8.30	(id10) x	0.249	(A) =	1.681	

HYDROGRAPH w/ 10 minute delay

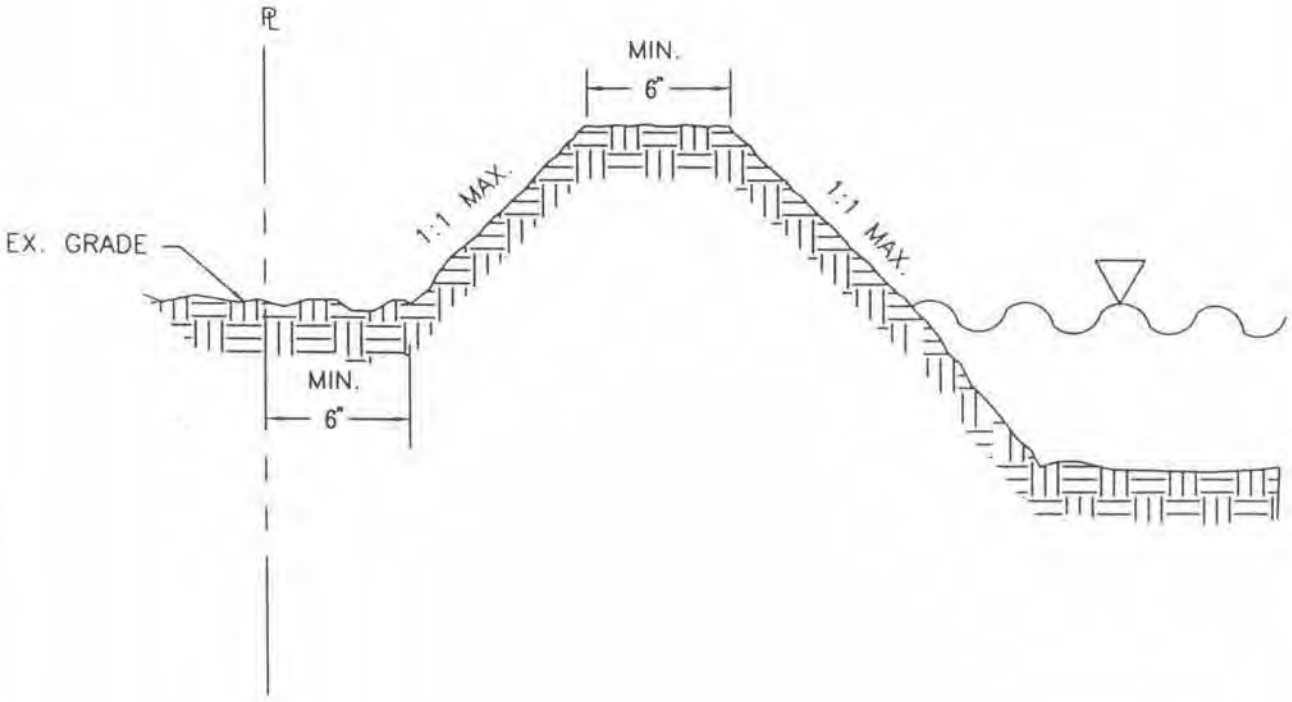
	1	2	3	4	5	6	7	8
Step 7	T min	T (sec)	i_d	T x i_d	T - 600	C_d x i_d x A x T	Q_u x (T-300)	
thru		1 x 60	Fig. SD-1	2 x 3	2 - 600	4 x $C_{P\,/\,43,560}$	Q_u x 5	6 - 7
Step 9	5	300	8.30	2490	0	504	0	504
	10	600	8.30	4980	0	1009	0	1009
	15	900	7.15	6435	300	1303	216	1088
	20	1200	6.40	7680	600	1556	431	1124
	30	1800	5.40	9720	1200	1969	863	1106
	45	2700	4.30	11610	2100	2352	1510	842
	60	3600	3.65	13140	3000	2662	2157	505
	90	5400	2.85	15390	4800	3117	3451	-333
	120	7200	2.35	16920	6600	3427	4745	-1318
	180	10800	1.75	18900	10200	3828	7333	-3505

ATTENUATION VOLUME REQUIRED:

Step 10 Peak Hydrograph X 1.20 = 1124 X 1.20 = 1349 cu. ft.

CITY OF SARASOTA **TYPICAL RETENTION CALCULATION SHEET**

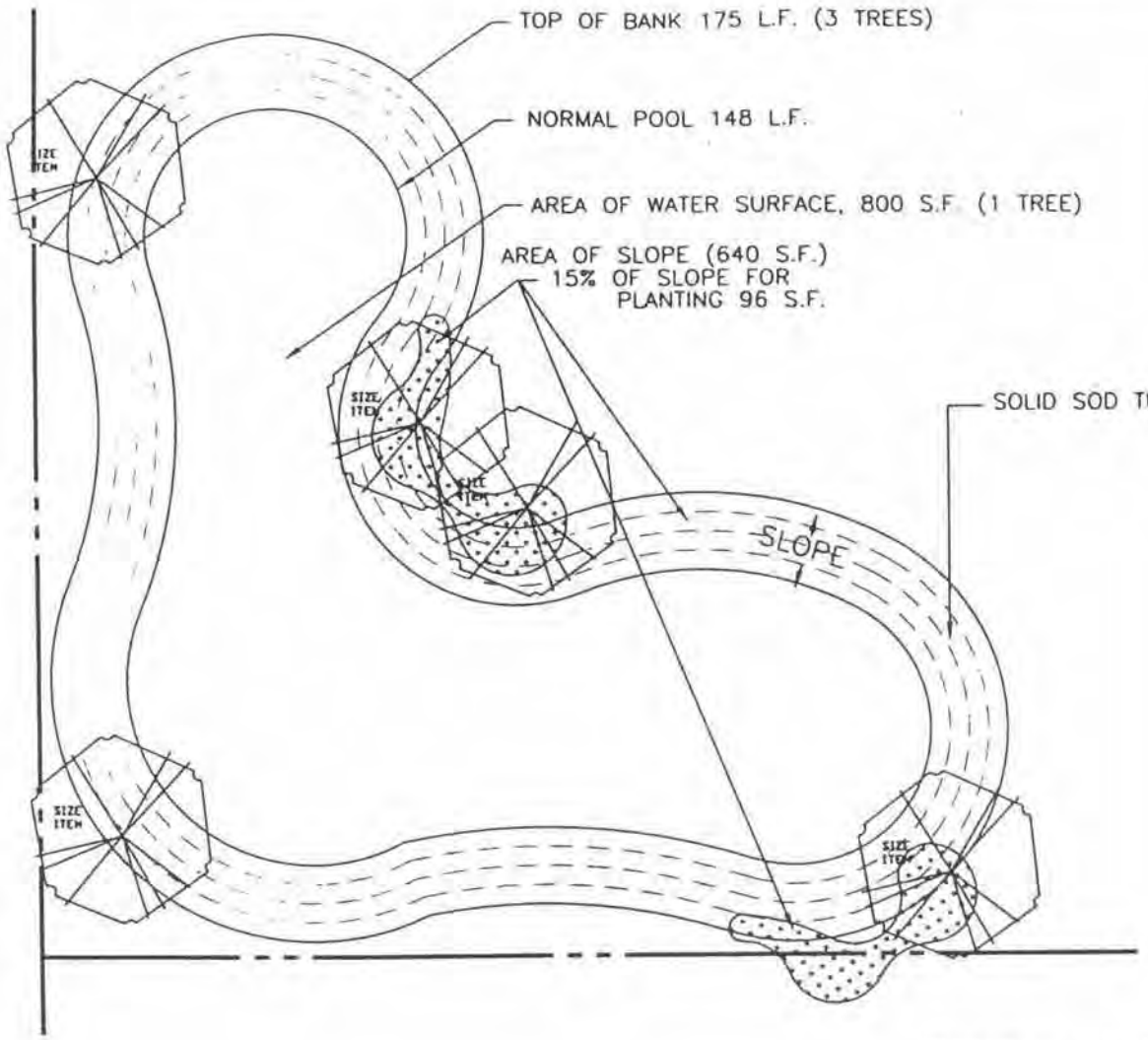
Fig. SD - 6



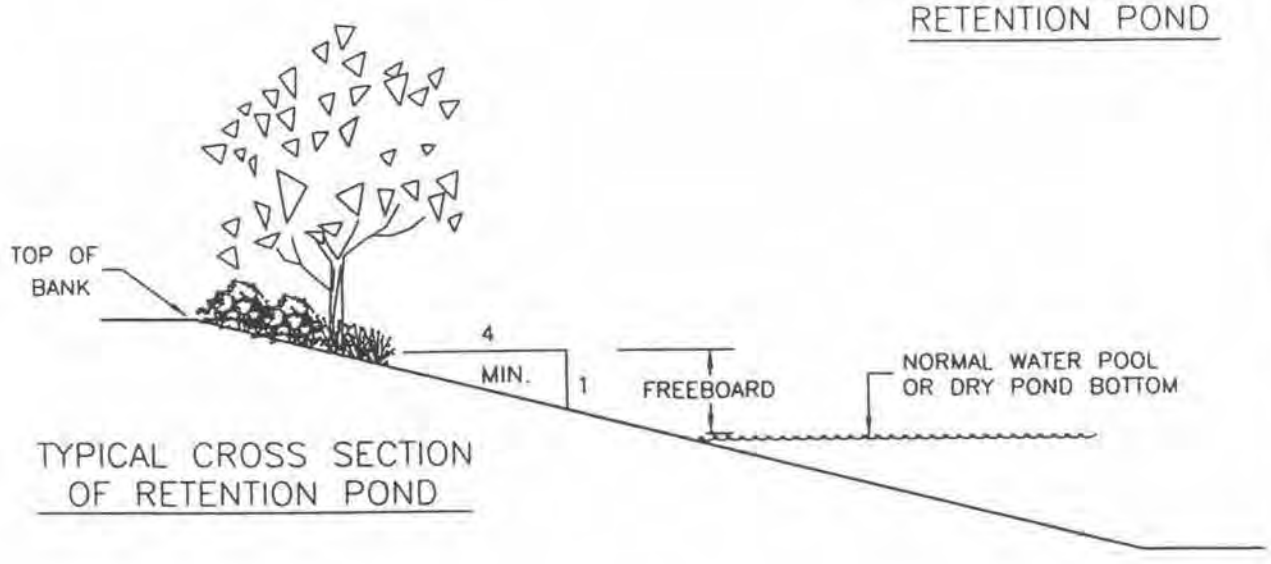
DRAINAGE RETENTION BERM

N.T.S.

CITY OF SARASOTA



TYPICAL PLAN OF
RETENTION POND



TYPICAL CROSS SECTION
OF RETENTION POND

RETENTION POND LANDSCAPING

N.T.S.

CITY OF SARASOTA

DRAINAGE SYSTEM CALCULATION

CITY OF SARASOTA

N.T.S.

P₈₀= _____ PROJECT _____ CALC. BY _____ DATE _____

DESIGN STORM _____ YEARS CHECK BY _____ DATE _____

INLET OR JUNCTION STRUCTURE							ACCUMULATED FLOW				PIPE FLOW										OUTLET CONTROL		INLET CONTROL	
AREA DESIGNATION (1)	AREA A (a.c) (2)	C (3)	A·C (4)	(MIN) T_c / (In/hr) (5)	Q (c.f.s) (6)	JUNCTION DESIGNATION (7)	ΣAC (8)	(MIN) ΣL/V + T_c (min) (9)	I (In/hr) (10)	Q (c.f.s) (11)	PIPE LINE DESIGNATION (12)	L (ft) (13)	(IN) D / Type (14)	(SQ.FT) PIPE Area / n (15)	(f.p.s) V / V (fpm) (16)	S (17)	LOSSES FRIC. $L_s S_n$ (ft) (18)	H_1 (ft) (19)	ΣH (ft) (20)	W.S. Elev (21)	T.G. Elev (22)	W.S. Elev (23)	REMARKS

See page 6–22 for description and instructions of circle numbers.

INSTRUCTIONS AND NOTES FOR "DRAINAGE SYSTEM CALCULATIONS" Fig. SD-6

(CIRCLED NUMBERS BELOW REFER TO NUMBERS SHOWN IN COLUMN HEADINGS)

① AREA DESIGNATION – Designate each drainage area beginning with the uppermost reach by a letter (i.e. B).

② AREA A – Areas in acres of each drainage area draining to inlet ⑦.

③ C – Runoff coefficient for drainage area A ②. See Engineering Design Criteria Manual (EDCM), Table 6-4. Future land use shall be taken into account.

④ A·C – Drainage area A ② multiplied by runoff coefficient C ③.

⑤ T_c – Time of concentration in minutes for drainage area A ②. See EDCM page 6-4. Minimum time is ten (10) minutes.

I – Rainfall intensity in inches per hour for T_c ⑤. See EDCM, page 6-4 and page 6-13.

⑥ Q – Runoff flow in cubic feet per second from Q = CIA (Rational Formula). Multiply A·C ④ by lower portion of I ⑤.

⑦ JUNCTION DESIGNATION – Designate each inlet and manhole by a number (i.e. 3) and each junction (more than one inlet pipe) by a number and the letter J, (i.e. 3J).

⑧ $\sum$ A·C – Progressive accumulation of A·C ④.

⑨ $\sum T_c$ – Progressive accumulation of time of concentration to upstream end of pipe to be sized beginning with T_c ⑤, (i.e. T_c ⑤ + T_c 1-2 ⑨ = $\sum T_c$ 2+4 T_c 2-3 = $\sum T_c$ 3). Use whichever is largest value T_c ⑤ or $\sum T_c$ ⑨ for determining runoff Q ⑪.

⑩ I – Rainfall intensity in inches per hour for $\sum T_c$ ⑨. See EDCM, page 6-13.

⑪ Q – Runoff flow in cubic feet per second for accumulated area. Multiply $\sum$ A·C ⑧ by I ⑩.

⑫ PIPE LINE DESIGNATION – Designate each pipe line by number designation of upstream inlet and downstream inlet (i.e. 2-3).

⑬ L – Length of pipe in feet. Maximum inlet spacing is 500 feet.

⑭ D – Diameter of pipe in inches. Minimum diameter is 15 inches.

Type – Designate type (i.e. RCP, PVC, etc.).

⑮ PIPE AREA – Cross-sectional area of pipe in square feet. See King's Handbook, page 6-44.

n – Manning's "n", roughness coefficient of pipe. See EDCM, Table 6-4.

CITY OF SARASOTA **DRAINAGE SYSTEM CALCULATION NOTES**

Fig. SD - 10a

INSTRUCTIONS AND NOTES FOR "DRAINAGE SYSTEM CALCULATIONS" Fig. SD-6 (Continued)

(16) $\underline{V_{fps}}$ – Velocity of flow in feet per second. Divide Q (11) by PIPE AREA (15).

$\underline{V_{fpm}}$ – Velocity of flow in feet per minutes. Multiply $\underline{V_{fps}}$ (16) by 60 sec/min.

(17) S_n – Neutral slope in feet per feet. (Identical to friction slope, slope of energy grade line, or slope from Manning's equation.) See King's Handbook, Table 6-2.

(18) FRIC. – Pipe friction loss in feet. Multiply L (13) by S_n (17) for pipe flowing full.

(19) $\underline{H_I}$ – Entrance and exit head loss of pipe in feet, usually equal to 1.4 $V^2/2g$ for C.M.P. and 1.1 $V^{2/}2g$ for other types of pipes. See King's Handbook, Table 4-2 for $V^2/2g$.

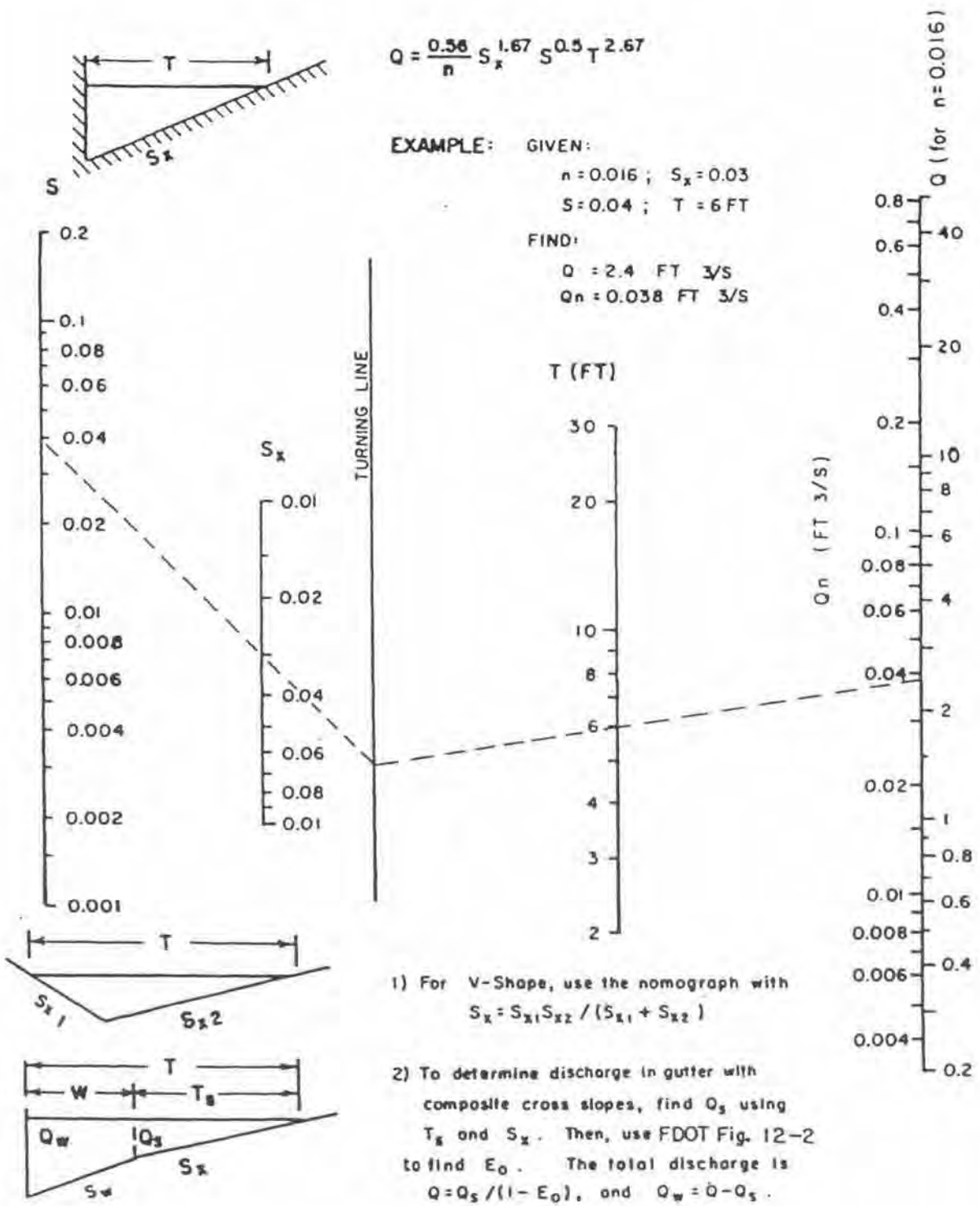
(20) $\underline{\sum H}$ – Summation of head losses in feet. (18) + (19) if flow is subcritical.

(21) W. S. Elev. – Outlet control, water surface elevation at inlet, manhole or junction. Calculate by adding $\sum H$ (20) to known downstream W. S. Elevation and progress upstream.

(22) T. G. Elev. – Top of grate elevation, or top of cover for manholes and junction boxes.

(23) W. S. Elev. – Inlet control. Calculate, W.S. = Entrance F. L. + pipe diameter + H_I (19). Design value is the greater of (21) or (23).

(24) REMARKS – Insert any comments that clarify the item.



1) For V-Shape, use the nomograph with $S_x = S_{x1} S_{x2} / (S_{x1} + S_{x2})$

2) To determine discharge in gutter with composite cross slopes, find Q_s using T_x and S_x. Then, use FDOT Fig. 12-2 to find E_o. The total discharge is $Q = Q_s / (1 - E_o)$, and $Q_w = Q - Q_s$.

NOMOGRAPH FOR FLOW IN TRIANGULAR CHANNELS

Ref. : FDOT drainage manual (Fig.. 12-1)

N.T.S.

CITY OF SARASOTA

APPLICATION AND SELECTION GUIDE FOR CURB INLETS AND GUTTER INLETS

INDEX NO.	INLET TYPE	TYPE CURB / GUTTER	GRADE CONSIDERATION	HYDRAULIC INTAKE (CFS)	BICYCLE SAFE / PEDESTRIAN SAFE	UTILITY LOCATION FROM CURB	MAXIMUM PIPE SIZE W/ STANDARD BOTTOMS
210	1	E & F	Continuous	4.1	Yes / Limited	Inside	30”
	2	E & F	Sag	9.0	Yes / Limited	Inside	30”
	3	E & F	Continuous	1.9	Yes / Limited	Inside	30”
	4	E & F	Sag	6.5	Yes / Limited	Inside	30”
211	5	E & F	Continuous	3.1	Yes / Limited	Outside	30”
	6	E & F	Sag	7.5	Yes / Limited	Outside	30”
212	7	Separator I & II& II	Continuous or Sag	4.4	Yes / Limited	Inside	24” Longitudinal 30” Traverse
213	8	Separator IV & V	Continuous or Sag	4.4	Yes / Limited	Inside	24” Longitudinal 30” Traverse
214	9	F	Continuous or Sag	0.5	Yes / Yes	Outside	30”
215	10	F	Continuous or Sag	0.3	Yes / Yes	Outside	30”
217	1	Median Barrier Wall	Continuous	4.0	No / Yes	N/A	15” Longitudinal 30” Traverse
	2	Median Barrier Wall	Sag	5.0	No / No	N/A	15” Longitudinal 30” Traverse
	3	Median Barrier Wall	Double Inlet Continuous	4.0	No / Yes	N/A	42” Longitudinal 30” Traverse
	4	Median Barrier Wall	Double Inlet Sag	5.0	No / Yes	4N/A	42” Longitudinal 30” Traverse
	5	Median Barrier Wall	Double Inlet Sag & Continuous	5.0	No / Yes	N/A	42” Longitudinal 30” Traverse
220	s	Shoulder	Continuous	4.0	No / Yes	N/A	30” Traverse
221	v	Valley	Continuous or Sag	5.0	Yes / Yes	N/A	30” Traverse

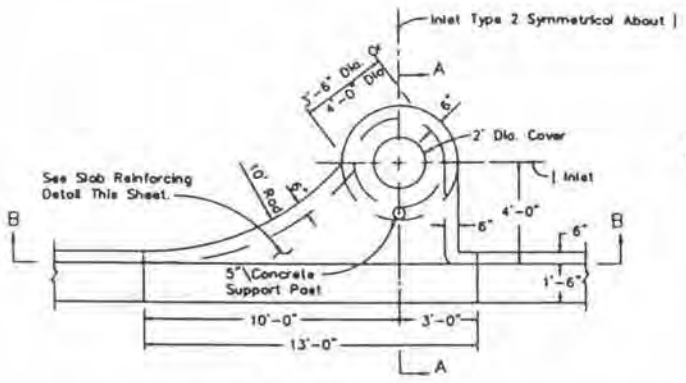
1. Hydraulic intake values do not represent hydraulic capacity but are shown to compare inlets based on a 0.2% longitudinal slope, .02 cross slope and a 90% efficiency factor. For other conditions the values shown should be adjusted for bypass flow or debris blockage. Sag inlet intake value is based on flooding the outside lane or shoulder, where spread rather than hydraulic intake may dictate inlet selection or spacing. Full design data and additional information is available in “Study of Stormwater Inlet Capacities” by U.S.F., and the Department’s 1987 Drainage Manual Vol. 2 Chapter 12 and Vol.3, Chapter 2.
2. Curb inlets and transitions should be located outside pedestrian cross walk areas, preferably upgrade from these locations.
3. Double throated inlets are usually not warranted unless the minor flow is in excess of 50 feet distance or 0.5 cfs.
4. Median Barrier Inlets Types 1,2,3,4,5 & Shoulder Inlet Type S can be made bicycle safe by specifying the reticuline grate.
5. Pipe sizes are circular, Class III, B Wall, concrete pipe. Elliptical pipe and corrugated pipe are to be checked for fit in accordance with Index No. 201; metal pipe sizes should be reviewed using 2 2/3” x ½” corrugation up to 30” and 3” x 1” corrugation for larger sizes.
6. Index No. refers to F.D.O.T. Roadway and Traffic Design Standards. Index No. 214 is to be used only where flows are light to moderate and R/W does not permit the use of throated curb inlets. Vanes to be directed to major flow direction. Index No. 215 is be used only where flows are light and R/W does not permit the use of throated curb inlets.

APPLICATION AND SELECTION GUIDE FOR DITCH BOTTOM AND MEDIAN INLETS

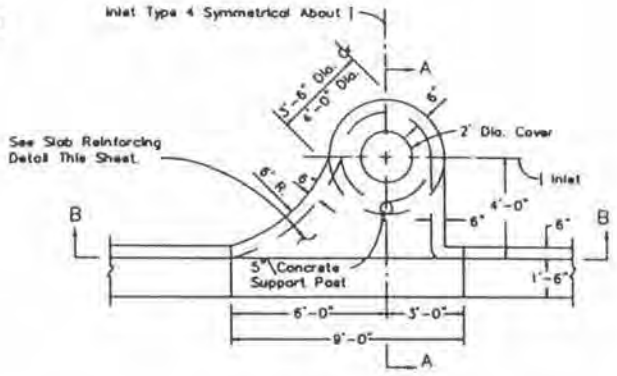
INDEX NO.	INLET TYPE	LOCATION	CAPACITY			SAFETY			DEBRIS TOLERANCE	PIPE SIZE LIMITATION	
			GRATE ONLY	GRATE WITH SINGLE STD. SLOT	GRATE WITH SINGLE TRAV. SLOT	TRAFFIC	PEDESTRIAN	BICYCLE		INLET INSIDE WIDTH	MAXIMUM PIPE SIZE
230	A	Limited Access Facilities	5	--	--	Heavy Wheel Loads	No	No	Good	2' – 0" 3' – 1"	18" 24"
231	B	Limited Access Facilities	16	--	--	Heavy Wheel Loads	No	No	Excellent	3' – 8" 4' – 2"	30" 36"
232	C	Outside CZ	6	15	10	Infrequent Traffic	Yes	Yes	Poor	2' – 0" 3' – 1"	18" 24"
	D	Outside CZ	12	31	20	Infrequent Traffic	Yes	Yes	Poor	3' – 1" 4' – 1"	24" 36"
	E	Outside CZ	13	27	19	Infrequent Traffic	Yes	Yes	Poor	3' – 0" 4' – 6"	24" 42"
	H	Outside CZ	19	33	--	Infrequent Traffic	Yes	Yes	Poor	3' – 0" 7' – 8"	24" 66" or 2-30"
233	F	Inside CZ	8	--	--	Heavy Wheel Loads	Yes	Yes	Poor	2' – 0" 4' – 0"	18" 36"
	G	Inside CZ	21	--	--	Heavy Wheel Loads	Yes	Yes	Poor	4' – 4" 5' – 0"	36" 42"
234	J	Inside CZ	10	--	--	Heavy Wheel Loads	Yes	Yes	Fair	2' – 11" 4' – 0"	24" 36"
235	K	Outside CZ	--	--	--	N/A	N/A	N/A	Good	2' – 0" See Index	36" See Index

GENERAL NOTES

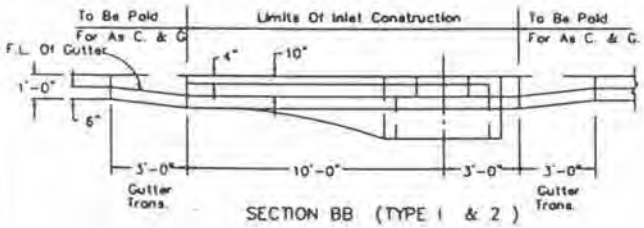
1. All inlets must be selected to satisfy hydraulic suitability, with proper consideration given to safety and economics.
2. CZ denotes clear zone, formerly CRA denoting clear recovery area.
3. Alternate G grates should be specified when in salt water environment.
4. Inlets C, D and E capacity and debris tolerance may be increased by the addition of a slot Traversable slots should be utilized when subject to high speed traffic or when pedestrians are anticipated. Traversable slots are not adaptable to Inlet Type H.
5. Special ditch blocks require plan detail.
6. Pipe size limitations are based on circular Class III, & Wall, Concrete Pipe. Elliptical pipe and corrugated pipe are to be checked for fit in accordance with Index No. 201, metal pipe sizes should be reviewed using 2 2/3" x ½" corrugation up through 30" and 3" x 1" corrugation for larger sizes.
7. The figures shown for capacity are approximate and are intended as a guide to assist in describing relative performance:
   a. Inlets with grates only are considered to be 50% blocked with 3" of ponding.
   b. Standard 12" slots and traversable slots are calculated assuming a 25% blockage and 3" of ponding above the grate.
8. The capacity values assume inlet control. The designer must verify the outlet conditions and design assumptions before accepting the capacity values shown; outlet constraints are likely to control with minimum pipe sizes.
9. Index No. refers to F.D.O.T. Roadway and Design Standards.



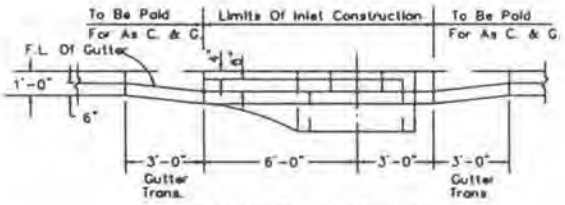
INLET TYPE 1
INLET TYPE 2 SYMMETRICAL ABOUT ℄



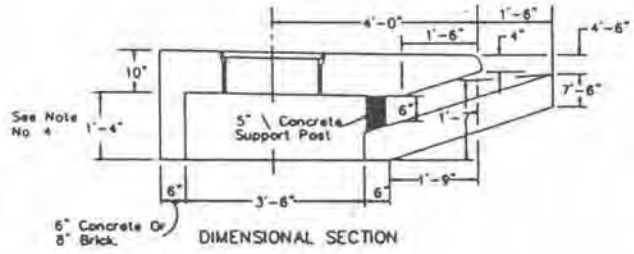
INLET TYPE 3
INLET TYPE 4 SYMMETRICAL ABOUT ℄



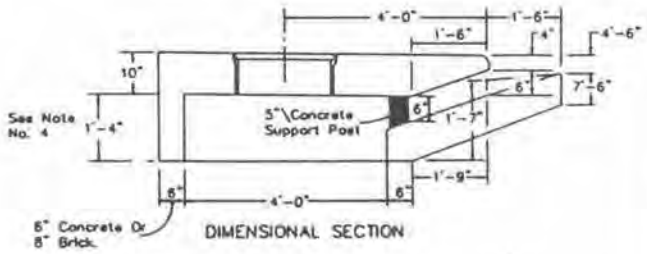
SECTION BB (TYPE 1 & 2)



SECTION BB (TYPE 3 & 4)



DIMENSIONAL SECTION



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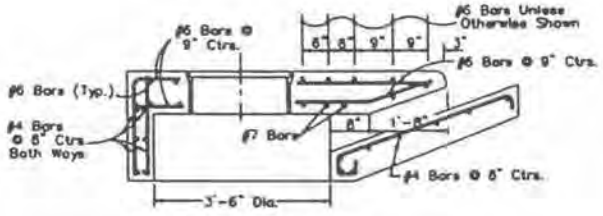
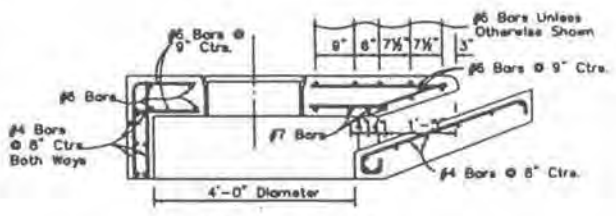


REINFORCING SECTION
3'-6" DIA. STRUCTURE BOTTOM (SECTION AA)



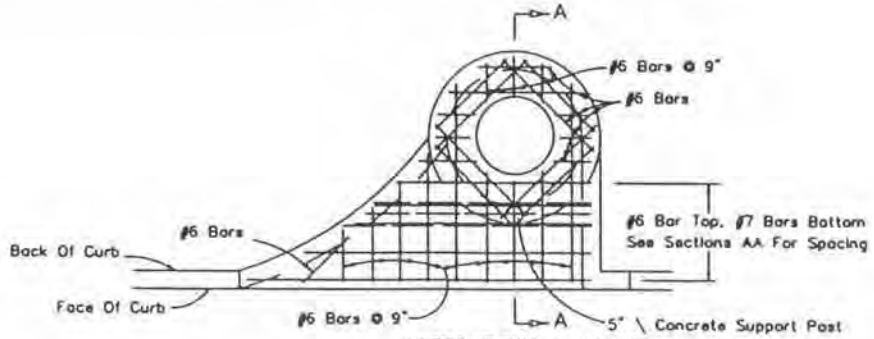
REINFORCING SECTION
4'-0" DIA. STRUCTURE BOTTOM (SECTION AA)

CURB INLET TOPS
TYPES 1, 2, 3, & 4

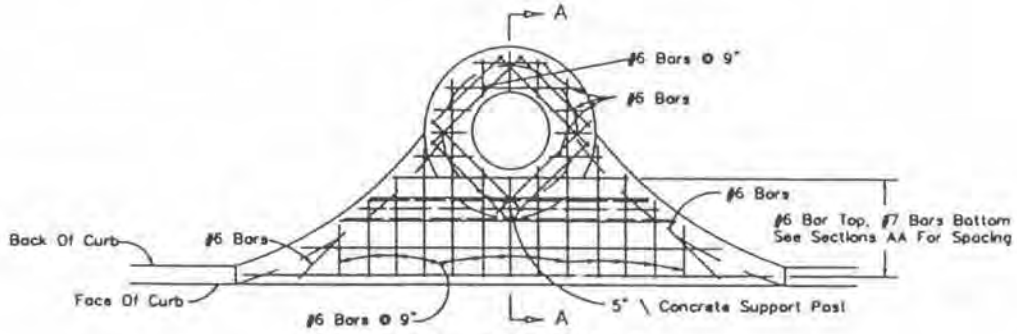
N.T.S.

GENERAL NOTES

1. The finished grade and slope of the inlet tops are to conform with the finished cross slope and grade of the proposed sidewalk and/or border.
2. When inlets are to be constructed on a curve, refer to the plans to determine the radius and, where necessary, modify the inlet details accordingly. Bend steel when necessary.
3. All steel in inlet top shall have 1 1/4" minimum cover unlessotherwise shown. Inlet tops shall be either cast-in-place or precast concrete.
4. The rear wall portion of inlet tops Types 1, 2, 3 & 4 may be constructed with brick. Dowels to top slab required.
6. For supplemental details see Index No. 201.
5. Only round concrete support post will be acceptable.
7. These inlets are to be used with Curb and Gutter Types E and F. Locate outside of pedestrain crosswalk where practical.
8. For structure bottoms see Index No. 200 – F.D.O.T. Design Standards.

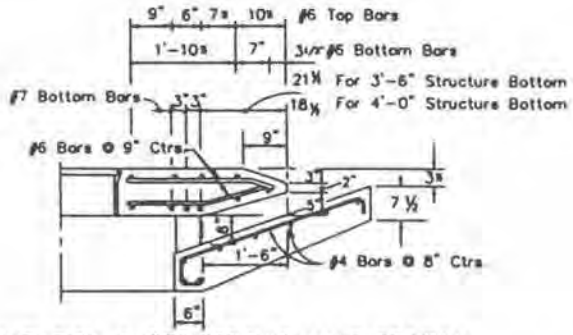


INLETS TYPES 1 AND 3



INLETS TYPES 2 AND 4

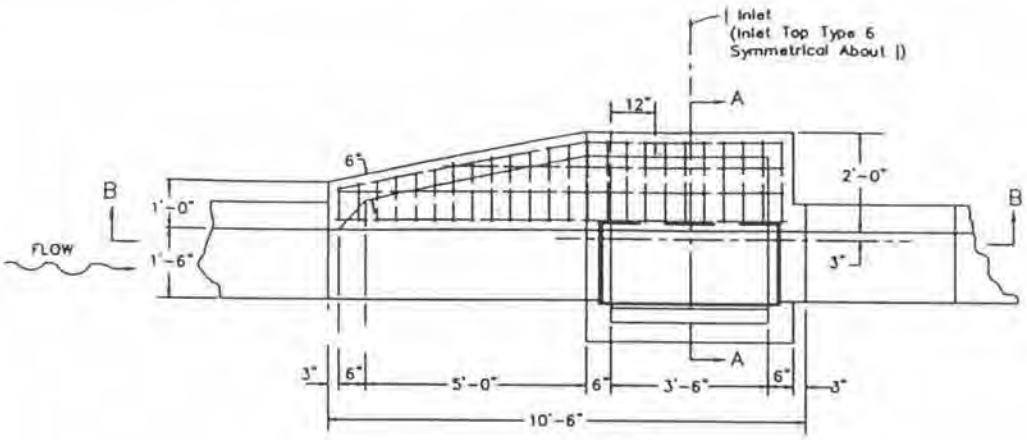
SLAB REINFORCING



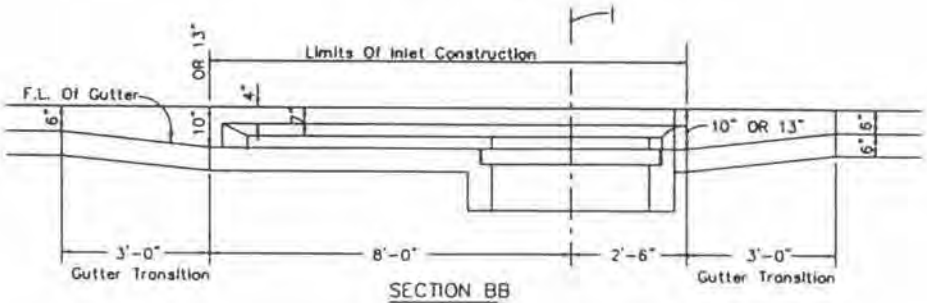
DIMENSION & REINFORCING HALF SECTION
TYPES A & E CURB (HALF SECTION AA)
(TYPE E GUTTER SHOWN)

CURB INLET TOPS
TYPES 1, 2, 3, & 4

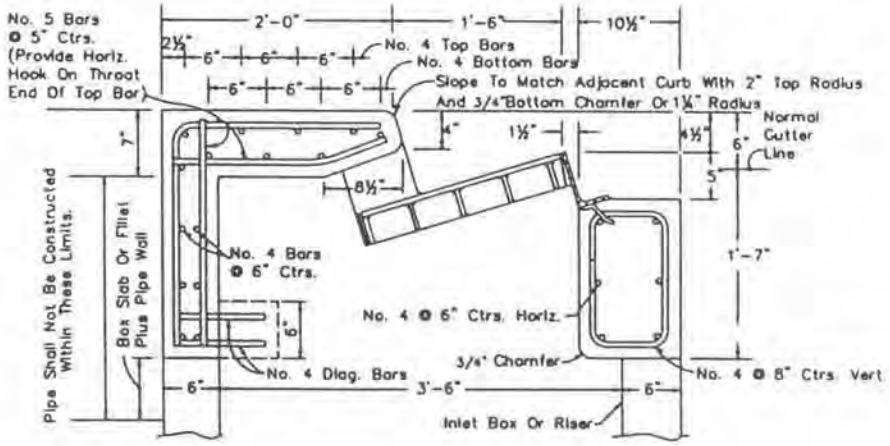
N.T.S.



INLET THROAT
(TYPE 5)



SECTION BB



SECTION AA

GENERAL NOTES

1. The finished grade and slope of the inlet tops are to conform with the finished cross slope and grade of the proposed sidewalk and/or parkway.
2. The corner fillets shown for rectangular throats Type 5 & 6 are necessary only when throats are to be used in conjunction with circular inlet "p " & "J" boxes or when used on skew with rectangular inlet "P" & "J" boxes
2. For supplemental details,see index no. 201 & 211 F.D.O.T. DESIGN STANDARDS
4. For inlet bottoms see index No. 200. F.D.O.T. design standards

INLET THROAT TYPES 5 & 6

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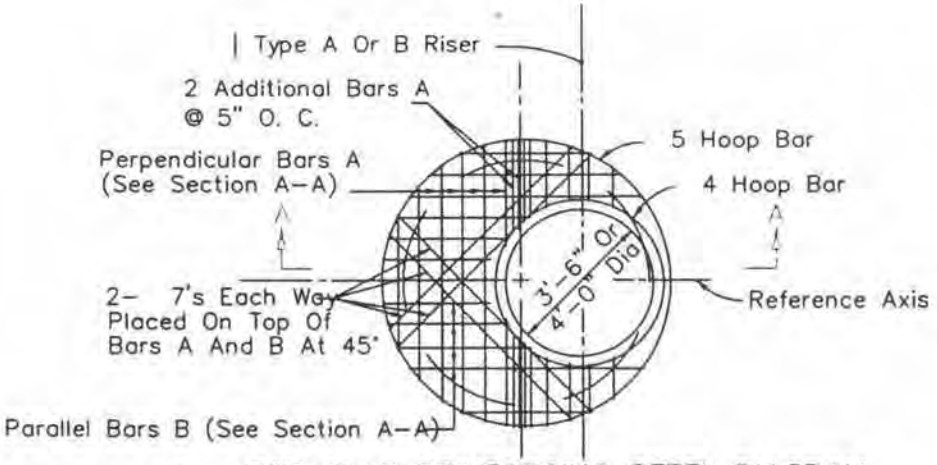
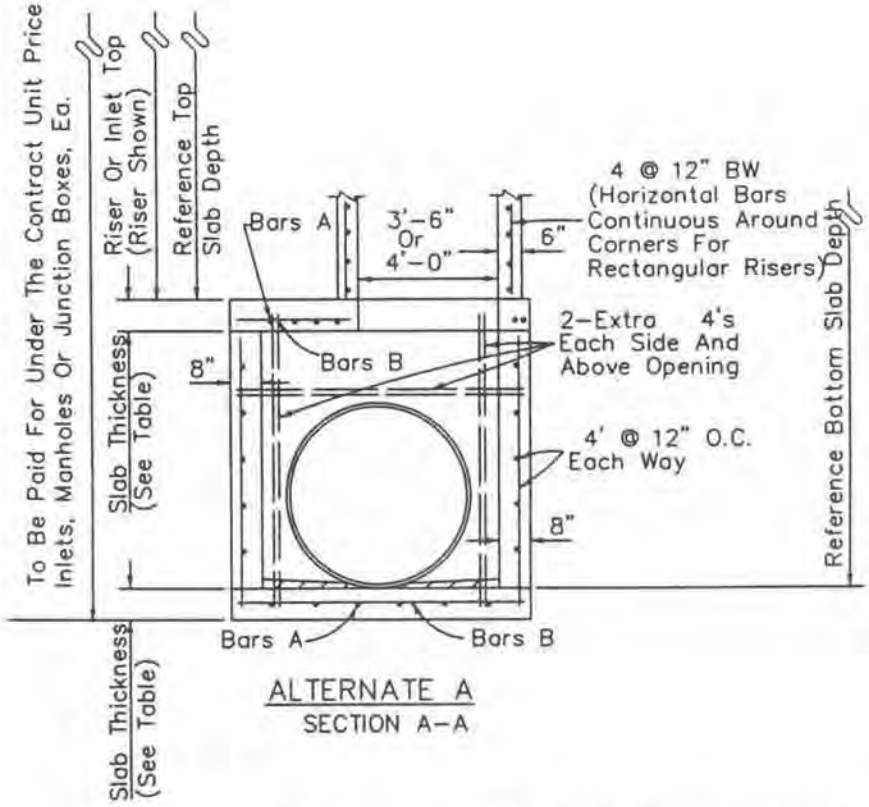


TOP SLAB REINFORCING STEEL DIAGRAM



ALTERNATE A
SECTION A-A

*NOTE: When the inside diameter of a round structure is not more than 1'-6" larger than the opening in the riser or top slab, the top of the structure or riser shall be constructed according to the "Special Top Slab" details on sheet FIG. SD-19.

*REF. FLORIDA DEPARTMENT OF TRANSPORTATION ROADWAY AND TRAFFIC DESIGN STANDARDS INDEX 200 FOR GENERAL NOTES AND SLAB & WALL DESIGN.

STRUCTURE BOTTOMS (TYPE J&P) ALTERNATE "A"

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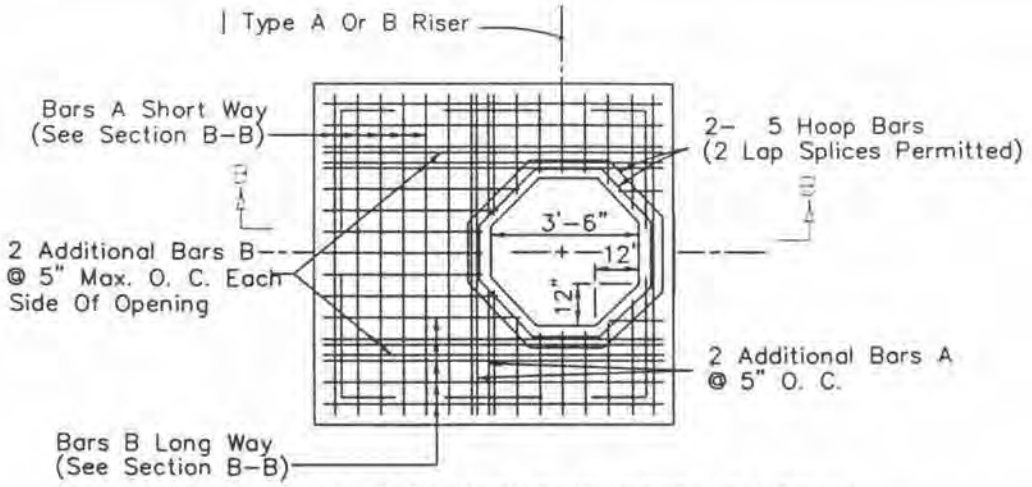
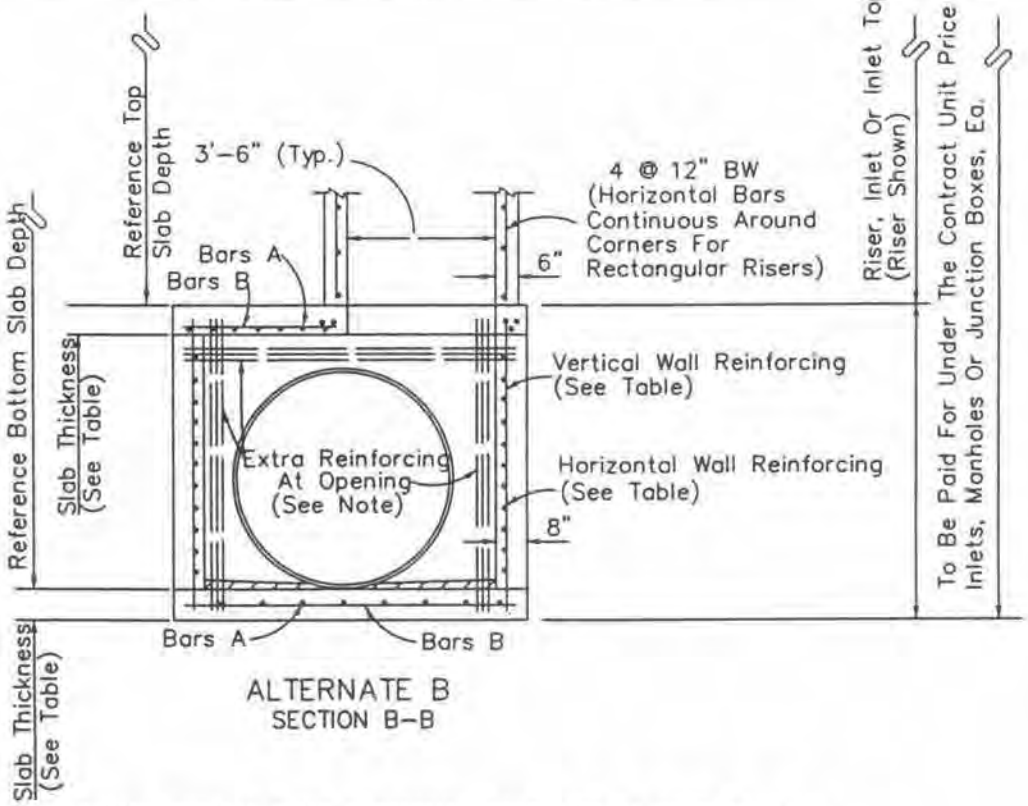


TOP SLAB REINFORCING STEEL DIAGRAM



ALTERNATE B
SECTION B-B

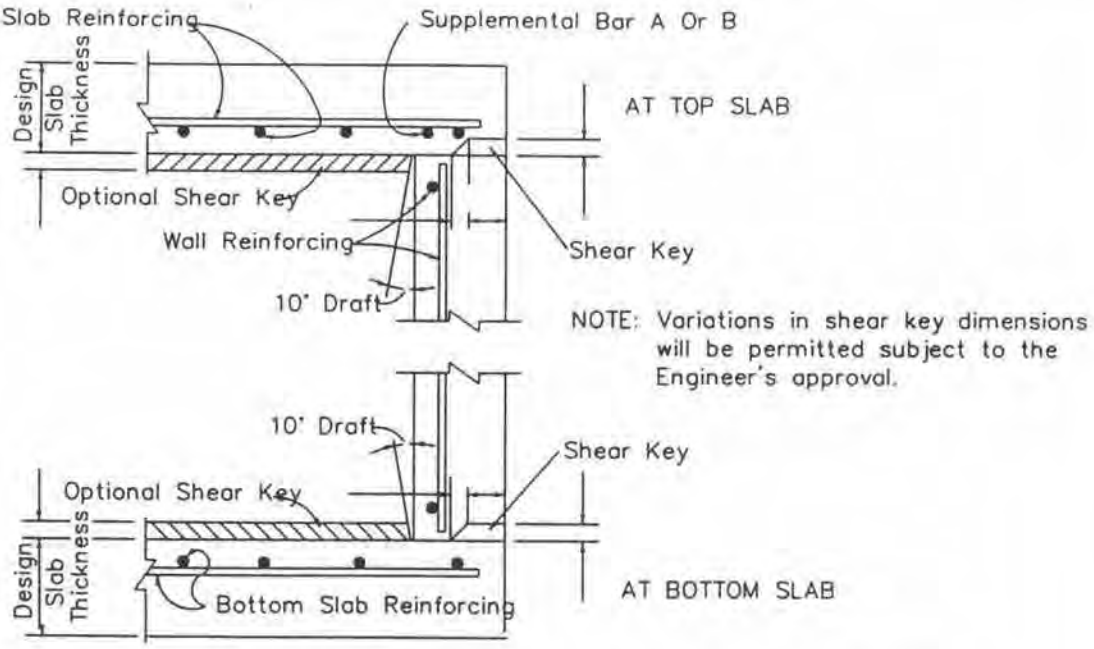
NOTE: Provide extra reinforcing each side of each opening at 3" maximum spacing equal to half the area of vertical reinforcment removed by the opening and provide the same area of reinforcment above each opening at 3" maximum spacing as removed by the opening.

*REF. FLORIDA DEPARTMENT OF TRANSPORTATION
ROADWAY AND TRAFFIC DESIGN STANDARDS INDEX 200
FOR GENERAL NOTES AND SLAB & WALL DESIGN.

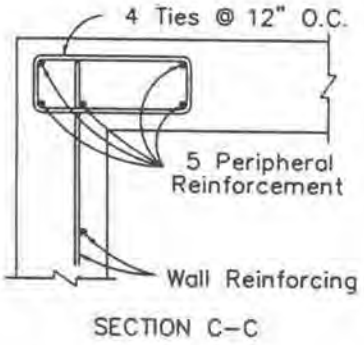
STRUCTURE BOTTOMS (TYPE J&P) ALTERNATE "B"

N.T.S.

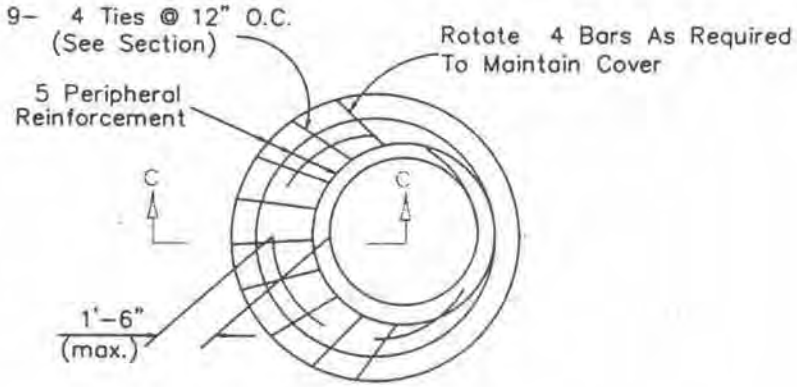
CITY OF SARASOTA



SLAB TO WALL DETAILS FOR PRECAST ALTERNATE WITH 8" WALLS



SECTION C–C



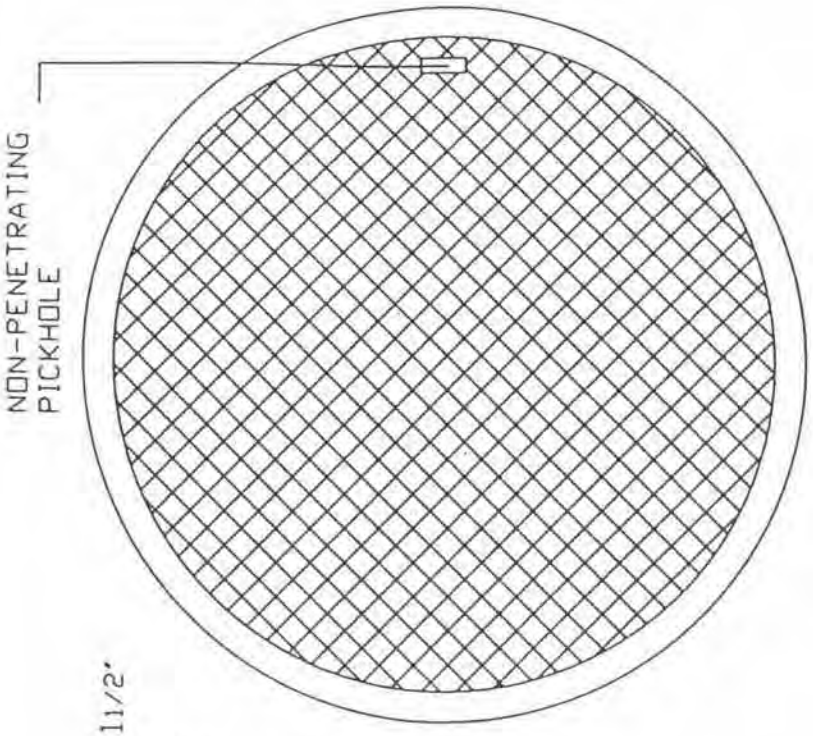
SPECIAL *TOP SLAB

*REF. FLORIDA DEPARTMENT OF TRANSPORTATION
ROADWAY AND TRAFFIC DESIGN STANDARDS INDEX 200
FOR GENERAL NOTES AND SLAB & WALL DESIGN.

SPECIAL TOP SLAB

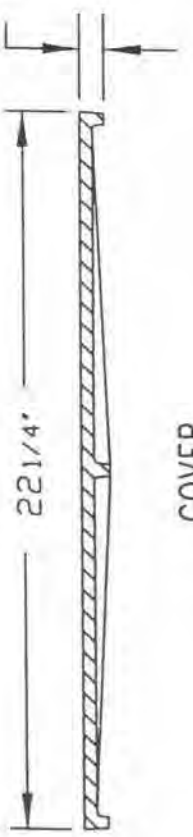
N.T.S.

CITY OF SARASOTA

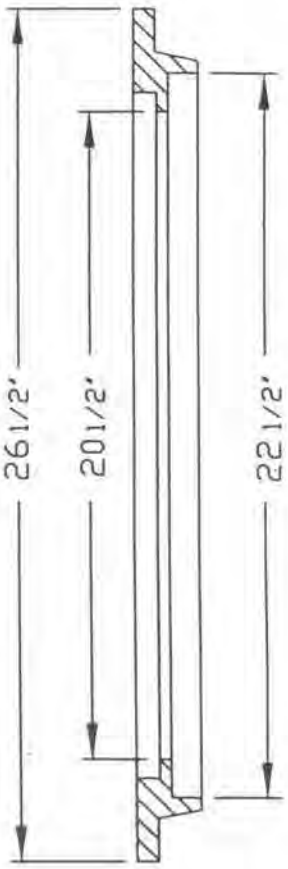


NOTE:
MATERIAL: CAST IRON, ONE COAT OF ASPHALTIC
PAINT USF #110 FRAME & COVER OR APROVED EQUAL.

FRAME WT: 90 LBS APP.
COVER WT: 125 LBS APP.



COVER



FRAME

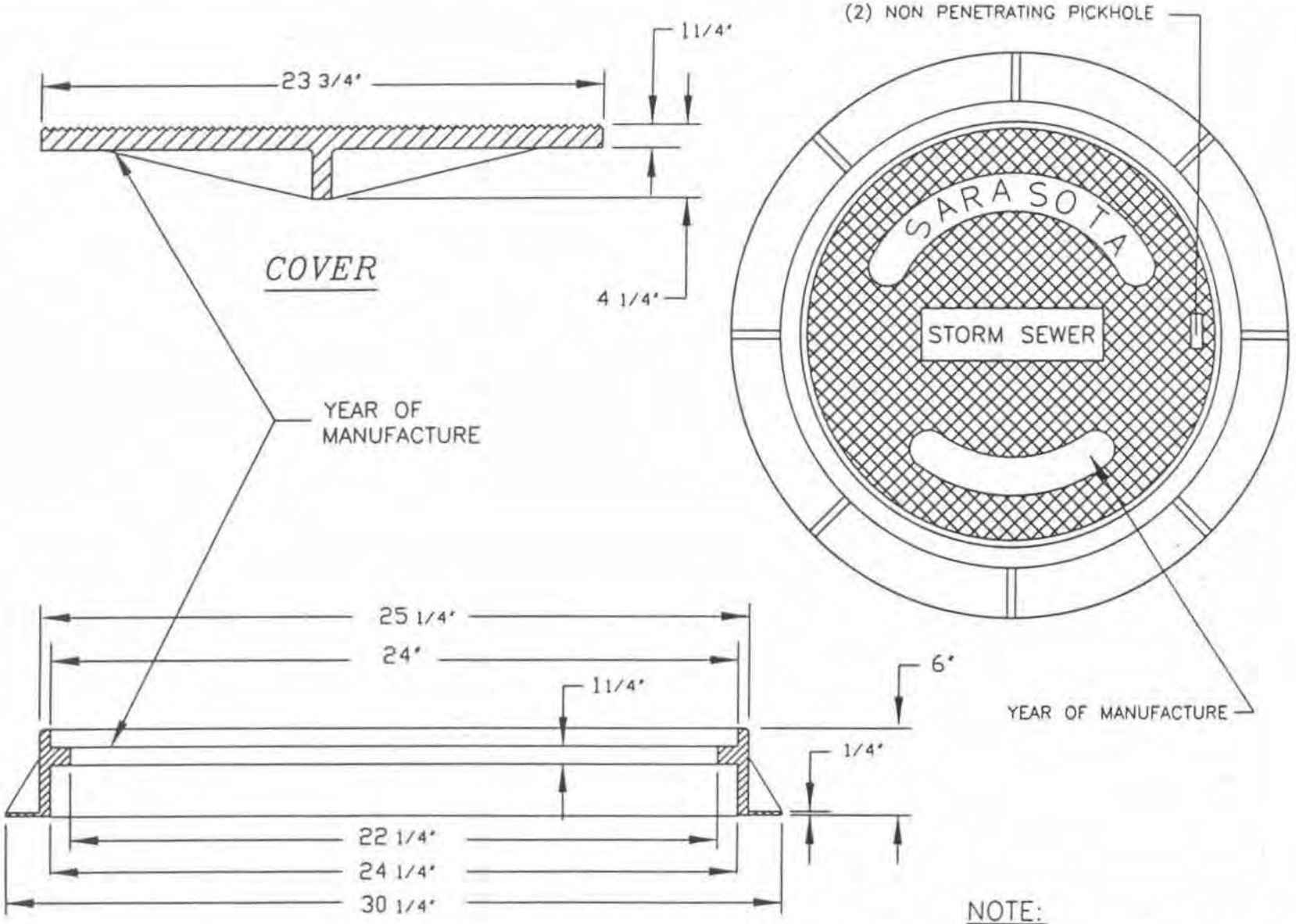
NON-TRAFFIC BEARING FRAME & COVER

CITY OF SARASOTA N.T.S.

TRAFFIC BEARING FRAME & COVER

CITY OF SARASOTA N.T.S.

MARCH 2002 6-33 FIG. SD-21



NOTE:

MATERIAL: CAST IRON, ONE COAT OF ASPHALTIC PAINT

FRAME WT : 155 LBS APP.
COVER WT : 160 LBS APP.

U.S.F. 170 RING & CE/W COVER OR APPROVED EQUAL

Figures shown in Table below are minimum and maximum permissible depths in feet. Minimum depth is measured from top of pipe to subgrade. Maximum depth is measured from invert of pipe to grade. For sizes 24" and over, see Figure SD-23 on page 6-35.

Pipe Size	Type of Pipe	No Cradle		Low Cradle	High Cradle
		Min.	Max.	Min.	Max.
12"	CISPX	2	12	20	30
12"	VCPX	2	17	30	
12"	CSPX	2	17	30	
12"	RCSP	2	17	30	
12"	RCCP	1.3	21	30	
12"	CMP#16	1.3	30*		
15"	CISPX	2	12	18	26
15"	VCPX	2	17	30	
15"	CSPX	2	17	30	
15"	RCSP	2	17	30	
15"	RCCP	1.3	21	30	

Pipe Size	Type of Pipe	No Cradle		Low Cradle	High Cradle
		Min.	Max.	Min.	Max.
15"	CMP#16	1.3	30*		
18"x11"	CMAP#16	1.3	20		
18"	VCPX	2	17	30	
18"	RCSP	2	17	30	
18"	RCCP	1.3	21	30	
18"	CMP#16	1.3	30*		
22"x13"	CMAP#16	1.3	20		
21"	VCPX	2	19	30	
21"	RCCP	1.3	22	30	
21"	CMP#16	1.3	30*		

CRITERIA

Loads

Based on Marstan Theory for trench conditions.

Superload = W = ICT

I = Impart Factor = 1.5
C = Ratio of load transmitted
T = Single H=20 truck wheel load

Fill Load = W = wCB^2

w = Weight of fill = 110 lbs./ cu.ft. C = Coefficient, saturated clay B = Width of trench

Pipe Crushing Strength

Based on A.S.T.M. tests and recommendations.
Load Factor (No Cradle) = 1.9
Safety Factor = 1.5

ABBREVIATIONS

VCPX = Vitrified Clay Pipe, Extra Strength
CSPX = Concrete Sewer Pipe, Extra Strength
RCSP = Reinforced Concrete Sewer Pipe
RCCP = Reinforced Concrete Culvert Pipe
RCCPX = Reinforced Concrete Culvert Pipe, Extra Strength
CMP#16 = Corrugated Metal Pipe, 16 Gauge
CMAP#16 = Corrugated Metal Arch Pipe, 16 Gauge
CISPX = Cast Iron Soil Pile, Extra Heavy
* = CMP & CMAP in depths over 20 feet to be used in culverts only.
* = CMAP 36"x22" and larger, where cover is less than 3", shall be supported by struts until pavement is completed.

GRADE

For new subdivisions, means established grade over pipe. For existing roads or rights-of-way, means existing or established grade, whichever gives worst condition.

CITY OF SARASOTA

PIPE LOADING TABLE 12" TO 21"

Fig. SD – 22

Figures shown in Table below are minimum and maximum permissible depths in feet. Minimum depth is measured from top of pipe to subgrade. Maximum depth is measured from invert of pipe to grade. For sizes 21" and smaller, see Figure SD-22 on page 6-34.

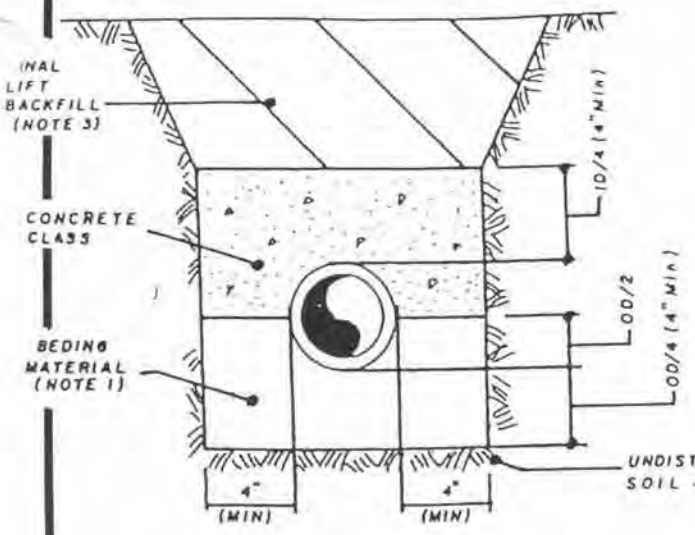
Pipe Size	Type of Pipe	No Cradle		Low Cradle	High Cradle
		Min.	Max.	Min.	Max.
24"	VCPX	2	20	30	
24"	RCCP	2	22	30	
24"	RCCPX	1.3	30		
24"	CMP#14	1.3	30*		
29"x18"	CMAP#14	1.3	20		
27"	VCPX	2	20	26	30
27"	RCCP	2	20	26	30
27"	RCCPX	2	20		
30"	VCPX	2	20	26	30
30"	RCCP	2	20	26	30
30"	RCCPX	2	30		
30"	CMP#14	2	30*		
36"x22"	CMAP#14	2*	20		
33"	VCPX	2	20	27	30
33"	RCCP	2	20	27	30
33"	RCCPX	2	30		
36"	VCPX	2	20	27	30
36"	RCCP	2	20	27	30
36"	RCCPX	2	30		
36"	CMP#12	2	30*		
43"x27"	CMAP#12	2*	20		
42"	RCCP	2	13	22	30
42"	RCCPX	2	30		
42"	CMP#12	2	30*		

Pipe Size	Type of Pipe	No Cradle		Low Cradle	High Cradle
		Min.	Max.	Min.	Max.
50"x31"	CMAP#12	2*	16		
50"x31"	CMAP#10	2*	20		
48"	RCCP	2	13	22	30
48"	CMP#12	2	24*		
48"	CMP#10	2	30*		
48"	RCCPX	2	30		
58"x36"	CMAP#10	2*	20		
54"	RCCP	2	13	22	30
54"	CMP#12	2	18		
54"	CMP#10	2	24*		
54"	RCCPX	2	30		
65"x40"	CMAP#12	2*	17		
65"x40"	CMAP#10	2*	20		
60"	RCCP	2	14	22	30
60"	CMP#10	2	14		
60"	CMP#8	2	29*		
60"	RCCPX	2	30		
72"x44"	CMAP#10	2*	14		
72"x44"	CMAP#8	2*	20		
66"	RCCP	2	13	18	22
66"	CMP#10	2	20		
66"	CMP#8	2	30*		
66"	RCCPX	2	30		
72"	RCCP	2	13	18	22
72"	CMP#10	2	13		
72"	CMP#8	2	20		
72"	RCCPX	2	30		

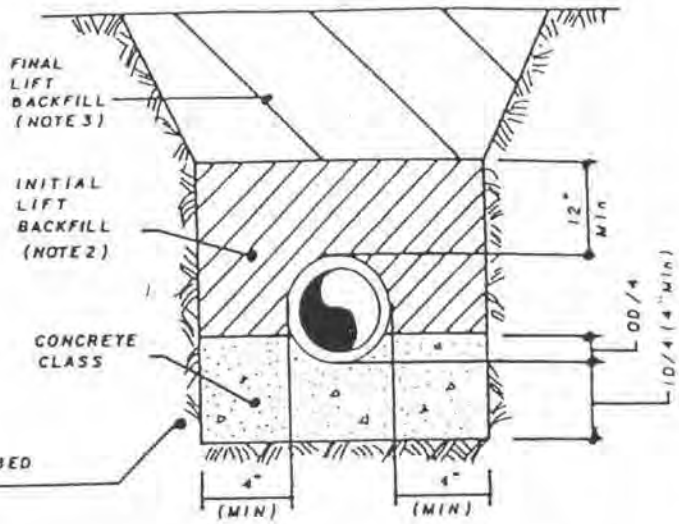
For Criteria, Abbreviations, notes, etc., see Figure SD-22 on page 6-34.

CITY OF SARASOTA **PIPE LOADING TABLE 24" TO 72"**

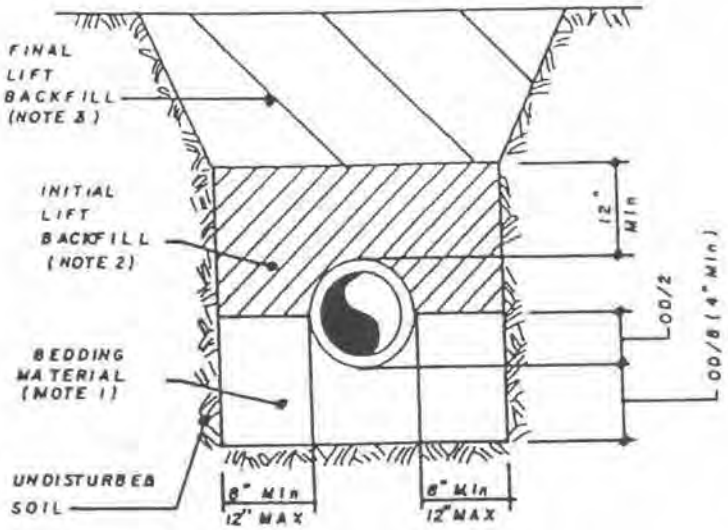
Fig. SD – 23



CLASS A CONC ARCH



CLASS A CONC CRADLE



CLASS B

GENERAL NOTES

1. BEDDING MATERIALS SHALL BE ASTM D2321 CLASS I, CLASS II, OR CLASS III, EXCEPT P.V.C PIPE SHALL NOT UTILIZE CLASS III.
2. INITIAL LIFT- COMPACT TO 95% MAXIMUM (AASHTO T-180) DENSITY 6" LIFTS.
3. FINAL LIFT- COMPACT 12" LIFTS TO 95% MAXIMUM (AASHTO T-180)

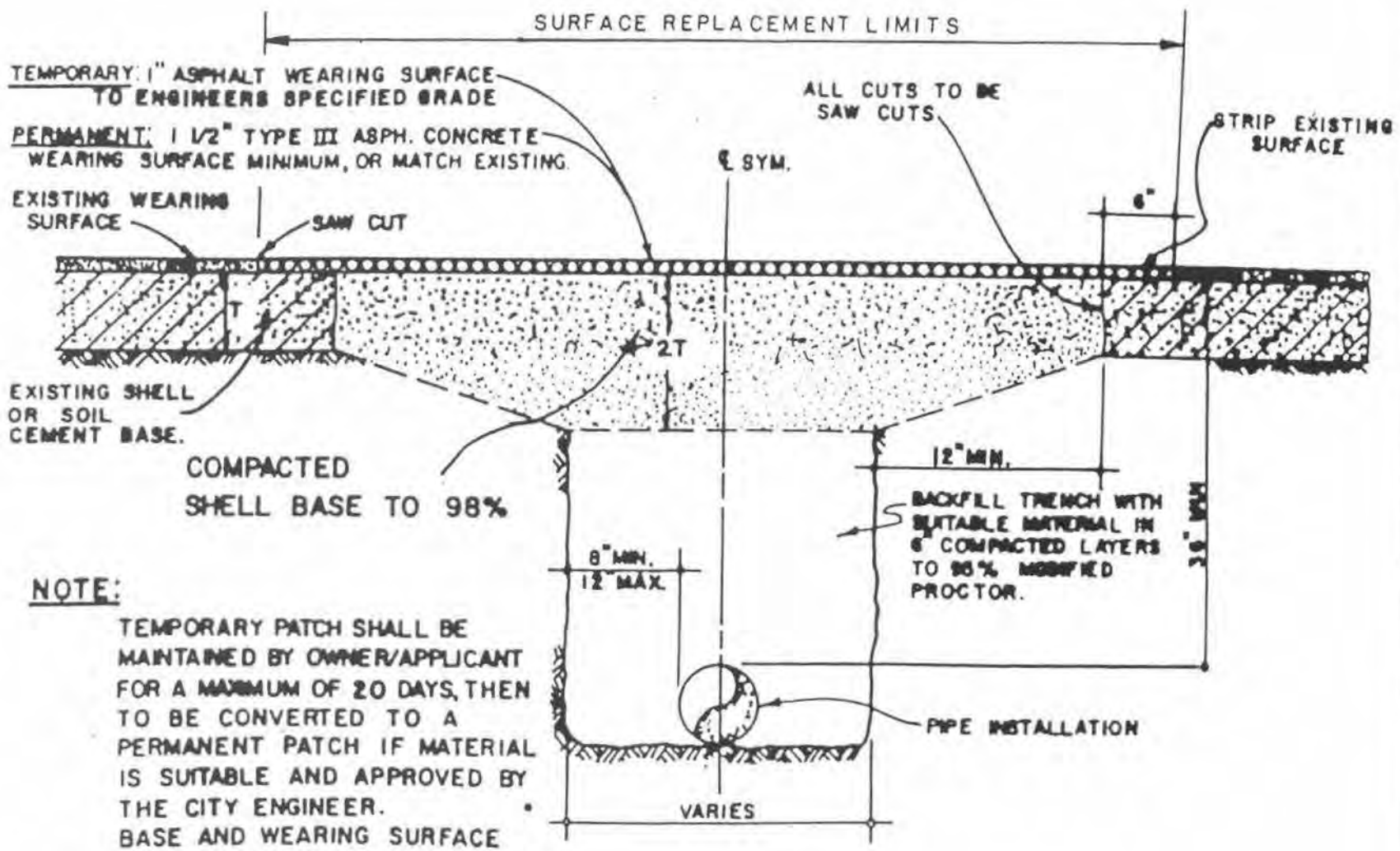
SPECIAL PIPE BEDDING DETAILS

CITY OF SARASOTA N.T.S.

CITY OF SARASOTA

N.T.S.

REQUIREMENTS FOR PAVEMENT RESTORATION



NOTE:

TEMPORARY PATCH SHALL BE MAINTAINED BY OWNER/APPLICANT FOR A MAXIMUM OF 20 DAYS, THEN TO BE CONVERTED TO A PERMANENT PATCH IF MATERIAL IS SUITABLE AND APPROVED BY THE CITY ENGINEER.

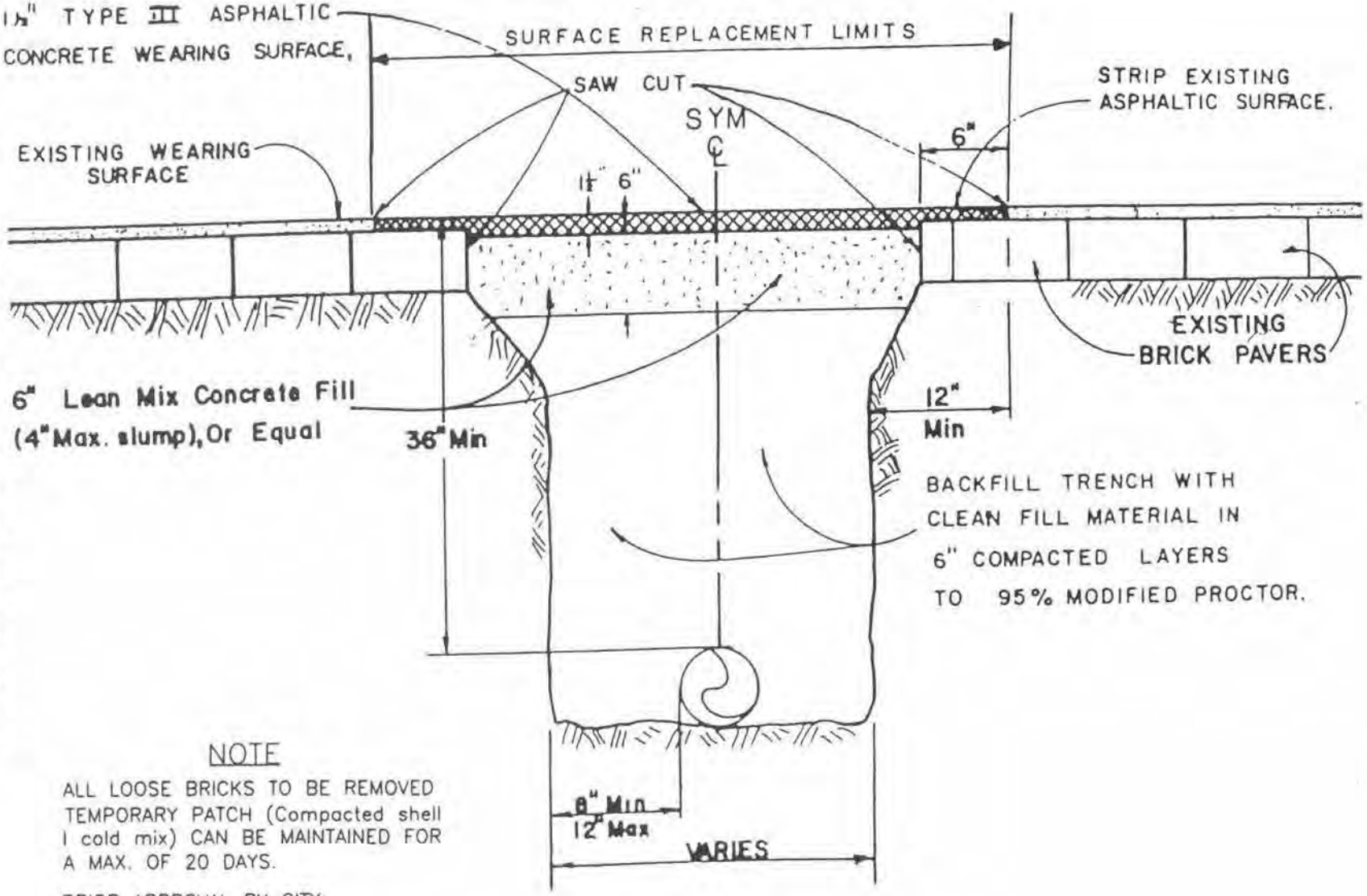
BASE AND WEARING SURFACE TO BE APPROVED AND INSPECTED BY THE CITY ENGINEER.

SHELL SURFACED ROADS SHALL BE COMPACTED AS SPECIFIED WITH SHELL BASE AND SURFACED TO MATCH EXISTING GRADES

CITY OF SARASOTA

TRENCH RESTORATION ON BRICK STREETS

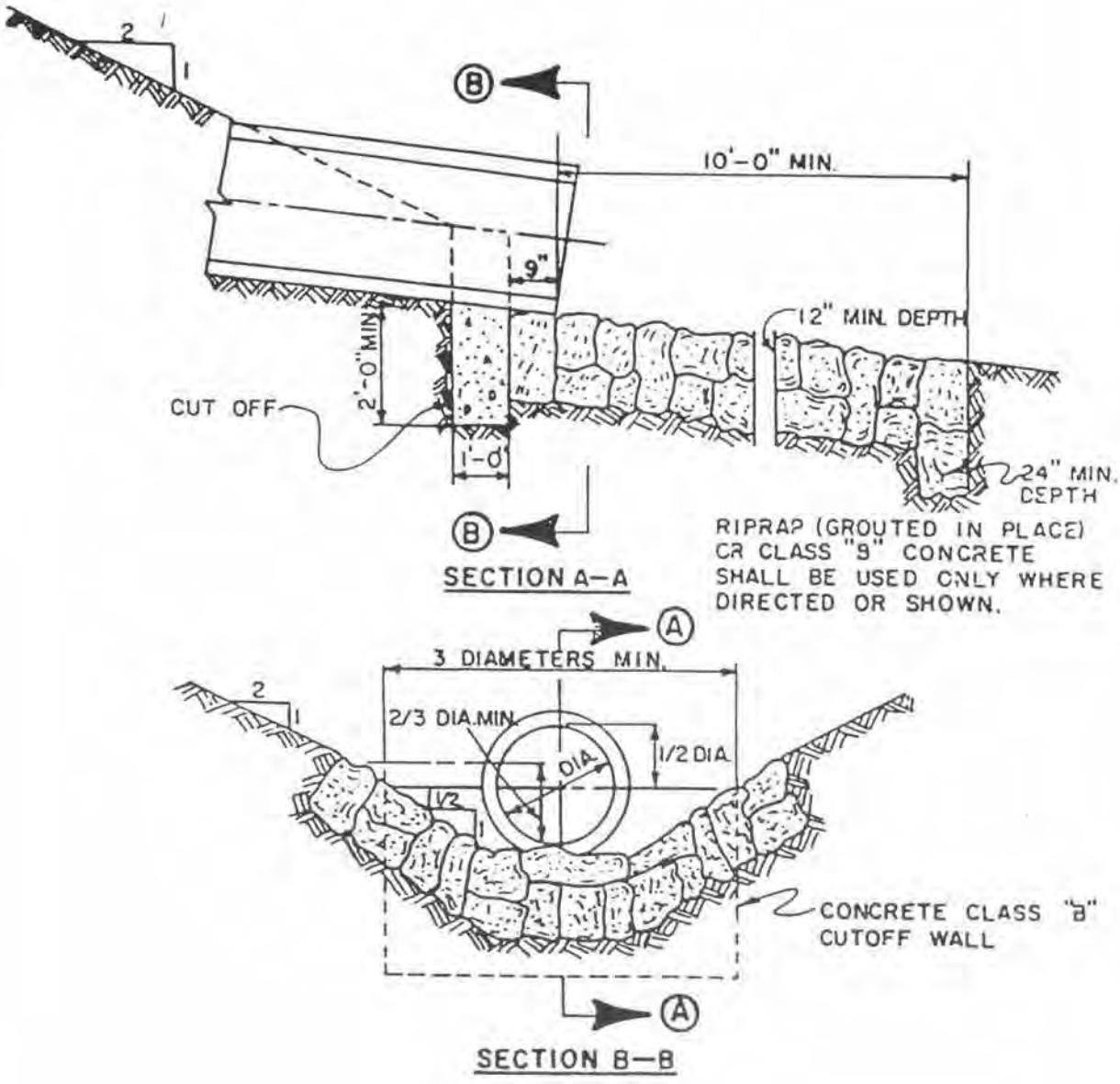
N.T.S.



NOTE

ALL LOOSE BRICKS TO BE REMOVED TEMPORARY PATCH (Compacted shell I cold mix) CAN BE MAINTAINED FOR A MAX. OF 20 DAYS.

PRIOR APPROVAL BY CITY ENGINEER MUST BE OBTAINED FOR EACH PHASE OF WORK.



CUTOFF WALL & RIP RAP

N.T.S.

CITY OF SARASOTA

CITY OF SARASOTA

STANDARD BUBBLER BOX

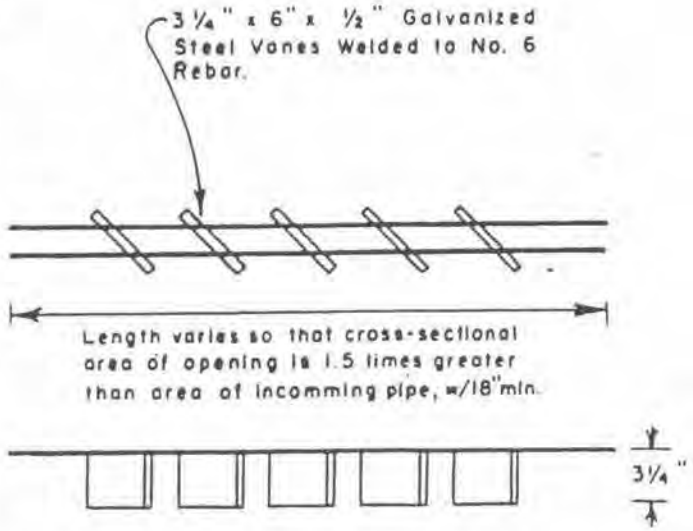
N.T.S.

MARCH 2002

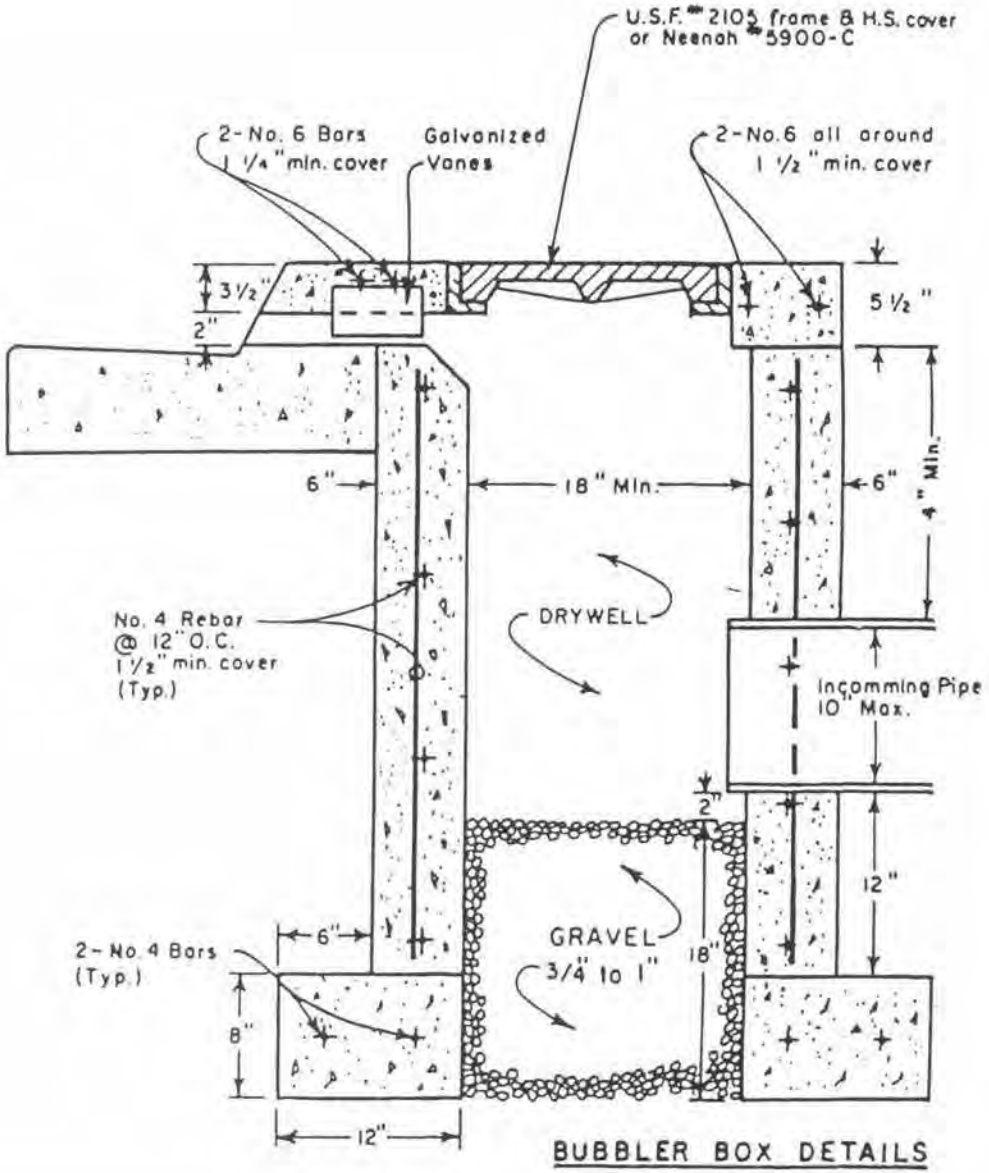
6-40

FIG. SD-28

NOTE:
For supplemental details see F.D.O.T. Index No. 213.



GALVANIZED VANES DETAIL



BUBBLER BOX DETAILS

ENGINEERING DESIGN CRITERIA MANUAL

PART 7

UTILITIES ENGINEERING FOR

WATER DISTRIBUTION
SANITARY SEWER
REUSE DISTRIBUTION

Prepared by
City of Sarasota
Public Works Department

PART 7. UTILITIES ENGINEERING FOR WATER DISTRIBUTION, SANITARY SEWER & REUSE DISTRIBUTION

Section A - Scope.

1. These specifications are intended to govern the furnishing of all materials, labor, equipment, tools and supplies necessary to construct, complete, and deliver to the City of Sarasota (hereinafter called "Owner"), all water distribution systems and sewage collection/transmission systems and appurtenances, or extensions to the existing systems. The provisions herein shall apply equally to work contracted directly by the Owner and to work contracted for and/or performed by others with the ultimate intent of transferring ownership and maintenance responsibility to the Owner. Sewage collection systems, regardless of ultimate intended ownership, shall conform to the provisions herein.

2. These specifications are also intended as a guide to designers of the works covered herein and shall be employed, in conjunction with the applicable laws of the State of Florida, the Standard Details and accepted engineering practice, to achieve a compatible and acceptable design.

Section B - Excavation

1. Scope: Excavation shall include the loosening, removing, loading, transporting, depositing, and compacting in final location of all materials, wet and dry, necessary to be removed for the construction of the pipe systems and appurtenances in conformity with the plans and specifications, including the furnishing, placing and removing of all sheeting and bracing; all pumping, draining and handling of all water encountered in the excavation; the supporting and protection of all structures and utilities above and below ground; all backfilling of trenches and around structures; the removing and replacing of all roadway pavement, drives and sidewalks; and all other incidental work as shown on the plans and specifications.

2. Character of Material: The Contractor must satisfy himself regarding the character and amount of loam, clay, sand, quicksand, muck, gravel, rock, water and all other material to be encountered in the work to be performed.

3. General Requirements:

   a. - The contractor shall provide adequate facilities and shall be responsible for protecting all structures, buildings, and utilities, underground, on the surface, or above ground, from damage due to trenching, dewatering or any other activity connected with the construction of the pipe system during the construction period, and shall protect and preserve the Owner harmless against all claims for damages resulting from these activities.
   b. The Contractor, in his use of streets, highways, alleys and easements for the work to be done under this contract, shall conform to all City, State and local laws and regulations. The Contractor shall provide, erect and maintain effective barricades, flashers, danger signals and signs on all intercepted streets or highways for protection of the work and the safety of the

public. All barricades or obstructions which encroach on, or are adjacent to public rights-of-way shall be provided with lights which shall be kept burning or flashing at all times between sunset and sunrise. The Contractor shall be responsible for all damages resulting from any neglect or failure to meet safety requirements. Watchmen will be provided by the Contractor if necessary to fulfill the requirements stated herein. The activities of the contractor are restricted to public rights-of-way unless otherwise noted on the plans or in the special provisions. Where the contractor wishes to use private property for stockpiling or any other reason, he shall first obtain permission of the Owner in writing and file a copy of said permission with the Engineer. In his use of private property under these circumstances he shall conform to all applicable portions of these specifications as a minimum requirement.

c. The Contractor shall arrange his work and when necessary furnish flagmen to cause minimum disturbance of normal pedestrian and vehicular traffic and will be held responsible for providing adequate means of access to all public and private properties during all stages of construction. Should the construction work require repairs, changes or modifications of other utilities it shall be the responsibility of the Contractor to provide for the maintenance of continuous water, electric, telephone, gas, sewage and other utility services to all present customers of such utilities, unless approval in writing is secured from the utility company or Owner for interruption of such service.

4. Preliminary Work:

a. The Contractor shall clear all rights-of-way and shall remove all obstructions along the pipe lines for a sufficient area to provide adequate work space, including space for control stakes, hubs and bench marks. Removal of trees and permanent structures along or in the right-of-way shall be done by the Contractor but only as directed.

b. The method of protection for valuable trees and shrubs within the public right-of-way shall be as follows:

(1)Property owners shall be given adequate notice of proposed construction and will be advised to remove privately owned shrubs and plantings they want saved from within the right-of-way.

(2)Shrubs not removed from the right-of-way prior to the start of construction need not be protected by the Contractor.

(3)Trees in conflict with the proposed construction and over six inches in diameter as measured twelve inches above the ground level shall be removed by the Contractor where directed by the Engineer and shall be replanted by the Contractor at designated points not over one-half mile from the point of removal. The Contractor shall perform this work in accordance with the requirements of the City of Sarasota Public Works Department, but he shall not be responsible for continued life of the trees after moving.

(4)Trees and shrubs not saved by one of the above methods shall be removed and disposed of by the contractor as directed at no additional cost to the Owner.

c. In places where working room is restricted, the Contractor shall protect privately owned trees and shrubs bordering the right-of-way from damage and shall take full responsibility therefore.

5. Conflicts:

a. Underground structures and utilities shown on the plans are located according to the best available records, but it shall be the Contractor's responsibility to acquaint himself with all

information and to locate all underground structures and utilities along the line of the work in order to avoid conflicts with existing facilities. The Owner shall not be held accountable for inaccuracies or omissions in the location or grade of existing underground facilities. The Contractor shall protect and preserve all underground facilities. Such facilities damaged in the prosecution of the work shall be immediately repaired by the Contractor in conformance with best practice or according to the specifications of the owner of the utility, up to and including replacement. If the owner of the utility elects to make such repair with his own forces, the Contractor shall make the necessary arrangements to save the City harmless from any and all damages.

b. Where actual conflicts are unavoidable, every effort shall be made to construct the work so as to cause as little interference as possible with the service rendered by the facility disturbed. Minor changes in the alignment, but not the grade, of gravity sewers may be made as directed by the Engineer where such changes will prove beneficial, provided that straight alignment can be maintained between manholes.

6. Trenches:

   a. All excavations for pipe laying shall be made by open cut unless otherwise specifically noted or authorized by the Engineer. Trench excavation may be accomplished by mechanical equipment, such as backhoes, except as provided in Paragraph b. below.
   b. The bottom two inches of trench excavation for sewers shall be excavated only a few feet in advance of the pipe laying by specially skilled workers. Holes for pipe bells shall be hand excavated in insuring that the pipe barrel shall rest for its entire length upon the bottom of the trench.
   c. All excavated material suitable for use as backfill shall be deposited neatly at the sides of the trench where space is available. Where stockpiling of excavated material is required, the Contractor shall be responsible for obtaining the sites to be used and shall so maintain his operations as to provide for natural drainage and not to present an unsightly appearance. Excavation shall be carried on in such a manner so as to obstruct streets or alleys as little as possible. Grade and line stakes, if used, shall be protected. No excavated material shall be placed on private property without the written consent of the owner.
   d. If the bottom of the excavation is found to consist of rock or any material that cannot be excavated to give a uniform bearing surface, said rock or other material shall be removed to a depth of at least six inches below the bottom of the pipe and refilled to grade with sand or crushed stone compacted thoroughly into place.
   e. Excess excavated material not required or unsuitable for backfill shall be immediately removed and disposed of by the contractor at locations designated by the Owner. Length of haul shall not exceed two miles.

7. Unauthorized Excavation: Excavation carried beyond or below the lines and grades given by the Engineer shall be refilled with such material and in such manner as may be directed by the Engineer to insure the stability of the various structures.

8. Width and Depth of Trench:

   a. The minimum clear width of the trench for pipe measured at the top of the pipe, shall be not less that the nominal diameter of the pipe plus twelve inches but in no case less than 24 inches.

b. The maximum clear width of the trench for pipe measured at the top of the pipe shall not exceed the nominal diameter of the pipe plus 24 inches.

9. Dewatering:

a. Water shall not be allowed in the trenches while the pipe is being laid. The use of a modern and efficient method of dewatering will be required. The Contractor shall not open up more trench than the available pumping facilities are able to dewater. The Contractor shall assume responsibility for disposing of all water so as not to injure or interfere with the normal drainage of the territory in which he is working. In no case shall the pipe lines being laid be used as drains for such water. The ends of the pipe shall be kept properly and adequately blocked during construction by the use of approved stoppers and not by improvised equipment. All necessary precautions shall be taken to prevent the entrance of mud, sand or other obstructing matter into the pipe lines, and on completion of the work any such material which may have entered the pipe lines must be removed so that the entire system will be left clean and unobstructed.

b. Water removed from the excavation shall be disposed of in such manner as not to cause injury to any portion of the work completed or in progress, or to the surface of streets, or to private property. All gutters, drains, culverts, sewers and inlets shall be kept clean and open for surface drainage. Water shall not be directed across or over pavements except through approved pipes or properly constructed troughs. The Contractor shall be responsible for obtaining permission in writing from the owner of any property involved before digging ditches or constructing water courses for the removal of water, but such permission shall not relieve him of the responsibility of disposing of the water without ponding or the creation of a public nuisance.

10. Backfilling:

a. In general, immediately after pipes have been laid and approved, the trenches shall be backfilled with fine, loose, selected materials free from clods, clumps, sticks, stones and foreign matter. This material shall be carefully deposited by hand on both sides of the pipe at the same time and thoroughly tamped and rammed around the barrel of the pipe until enough fill has been placed to provide a cover at least one foot above the bell of the pipe. The remainder of the fill may then be mechanically deposited in one foot layers with each layer thoroughly tamped. Sufficient hand or mechanical tampers must be used so that each successive foot of backfill will be thoroughly compacted before more material is added. Water settling may be required by the Engineer. The top material shall be used last, and the surface of the trench shall be restored to the same elevation as existed prior to construction. As soon as the backfilling is completed, the Contractor shall clean and regrade the street, alley, or right-of-way, remove all surplus materials, and leave it free, clean and open to traffic. Trenches that have not been properly filled, or if settlement occurs, shall be refilled, smoothed off and finally made to conform to the original grade, line and surface. Should there be a deficiency of proper material for backfilling, the Contractor shall furnish the same. Under no conditions are destroyed pavement material, curbs, etc., to be included with the backfill.

b. Backfill within streets and alleys and at other locations subject to vehicular traffic shall conform to all the requirements of Paragraph a. above. In addition, each one foot layer of backfill shall be compacted with approved mechanical tampers.

c. Dewatering, if required, shall be continued during construction until the backfill is completed to keep the ground water below the level of the backfill at all times.

d. Where the grade line of the pipe is within rock cut, backfilling under, around and over the pipe to a height of one foot over the top of the bell shall be with loose, dry earth or sand, thoroughly compacted. The remaining depth of the trench shall be backfilled using the best available material from the excavation. Excavated rock may be used, provided it is broken into pieces not larger than three inches in size, and sufficient fine material is used to fill the voids.
e. Where the material excavated from the trench is muck, mud, or other unstable material, it may be utilized in the backfill under the following conditions:
   (1) No such material may be used in the backfill of any trench where it did not exist prior to construction.
   (2) No such material may be placed in the trench until backfill with suitable material has been placed and compacted to a height at least one foot above the top of the bell of the pipe.
   (3) No such material shall be utilized as backfill in any portion of a trench over which a sidewalk, roadway paving, or a driveway of any type is to be replaced.
f. Sheeting, if utilized, shall be removed in all cases except where directed to be left in place by the Engineer. Where sheeting is drawn, all cavities remaining in or adjoining the trench shall be solidly filled and thoroughly compacted. Where sheeting is left in place, all cavities behind such sheeting shall be backfilled in the same manner as specified for trench backfill.

11. Roadway, Sidewalk and Driveway Replacement:

a. Roadway paving shall be replaced according to detail on the plans or in the Standard Details. State roadways shall be replaced in conformance with Florida Department of Transportation requirements.
b. Existing sidewalks and paved driveways removed, disturbed or destroyed by the construction of the sewer lines shall be replaced or repaired by the Contractor. The finished work shall, at minimum, be equal in all respects to the original.
c. Stone, shell and/or slag driveways damaged during construction shall be repaired or replaced with material equal in all respects to that existing prior to construction.

12. Railroad Crossings:

a. Where pipe lines cross or are within railroad rights-of-way, the Contractor shall install the lines in full compliance with all requirements of and to the satisfaction of the railroad company, including any special encasement, allowable periods of work and track protection. The Contractor shall provide all watchmen, barricades, lights, and other protective measures required by the railroad company. After completion of the work, the Contractor shall secure from the railroad company a letter in triplicate stating that the work within its right-of-way has been completed with and to the satisfaction of all its requirements. These letters shall be transmitted to the Engineer.
b. All permits for work within the railroad right-of-way will be secured by the Owner. It shall be the Contractor's responsibility to verify the existence of the permit before starting work within the right-of-way of a railroad.

13. State Highway Crossings:

a. Where pipelines cross or are within the right-of-way of a state highway, the Contractor shall install the lines in full compliance with all requirements of and to the satisfaction of the Florida

Department of Transportation. Work within the right-of-way of public thoroughfares which are not under the jurisdiction of the Florida Department of Transportation shall conform to the requirements of the county or city agency having jurisdiction.

b. All permits for work within the right-of-way of a state highway will be obtained by the Owner, but it shall be the Contractor's responsibility to verify the existence of the permit before starting work within the right-of-way of a state highway.

Section C - Construction of Water Distribution Systems

1. Laying Pipe:

   a. The interior of the pipes shall be thoroughly cleaned of all foreign matter before being lowered into the dry trench and shall be kept clean during laying operation by means of plugs or other approved methods. No trench water shall be allowed to enter the pipe or fittings. During suspension of work for any reason at any time a suitable stopper shall be placed in the end of the pipe, last laid, to prevent mud or other foreign material from entering the pipe. Lines shall be laid reasonably straight and any change in grade in following the contour of the ground shall be made in long sweeping curves and no abrupt changes in line or grade will be allowed without the use of fittings. Water mains shall have at least thirty inches of cover, except where indicated on the plans or otherwise required to miss obstructions. All fittings at bends in the pipe lines shall be properly braced with concrete buttresses. Any pipe found defective shall be removed immediately and replaced with sound pipe.
   b. At the close of each day's work, and at such other times when pipe is not being laid, the end of the pipe shall be protected with close fitting stopper, approved by the Engineer. Whenever the work ceases for any reason, or when the pipe line is constructed with the end not joined to an existing pipe or structure, it shall be closed by a stopper jointed similarly to joints between sections of pipe, and which provides watertight integrity. The stopper shall be removable without damage to the pipe.

2. Cradles and Encasements:

   a. Concrete Cradles, Encasements and Specials: Where shown on the plans directed by the Engineer, concrete pipe cradles, encasements or special pipe supports shall be provided. Various pipe supports shall be as shown on the plans and as directed by the Engineer in the field to suit local conditions and emergencies. Where, in the opinion of the Engineer, pipe covering is inadequate, concrete encasements for protection shall be provided in accordance with the details on the plans. Any other concrete needed to build and protect the pipe work properly shall be used at the direction of the Engineer. All concrete included in these items shall have a minimum compressive strength of 3,000 psi @ 28 days.

3. Service Connections:
   a. The Contractor shall install water service connections of the sizes and in the locations as shown on the plans and in the Standard Details.
   b. Termini of water services shall be marked with a 2" X 4" stake, painted blue, protruding 3' above finished grade. Prior to backfill, water service locations shall be marked by a chiseled "W" on the curb directly over the service pipe. Meters and vaults will be furnished and installed by the Owner.

4. Setting Valves and Fittings:

   a. Valves, fittings, plugs and caps shall be set and jointed to pipe in the manner heretofore specified for cleaning, laying and jointing pipe. Valves and fittings shall have the same type joint as the pipe to which it is jointed. Adapters are to be used only to connect existing pipe or as indicated in the plans.
   b. A valve box shall be provided for every valve.
   c. Valve boxes shall be provided for valves which have no gearing or operating mechanism or in which the gearing or operating mechanism is fully protected with a cast iron grease case. The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the wrench nut of the valve, with the box cover flush with the surface of the finished pavement or such other level as may be directed.
   d. All dead ends on new mains shall be closed with cast iron plugs or caps, with or without a blow-off cock, as shown on the drawings.

5. Setting Hydrants:

   a. Hydrants shall be located as shown or as directed, and in a manner to provide complete accessibility, and also in such a manner that the possibility of damage from vehicles or injury to pedestrians will be minimized.
   b. When placed behind the curb, the hydrant barrel shall be set so that no portion of the pumper hose nozzle cap will be less than 12 inches or more than 18 inches from the gutter face of the curb.
   c. When set in the space between the curb and the sidewalk, or between the sidewalk and the property line, no portion of the hydrant or nozzle cap shall be within six inches of the sidewalk.
   d. All hydrants shall stand plumb and shall have their nozzles parallel with or at right angles to the curb, with the pumper nozzle facing the curb, except that hydrants having two hose nozzles 90 degrees apart shall be set with each nozzle facing the curb at an angle of 45 degrees. Hydrants shall he set to the established grade, with nozzles at least 16 inches above the ground, as shown or as directed by the Engineer.
   e. Each hydrant shall be connected to the main with a six inch cast iron branch controlled by an independent six inch gate valve.
   f. Wherever a hydrant is set in soil that is pervious, drainage shall be provided at the base of the hydrant by placing coarse gravel or crushed stone mixed with coarse sand, from the bottom of the trench to at least six inches above the waste opening in the hydrant and to a distance of one foot around the elbow. No drainage system shall be connected to a sewer.
   g. Wherever a hydrant is set in clay or other impervious soil, a drainage pit two feet in diameter and three feet deep shall be excavated below each hydrant and filled completely with coarse gravel of crushed stone mixed with a coarse sand, under and around the elbow of the hydrant and to a level of six inches above the waste opening. No drainage pit shall be connected to a sewer.
   h. All hydrant valves shall be tied to hydrant service tees with tie rods.

6. Anchorage:

   a. The bowl of each hydrant shall be well braced against unexcavated earth at the end of the trench with concrete backing, or it shall be tied to the pipe or valve with metal tie rods or

clamps, as shown or directed by the Engineer.

b. All plugs, caps, tees and bends deflecting 22½ degrees or more on mains three inches in diameter or larger, shall be provided with thrust blocks or movement shall be prevented by attaching suitable metal rods or clamps as shown or specified.

c. Thrust block backing shall be ready mix concrete having a compressive strength not less than 3,000 psi @ 28 days. Hand mixing will not be permitted. Backing shall be placed between solid ground and the fitting to be anchored. The area of bearing on the pipe and on the ground in each instance shall be that shown or directed by the Engineer. The backing shall, unless otherwise shown or directed, be so placed that the pipe and fittings joints will be accessible for repair. All fittings and/or joints in the area of the thrust block shall be protected from spillage of concrete.

d. Metal harness or tie rods or clamps of adequate strength to prevent movement may be used instead of concrete backing as directed by the Engineer. Steel rods or clamps shall be galvanized or otherwise rust-proof treated, or shall be painted as shown or directed by the Engineer.

7. Tests:

a. After pipe and appurtenances have been laid and backfilled, the distribution system or segments thereof shall be subjected to a hydrostatic gauge pressure of 150 psi. A leakage test shall be conducted at that pressure for a duration of two hours. Allowable leakage shall be determined by the formulae of AWWA Specifications, Section C600, (latest revision). The contractor shall furnish all equipment and personnel necessary to perform the pressure and leakage test. Any visible leaks must be repaired regardless of acceptability of pressure test results.

b. After completion of a satisfactory pressure and leakage test, the contractor shall disinfect the newly laid system, or segment thereof, in accordance with AWWA Specifications, Section C601-68. The Contractor will be responsible for arranging a bacteriological test by the Sarasota County Health Department. No newly laid system, or segment thereof, shall be connected to previously existing water distribution facilities until evidence of a satisfactory bacteriological test is presented to the Engineer.

8. Aerial and Subaqueous Crossings:

a. Water mains suspended from or attached to bridge or supported by above grade structures shall be constructed of ductile iron pipe, AWWA 151 Class 50, with restrained or flanged joints. Fastening hardware shall be Type 316 stainless steel.

b. Subaqueous crossings of water mains shall be ductile iron pipe, AWWA 151 Class 50, with restrained joints, within the limits as shown on the plans. Fastening hardware shall be Type 316 stainless steel.

c. All subaqueous lines shall be pneumatically tested with compressed air for two hours under a pressure of 20 psi. All joints found to be leaking or otherwise defective shall be corrected and tests repeated until the system is proved tight. Thereafter the entire system shall be tested as specified in Section 7.a.

d. Fire Hydrants shall be 5¼" nominal valve size, with 6" mechanical joint inlet and two 2½" hose nozzles and one 4½" streamer connection, designed for 150 psi working pressure, and meeting all requirements of AWWA Section C520 (latest revision) standard for fire hydrants for ordinary water works service. All working parts shall be bronze with 0-ring seals, safety stem coupling and safety flange. Main valve rod shall be bronze. Valve shall be National Standard and shall turn to the left to open. Hydrants shall be provided with the necessary

connection to fit the pipe indicated. All fire hydrants to be shop tested to 300 psi. Hydrants shall be furnished with caps and chains. Hydrants shall be equal to those currently used by the City. Any hydrants other than Mueller A423 must have prior approval of the Public Works Department.

e. Tapping Saddles shall be double-strap type, Smith-Blair 313 or approved equal.
f. Corporation Stops shall be McDonald 3131 or approved equal.
g. Curb Stop shall be Mueller 4-10257, T-head, FIPT-FIPT, or approved equal.
h. PVC Pipe for service connections shall be Schedule 40, conforming to ASTM Standard D-1784.
i. Reaction Blocking shall be Portland cement concrete (3,000 psi compressive strength @ 28 days) of dimensions as shown on the plans or Standard Details, or as directed by the Engineer.

9. Materials:
   a. Water Mains of a nominal size of 4" or greater shall be Class 150 (SDR 18), as approved by AWWA for water distribution system use. Water mains in areas of aerial and subaqueous crossings and in areas of unstable soil conditions, excessive loading and/or special conditions or hazards to warranting, shall be constructed of ductile iron - AWWA C-151, Class 50. All PVC pipe shall have an outside diameter equivalent to that of cast and ductile iron pipe and shall conform to AWWA standards under Section C900.
   b. Gate Valves shall be AWWA, non-rising stem, 2" square operating nut, iron body, bronze mounted, resilient wedge, inside screw, water gate valves. (Mueller 2380-20 or approved equal). Valves shall be furnished with standard mechanical joint and connections and shall be furnished complete with glands, gaskets, bolts and nuts, in accordance with applicable section of A.S.A. Specifications A 21.11.
   c. Valve Boxes and extensions shall be standard cast iron roadway type, adjustable three-piece, slip type, having 5¼" shaft and suitable for three or four foot deep trenches. Valve box covers shall be marked "WATER". Valve boxes outside of a paved surface shall be installed to finished grade.

Section D - Construction of Sewage Collection and Transmission Systems

1. Laying Sewer Pipe:
   a. All gravity sewers shall be laid in accordance with applicable portions of WPCF Manual of Practice No. 9. The pipe laying shall proceed upgrade, beginning at the lower end of the sewer, with pipe bell ends upgrade. Extreme care shall be exercised in keeping the pipe in exact alignment and elevation. Provisions for maintenance of specified alignment and grade may consist of batter boards and line, laser beam system or any other proven method satisfactory to the Engineer. In no case shall the pipe be walked on either before or after the joints have been made. All openings, such as stubs, wyes and other services along the sewer lines shall be securely closed by means of an approved stopper that fits into the bell of the pipe. This stopper shall be jointed in such a manner that it may be removed at some future time without damage to the pipe itself. During suspension of work, at any time for any reason, a suitable and approved stopper shall be placed in the end of the pipe last laid to prevent any foreign material from entering the line. Immediately after the pipe has been jointed and inspected, sufficient backfill shall be placed to protect the pipe adequately from injury and movement. Backfilling shall conform to applicable sections of these specifications. Upon discovery at any time, any defective pipe which may have been laid shall be removed and replaced with sound pipe. On

completion, sewer lines shall show a full circle of light when lamped between manholes.

b. All gravity sewer pipes shall be laid without break, upgrade between manholes, with bell ends of the pipe upgrade. The pipe shall be laid on an unyielding foundation with uniform bearing under the full length of the barrel of the pipe. Suitable excavations shall be made to receive the bell of each pipe, which shall be carefully laid true to line and grade. All adjustments to line and grade must be made by scraping away or filling in under the barrel of the pipe, and not by wedging or blocking up the bell. The ends of shoulders of each pipe shall abut against the adjacent pipe in such manner that there will be no unevenness of any kind along the bottom halves of the pipes.

c. At the close of each day's work, and at such other times when pipe is not being laid, the end of the pipe shall be protected with a close fitting stopper, approved by the Engineer. Whenever the work ceases for any reason, or when the pipe line is constructed with the end not joined to an existing pipe or structure, it shall be closed by a stopper jointed similarly to joints between sections of pipe, and which provides watertight integrity. The stopper shall be removable without damage to the pipe.

2. Pressure Sewers:

a. Sewage force mains shall be laid in the following manner: The interior of the pipes shall be thoroughly cleaned of all foreign matter before being lowered in to the dry trench and shall be kept clean during laying operation by means of plugs or other approved methods. No trench water shall be allowed to enter the pipe or fittings. During suspension of work for any reason at any time a suitable stopper shall be placed in the end of the pipe, last laid, to prevent mud or other foreign material from entering the pipe. Lines shall be laid reasonably straight and any change in grade in following the contour of the ground shall be made in long sweeping curves and no abrupt changes in direction or grade will be allowed. Sewage force mains shall have at least thirty inches of cover, except where indicated on the plans or otherwise required to miss obstructions. All fittings at bends in the pipe lines shall be properly braced with concrete buttresses. Any pipe found defective shall be removed immediately and replaced with sound pipe.

3. Foundations and Encasements:

a. At locations designated by the Engineer, gravity sewer lines shall be laid on preservative treated wood sills supported by wood piling. The pipe trench shall be excavated to twelve inches below pipe grade and the piles and sills constructed of treated lumber as detailed on the plans. After placing of piling and before installation of the wooden sill, the twelve inch undercut shall be backfilled with selected material which shall be thoroughly compacted by approved tampers. The wooden sills shall be then built on the pile foundations at as near the required elevation as practical. Pipe shall be laid on the sill and wedged to the exact invert as shown on the plans, and wedges firmly spiked in place. The select material backfill shall then be continued to at least one foot over the top of the bell of the pipe. In no case shall piling be cut to less than minimum length as shown on the plans. Treated lumber for piling and sills shall be pressure treated to refusal with creosote or with Wolman salts to at least 0.5 pounds per cubic foot of wood.

b. Concrete Encasements and Specials: Where shown on the plans directed by the Engineer, concrete pipe encasements or special pipe supports shall be provided. Various pipe supports shall be as shown on the plans and as directed by the Engineer in the field to suit local conditions and emergencies. Where, in the opinion of the Engineer, pipe covering is inadequate, concrete encasements for protection shall be provided in accordance with the

details on the plans. Any other concrete needed to build and protect the pipe work properly shall be used at the direction of the Engineer. All concrete included in these items shall have a minimum compressive strength of 3,000 psi @ 28 days.

4. Manholes: Manholes shall be constructed at locations shown on the plans or as directed by the Engineer, and shall be of the size indicated on the plans. Distance between manholes shall not exceed 400 feet. Excavation shall be made in conformance with the applicable portions of these specifications.
   a. All manholes shall be precast concrete, conforming to ASTM Specification C-478 (latest edition). Joints shall be continuously sealed with "Ram-nek" bituminous sealant, or approved equal, and non-shrink grout. The exterior surface of every manhole shall receive two coats of coal tar epoxy, 8 mils dry thickness per coat.
   b. When directed by the Engineer, a brick masonry collar will be constructed around the pipe at its juncture with a precast manhole.
   c. Special manhole bottoms on pile supports shall be constructed as detailed on the plans, when directed by the Engineer. In general, such construction will be used whenever the invert of the lowest sewer entering the manhole is of such elevation that piling supports are required for the sewer. However, when so directed by the Engineer, the Contractor shall excavate to solid material and construct a standard manhole, filling to the invert of the sewer with rubble masonry flushed full with mortar.
   d. Where shown on the plans or ordered by the Engineer, drop inlets to the manholes shall be constructed.
   e. Manhole steps will not be used.
   f. Manhole inverts shall be formed of Portland cement concrete, 4000 psi compressive strength @ 28 days, utilizing type II cement. All inverts shall follow the grades of the pipe entering the manholes. Changes in direction of the sewer and entering branch or branches shall have a true curve of as large a radius as the size of the manhole will permit, but will be shaped to allow easy entrance of maintenance equipment including buckets, T.V. camera, etc.
   g. Where shown on the plans or ordered by the Engineer, new lines shall be connected into existing manholes. For this purpose a portion of the manhole wall masonry and floor slab shall be removed unless existing stubs of correct size are found to exist. The floor shall be reformed and finished to provide flow channels as specified for new manholes, and brick masonry replaced to give a watertight joint with the new pipe.
   h. Where shown on the plans or ordered by the Engineer, manholes shall be provided with stub lines for connection to future sewer lines. The end of each stub line shall be provided with a bell end which shall be closed by means of an approved stopper. This stopper shall be jointed in such a manner that it may be removed, at some later time, without damage to the pipe. Each stub line shall be accurately referenced to the center of the manhole, and the actual invert elevation of each end of the stub line shall be accurately recorded. The Contractor shall furnish the Engineer a list in duplicate of each stub line installed and including the above mentioned referenced data.

5. Service Connections:
   a. The Contractor shall install the types of service connections directed by the Engineer. Types of connections are shown on plans and the location of each will be determined in the field. Each service connection shall be accurately referenced to the center of the downstream manhole, and the Contractor shall furnish the Engineer a list in duplicate of each wye and double wye service connection installed.

b. The wye service connection, except as directed otherwise, shall include a wye, six inch bend, and concrete as indicated on the drawings. If the service line is not installed at the time of construction, the opening shall be securely closed with an approved stopper that fits into the bell of the pipe. This stopper shall be jointed in such a manner that it may be removed, at some future time, without damage to the pipe.
c. Service pipe shall be six inch diameter pipe unless otherwise shown on the plans. The openings at the ends of all service pipe that are not connected to house sewers shall be securely closed with an approved stopper as specified above. The Contractor shall furnish the Engineer a list in duplicate of the location of the ends of all capped service pipes, in addition to the location of the service connections. Ends of service pipes shall be located by distance along the sewer line from the downstream manhole and distance at right angles right or left of the sewer line, facing upstream. They shall be marked by a 2" X 4" stake, painted green, driven securely into the ground at the end of the service and left approximately 3' above finish grade.

6. Tests:

a. General: All work constructed under this contract shall be subject to visual inspection for faults or defects and any such deviation or omission shall be corrected at once.
b. Pressure Sewers: All sewage pressure lines, or force mains, shall be tested with a test pressure of 75 psi for two hours.

Table of allowable leakage per 100 joints per hour:

3"pipe - 1.5 gallons	10"pipe - 4.7 gallons
4"pipe - 1.9 gallons	12"pipe - 5.6 gallons
6"pipe - 2.8 gallons	14"pipe - 6.5 gallons
8"pipe - 3.7 gallons	16"pipe - 7.5 gallons

c. Gravity Sewers: After completion, the gravity sewers, or sections thereof, will be tested and gauged for infiltration or exfiltration, and if leakage of water is above allowable limits specified herein, the section or sections found defective will be rejected until corrective work has been performed to bring it within the allowable limits. The allowable limit of infiltration or exfiltration for the sewer system for any one trunk, main or lateral shall not exceed the following rates:
   (1)200 gallons per 24 hours per mile of sewer per inch of pipe diameter.
   (2)Infiltration, if taken between any two adjacent manholes, shall not exceed two gallons per 24 hours per foot of sewer for all sizes and all locations. This testing of lines between adjacent manholes will not be required except to localize the position of a leak in a system that does not test below the allowable limit.
d. Measurements and test of infiltration will be made as soon as practicable after construction of sufficient lines to warrant a test. All measurements shall be made by means of a weir suitable for this purpose, or by actual volumetric measuring direct from the sewer. The Engineer may require sections of sewer systems not covered with at least one foot of ground water at the time of testing to be plugged off and filled with clean water to a level determined by the Engineer but not to exceed 10 feet as measured at the invert of any joint. All lines which fail to meet these tests shall be repaired and retested as necessary, until test requirements are complied with.

7. Aerial and Subaqueous Crossings:
a. Force mains and gravity sewers suspended from or attached to bridge or supported by above

grade structures shall be constructed of ductile iron pipe, AWWA 151 Class 50, with restrained or flanged joints. Fastening hardware shall be Type 316 stainless steel.

b. Subaqueous crossings of force mains and gravity sewers shall be ductile iron pipe, AWWA 151 Class 50, with restrained joints, within the limits as shown on the plans. Fastening hardware shall be Type 316 stainless steel.

c. All subaqueous pipe lines shall be pneumatically tested with compressed air for two hours under a pressure of 20 psi. All joints found to be leaking or otherwise defective shall be corrected and tests repeated until the system is proved tight. Thereafter the entire system shall be tested as specified in Section 6.

8. Materials:

a. Pipe for gravity sewer mains shall normally be Polyvinyl Chloride sewer pipe (ASTM D-3034, SDR 35).

b. Ductile iron pipe, AWWA 151, Class 50, shall be used where shown on the plans. Joints shall be of the type as specified in the special provisions, except as required in Section 7.

c. Sanitary force mains pressure sewers shall be polyvinyl chloride pipe, AWWA C-900, Class 100 (SDR 25) except as provided in Section 7 or as shown on the plans or specified in the Special Provisions.

d. Fittings incorporated into force mains shall be ductile iron, mechanical joint, and shall be coal tar pitch conforming to ASA A-21.5.

e. All "push-on" joints shall employ an "0-ring" type compression seal which insures a durable, permanent, water tight seal. Details of joints shall be submitted to the Engineer for approval prior to the incorporation of the pipe into the system.

f. Lubricant used in joining of the pipe sections shall conform to the pipe manufacturer's recommendations.

g. Manhole frames and covers shall be of uniform quality, free from blowholes, porosity, hard spots, cracks or other injurious defects. They shall be smooth and well cleaned and coated with coal tar pitch varnish. Castings shall conform to ASTM Specifications A48-43, latest revision, Class 30 iron or U.S. Government Specifications QQ1-652 latest revision, for gray iron. All castings shall be manufacturer true to pattern and with close fit of component parts. Round frames and covers in roadway and traffic areas shall have machined bearing surfaces so that fittings (parts) will not rattle or rock under traffic. Manhole frame and cover shall conform to Standard Detail No. WS-18.

9. Lift Stations:

a. Sewage lift stations shall be designed to accommodate the ultimate flow resulting from build-out at allowable density of the tract served by the station or stations.

b. Lift stations shall be constructed with a wet well capacity sufficient to accommodate the ultimate flow.

c. Phased development of a tract may require the installation of interior pumping equipment to preclude sepsis in the wet well.

d. Lift stations may be either factory-built ("Package") or completely constructed on site, and shall be limited to the following types:

(1) Wet well/dry pit installations, utilizing a minimum of two close-coupled centrifugal pumps.

(2) Submersible installations, utilizing a minimum of two submersible pumps installed on self-seating guide rail devices in the wet well.

e. All structural, mechanical and electrical components of sewage lift stations shall be of a type and manufacturer as approved by the Department of Public Works.

Section D - Restoration of Turf Areas

1. General: As soon as practicable after construction is completed, the Contractor shall restore all turf areas disturbed by construction or supportive operations to a condition at least equal to that existing prior to commencement of construction. Turf areas shall be seeded or sodded, as indicated on the plans or as specified in the Special Provisions.

2. Preparation: Prior to seeding or sodding, the affected area shall be cleared of all trash, debris, stones larger than one inch (1") in diameter, roots, brush, metal, wood and other extraneous matter. The surface shall be graded to conform, as closely as possible, to the grade existing prior to commencement of construction. After completion of fine grading, the soil shall be raked and scarified to result in a fine, friable texture.

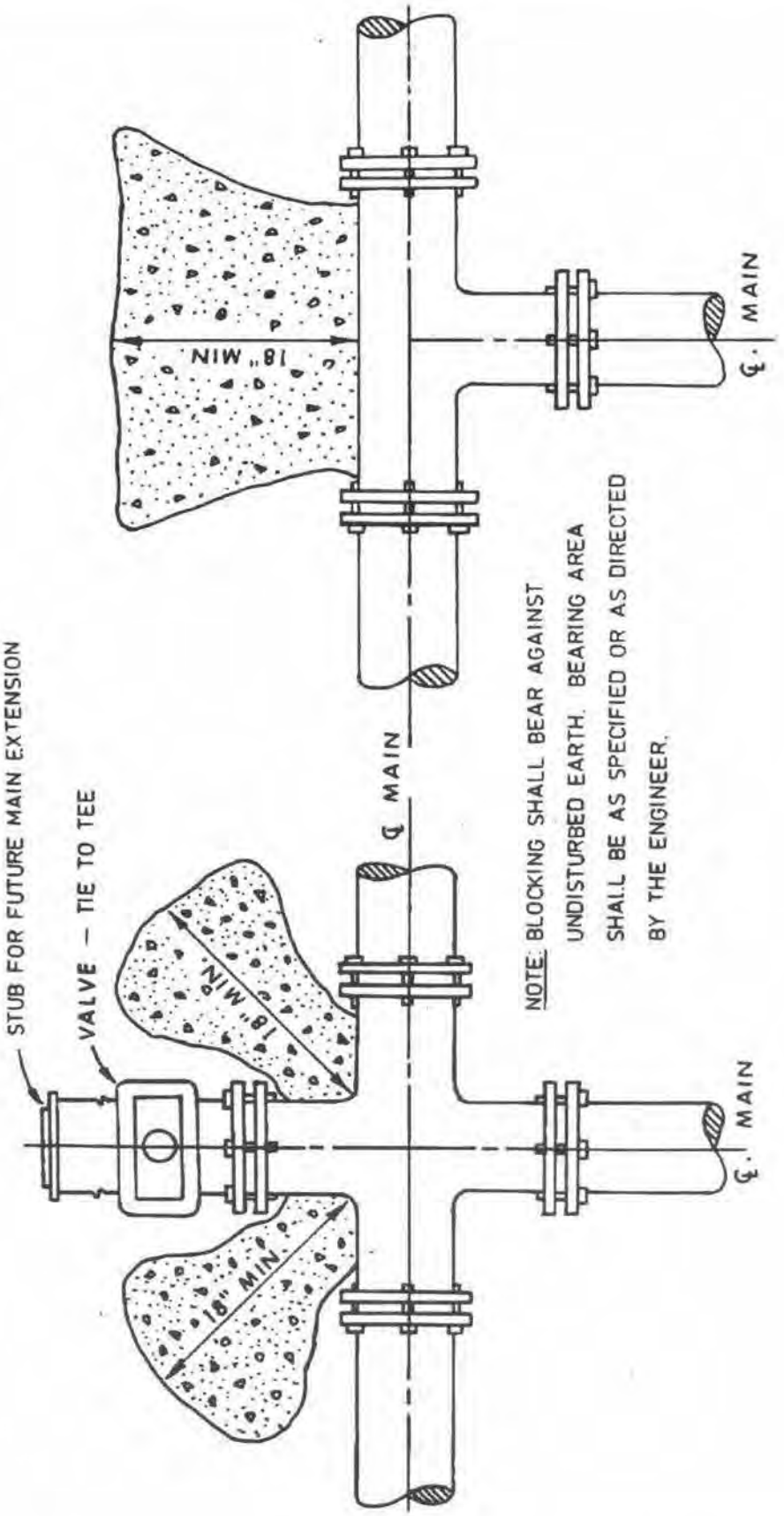
3. Seeding:
   a. Seed shall be Argentine Bahia (scarified), domestically grown and in compliance with current state and federal regulations regarding purity. Germination rate of all seed shall be not less than 65% and no seed with an excess of 5% weed seed shall be used. All seed shall be delivered to the job site in sacks plainly marked and certified as to content.
   b. Seed shall be sown with a mechanical spreader at a rate of application not less than 5 pounds per 1000 square feet. In the months of December, January and February, Annual Ryegrass, conforming to Paragraph 3.a above, shall be uniformly mixed with the above specified seed and sown at the rate of 2 pounds per 1000 square feet.
   c. After completion of seeding, all seeded areas shall be raked and rolled to satisfactorily cover seed, then thoroughly watered. The Contractor shall be responsible for supplemental watering and other necessary maintenance until a viable stand is established.

4. Sodding:
   a. The sod used shall be 97% weed free. It shall be nursery grown and well rooted. Sod shall be subject to review by the Engineer prior to being cut and again before it is laid. The consistency of adherent soil shall be such that it will not break, crumble, or tear during handling and placing of the sod. Each piece of sod shall be well covered with turf grass, shall be free from noxious weeds and other objectionable plants and shall not contain substances injurious to growth. The grass shall be mown to a length of not less than 1½ inches nor more than 4 inches before the sod is cut. All sod used shall comply with State and Federal laws with respect to inspection for plant diseases and insect infestation. An inspection certificate, required by law to this effect, shall accompany each shipment, and on arrival shall be filed with the Engineer. Sod shall be machine cut at a uniform soil thickness of 3/4 inch, plus or minus 1/4 inch, at the time of cutting. Measurement for thickness shall exclude top growth and thatch. Individual pieces of sod shall be cut to the supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be 5%. Broken pads and torn or uneven ends will not be acceptable. Standard size sections of sod shall be strong enough to support their own weight and retain their size and shape when suspended vertically from a firm grasp on the upper 10% of the section. Sod shall not be harvested, or transplanted when moisture content (excessively dry or wet) may adversely affect its survival. Sod shall be harvested, delivered and installed within a period of 18 hours.
   b. Sod shall be placed when the ground is in a workable condition and temperatures are less than

90 degrees Fahrenheit. Sod shall not be placed during extended drought, unless irrigation is available. Sod shall be in a moist condition at the time of cutting and shall be kept in a moist condition until it is placed. Any sod that has dried out will be rejected and shall be immediately removed from the job site by the Contractor. All sod shall be transported in either a closed van or in open truck properly covered. All sod shall be kept moist and protected from exposure to sun, wind and freezing prior to placing. During periods of high temperature and after all unevenness in the solid surface has been corrected, the soil shall be lightly irrigated immediately prior to laying the sod. The first row of sod shall be laid in a straight line with subsequent rows placed parallel to and tightly against each other. Lateral joints shall be staggered to promote more uniform growth and strength. Care shall be exercised to insure that the sod is not stretched or overlapped and that all joints are butted right in order to prevent voids which would cause air drying of the roots. In ditches, the sod shall be placed with the longer dimension parallel to the contours of the ground. The exposed edge of the sod shall be buried flush with the adjacent sod. On slopes where the sod may be displaced during sodding operations, the workmen shall work from ladders or treaded planks. The sod shall be staked on all slopes of 2:1 or steeper. Sod shall be staked with not less than 4 stakes per square yard with at least one stake for each piece of sod. Stakes shall be of lath or similar material, pointed, and driven with the flat side against the slope, 5 inches into the ground, leaving approximately 1/2 inch of the top above the ground.

c. The Contractor shall water sod immediately after installation to prevent excessive drying during progress of the work. As sodding is completed in any one section, the entire area shall be rolled. It shall then be thoroughly irrigated to a depth sufficient that the underside of the new sod pad and soil immediately below the sod are thoroughly wet. The Contractor shall be responsible for supplemental watering and other necessary maintenance until the sod is integrally established.

5. Clean Up: Surplus and waste materials resulting from seeding and sodding operations shall be removed from the site and disposed of by the Contractor at his expense. All paved areas shall be thoroughly cleaned of soil and debris.

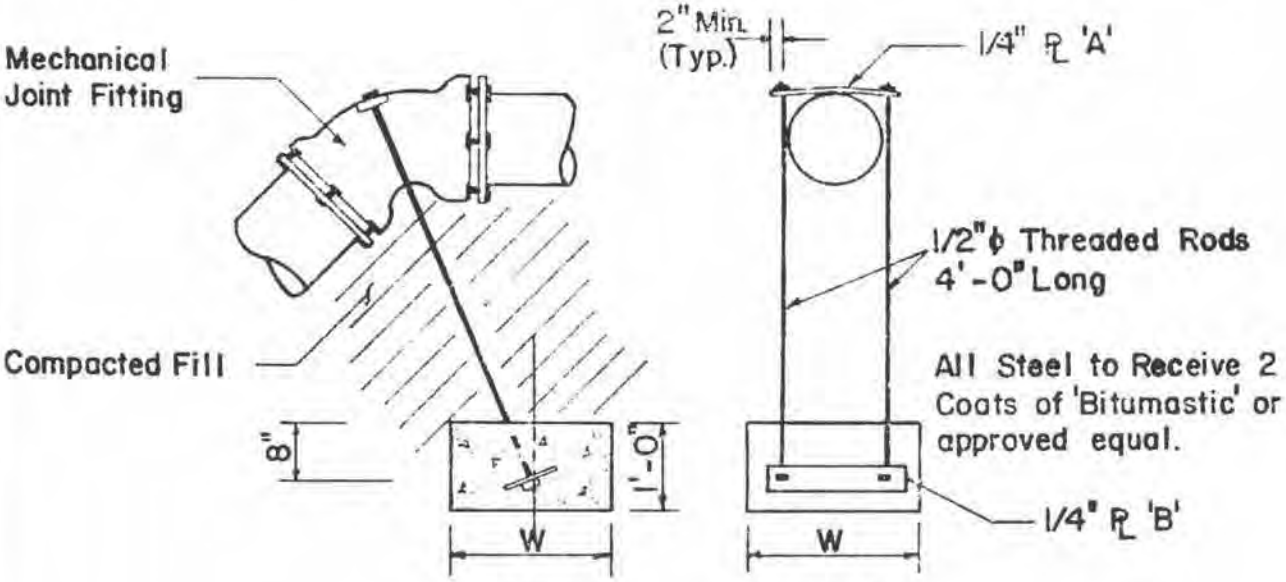


CITY OF SARASOTA

THRUST BLOCKING FOR PRESSURE MAINS

Fig. WS - 1

NOTE ALL ANCHORING HARDWARE TO BE GALVANIZED STEEL

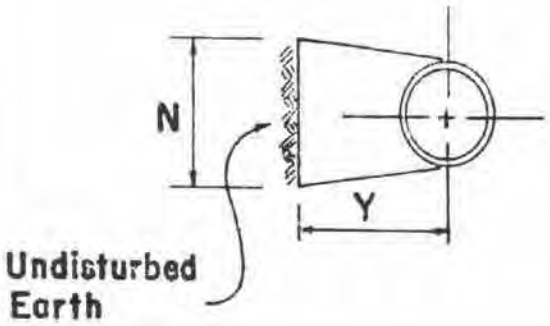


ELEVATION SECTION

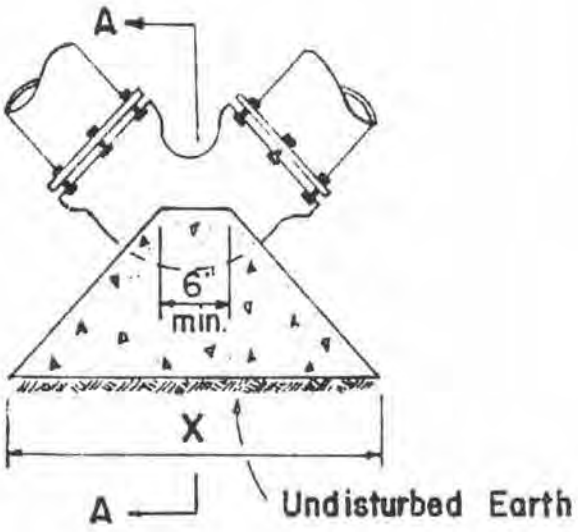
(FOR VERTICAL CREST BEND ON PRESSURE SEWERS)

BUTTRESSES OF GREATER DIMENSIONS MAY BE REQUIRED AS DIRECTED BY THE ENGINEER IS SOIL BEARING VALUE IS DEEMED INSUFFICIENT TO EMPLOY THE BELOW DIMENSIONS.

MAIN DIAMETER	"W"	PLATE "A"		PLATE "B"	
		LENGTH	WIDTH	LENGTH	WIDTH
4" or less	1'-2"	10"	4"	10"	4"
6"	1'-4"	1'-0"	4"	1'-0"	5"
8"-10"	1'-8"	1'-4"	4"	1'-4"	6"
12"	2'-0"	1'-6"	4"	1'-6"	8"



SECTION 'A-A'

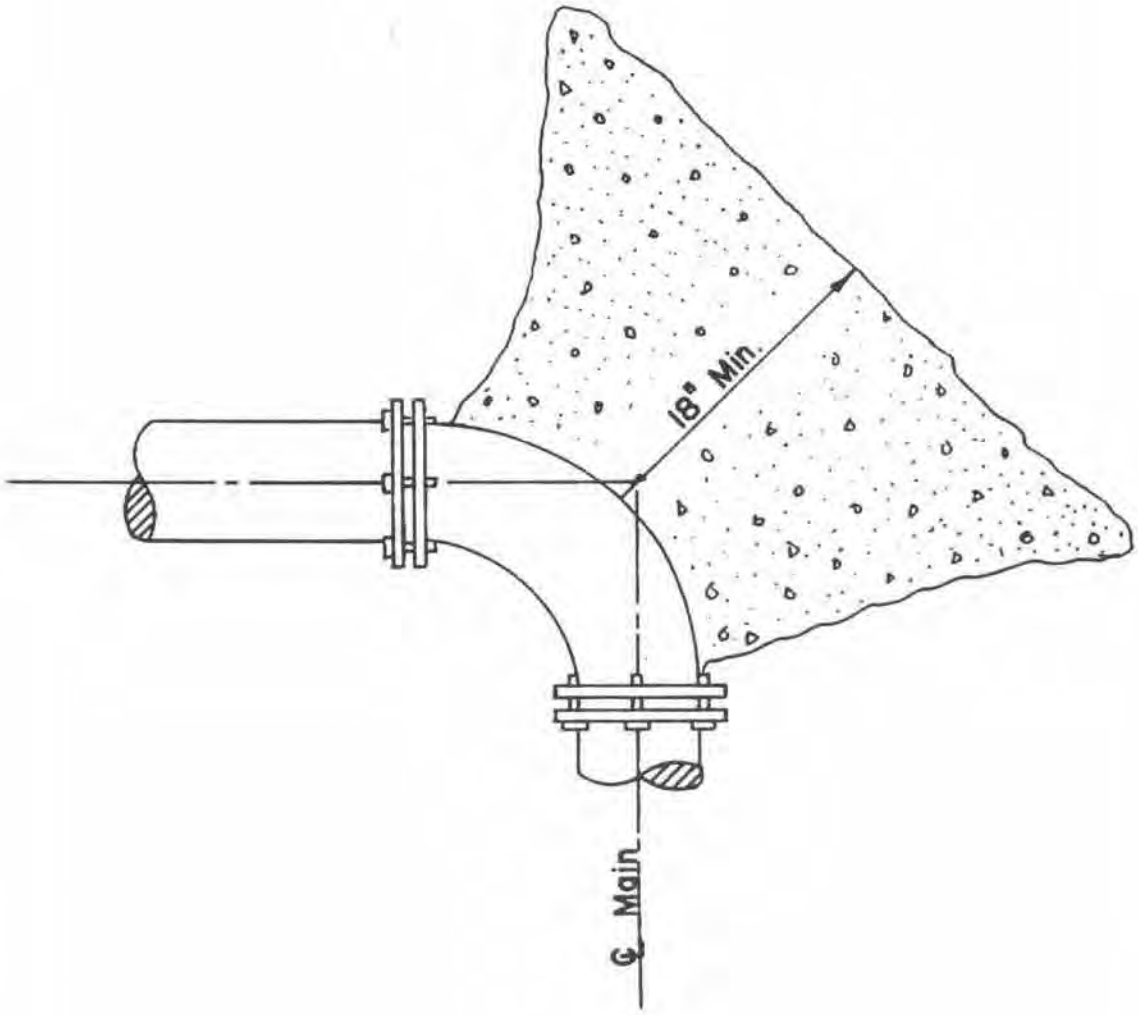


PLAN

NOTE: Buttresses of greater dimensions may be required as directed by the Engineer if soil bearing value is deemed insufficient to employ the below dimensions.

SIZE	BEND	MINIMUM DIMENSION		
		X	Y	Z
4" or less	90°	1'-0"	1'-6"	1'-0"
	45° or less	1'-0"	1'-6"	1'-0"
8" - 10"	90°	1'-6"	1'-6"	1'-3"
	45° or less	1'-0"	1'-6"	1'-3"
12"	90°	2'-0"	1'-6"	1'-6"
	45° or less	1'-6"	1'-6"	1'-6"

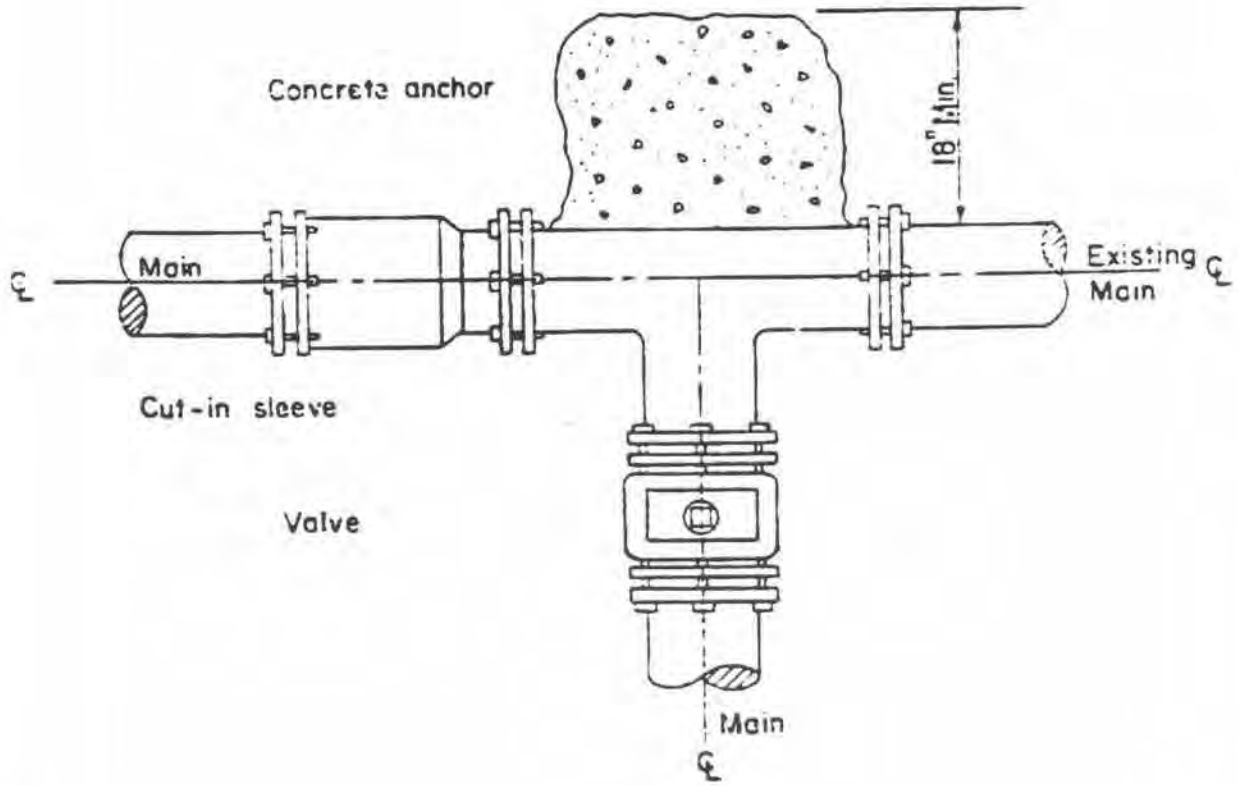
NOTE: BLOCKING SHALL BEAR AGAINST UNDISTURBED EARTH. BEARING AREA SHALL BE AS SPECIFIED OR AS DIRECTED BY THE ENGINEER.



CITY OF SARASOTA

90° BEND BUTTRESS DETAIL

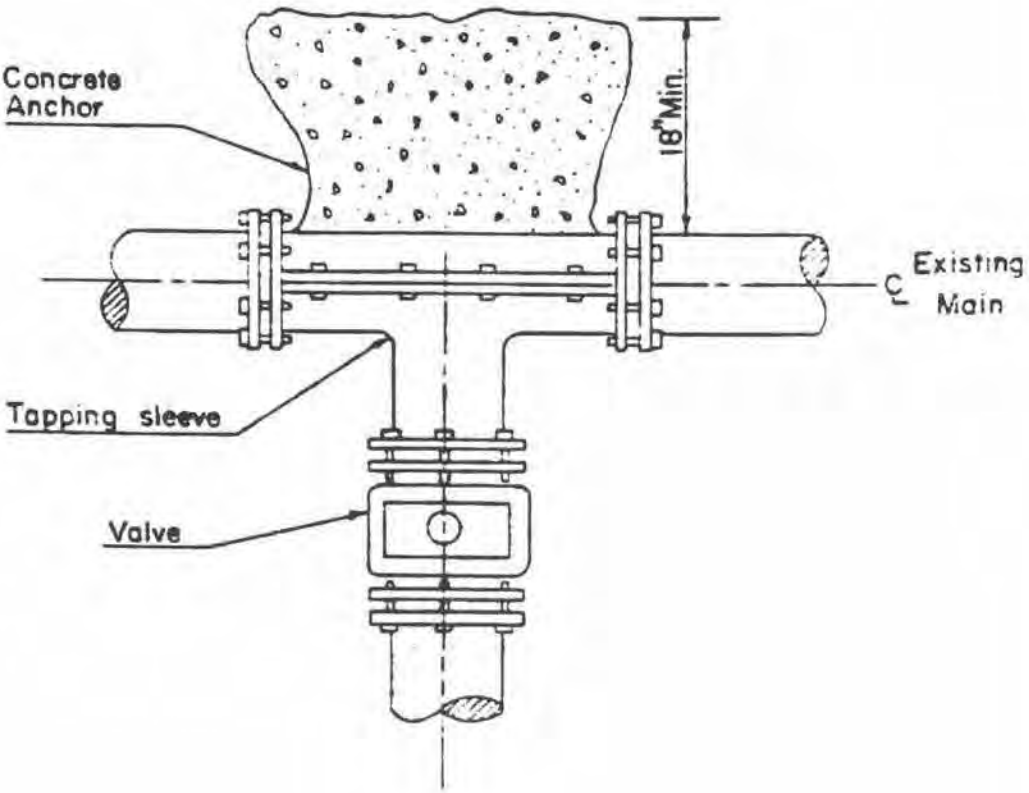
Fig. WS - 4



CITY OF SARASOTA

TYPICAL CUT-IN SLEEVE AND FITTING

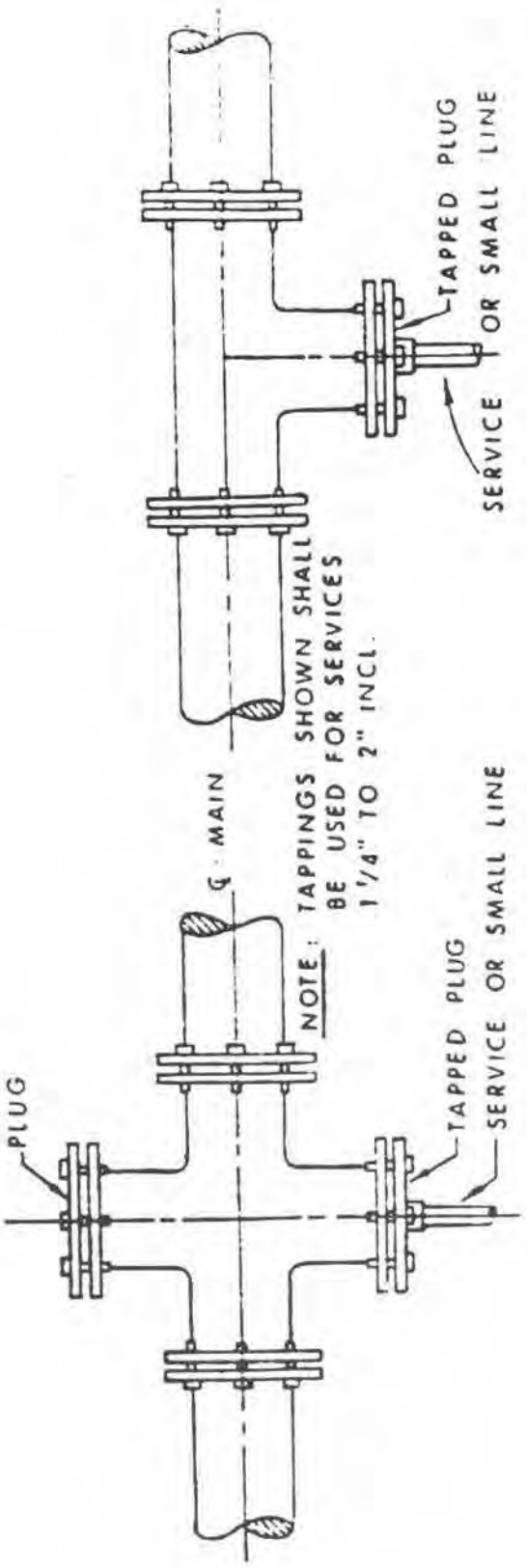
Fig. WS - 5



CITY OF SARASOTA

TYPICAL TAPPING SLEEVE AND VALVE

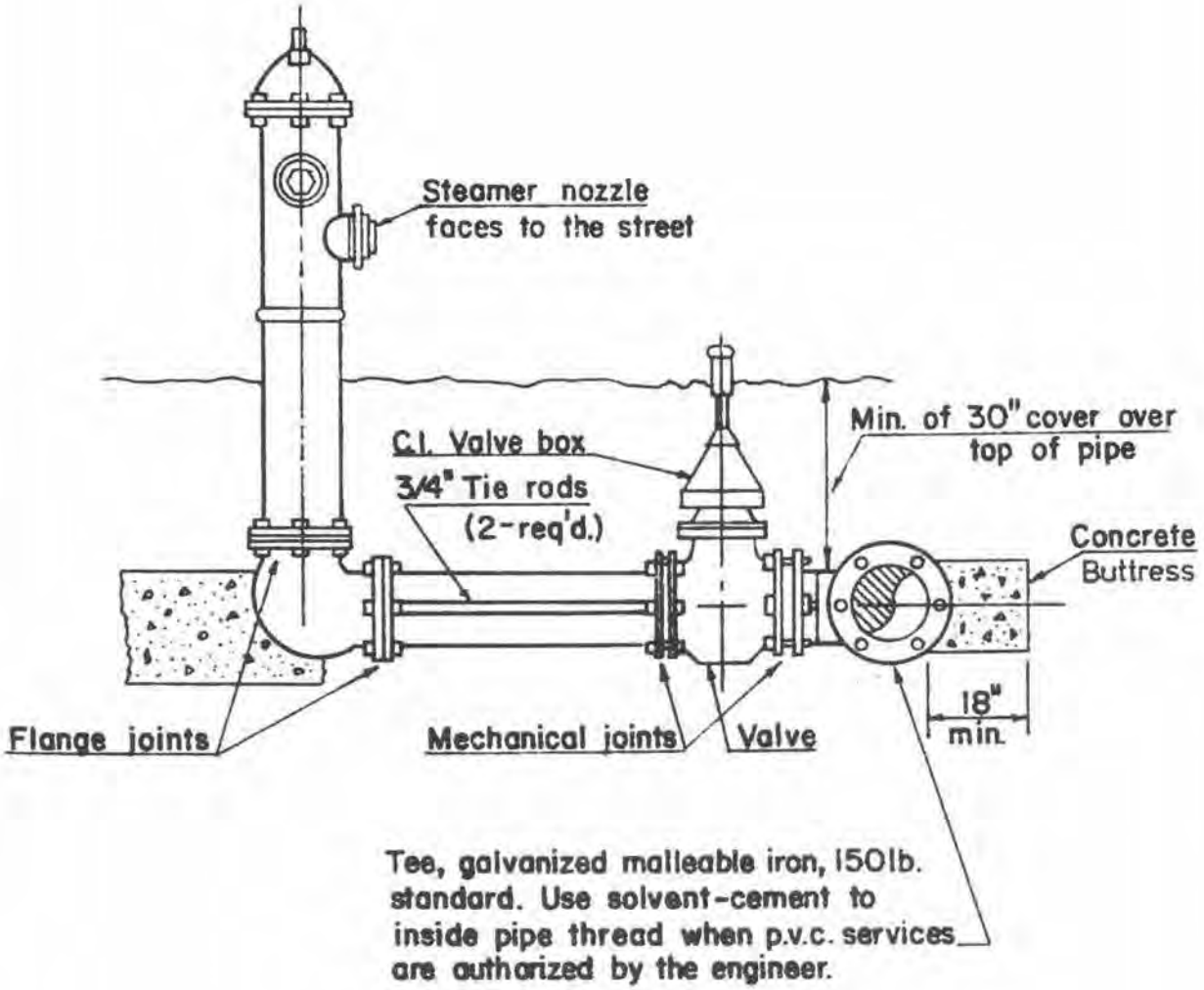
Fig. WS - 6



CITY OF SARASOTA

DETAILS FOR CONNECTIONS TO MAINS

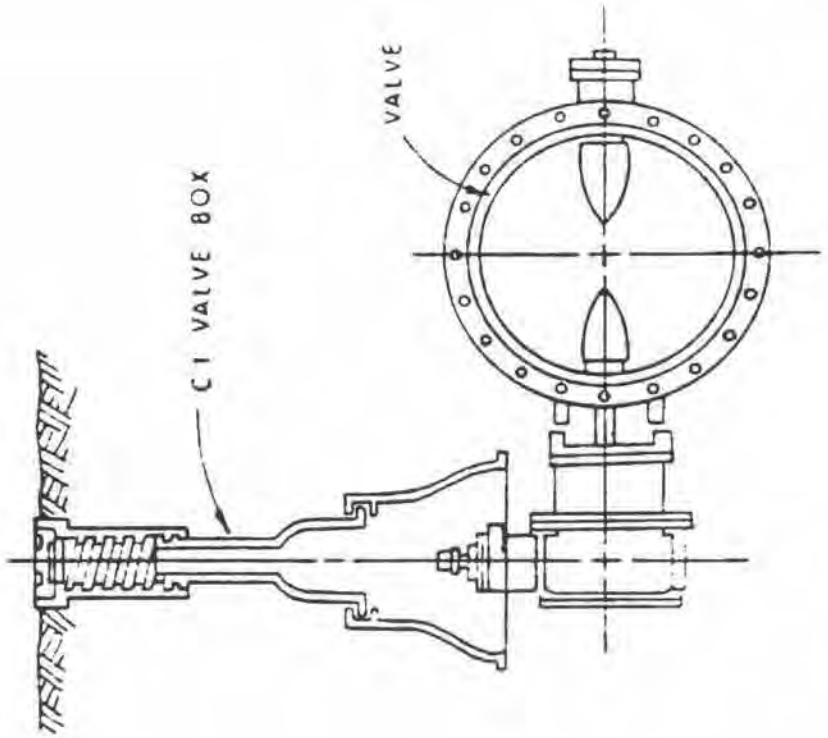
Fig. WS - 7

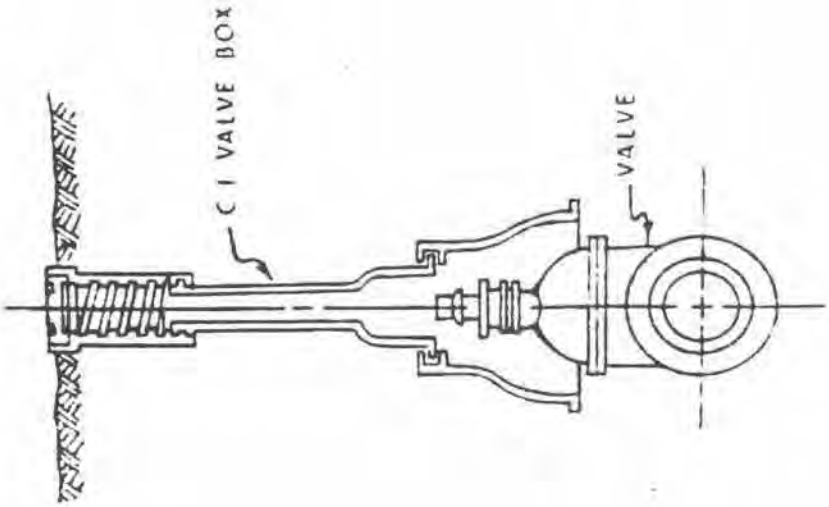


CITY OF SARASOTA

TYPICAL HYDRANT AND AUXILARY GATE VALVE

Fig. WS - 8

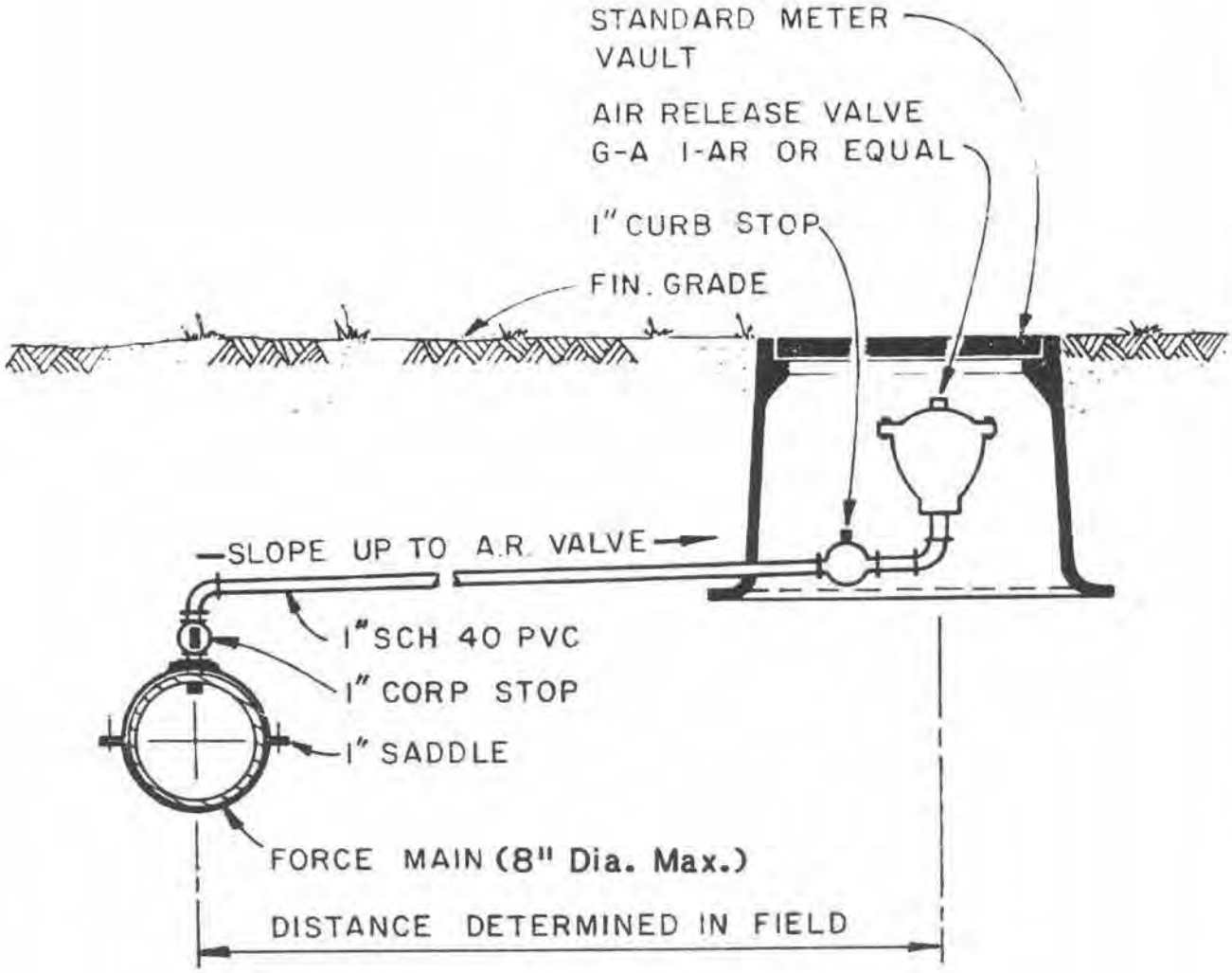




CITY OF SARASOTA

TYPICAL C.I. VALVE BOX & BUTTERFLY VALVE

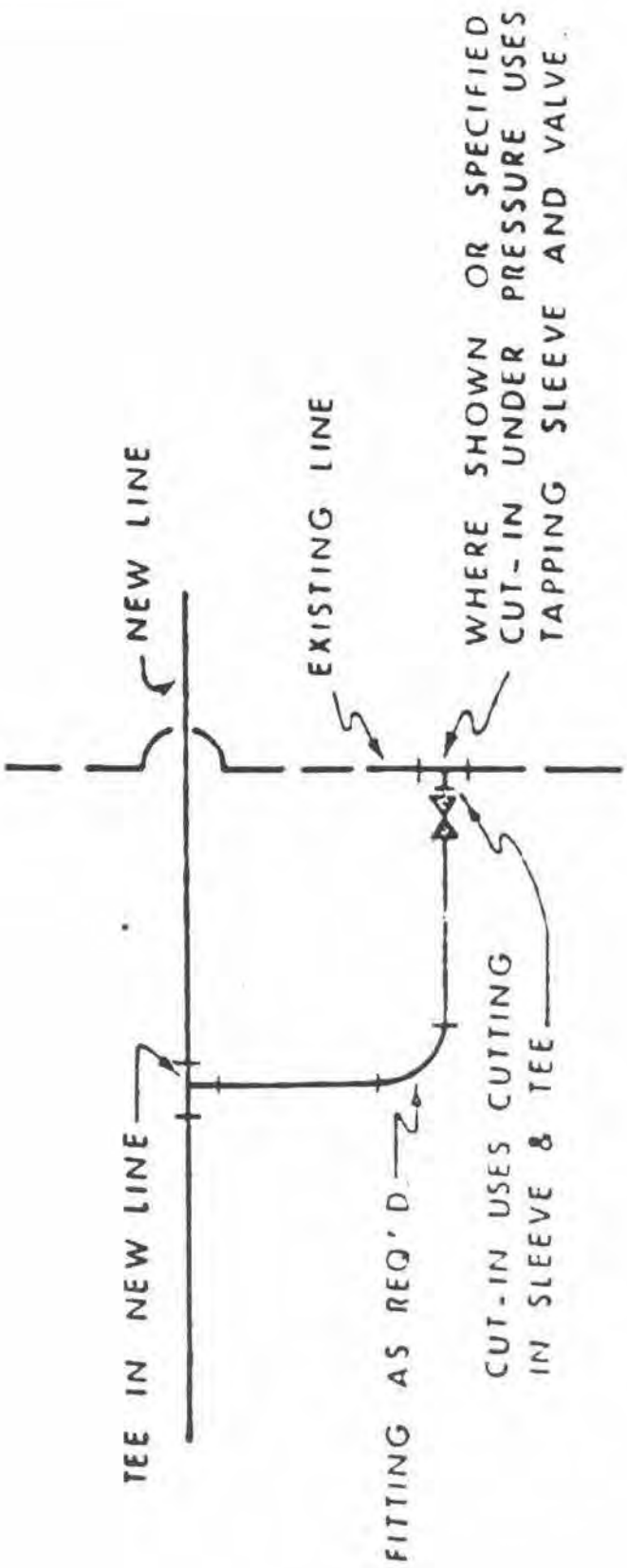
Fig. WS - 9



CITY OF SARASOTA

AIR RELEASE VALVE INSTALLATION

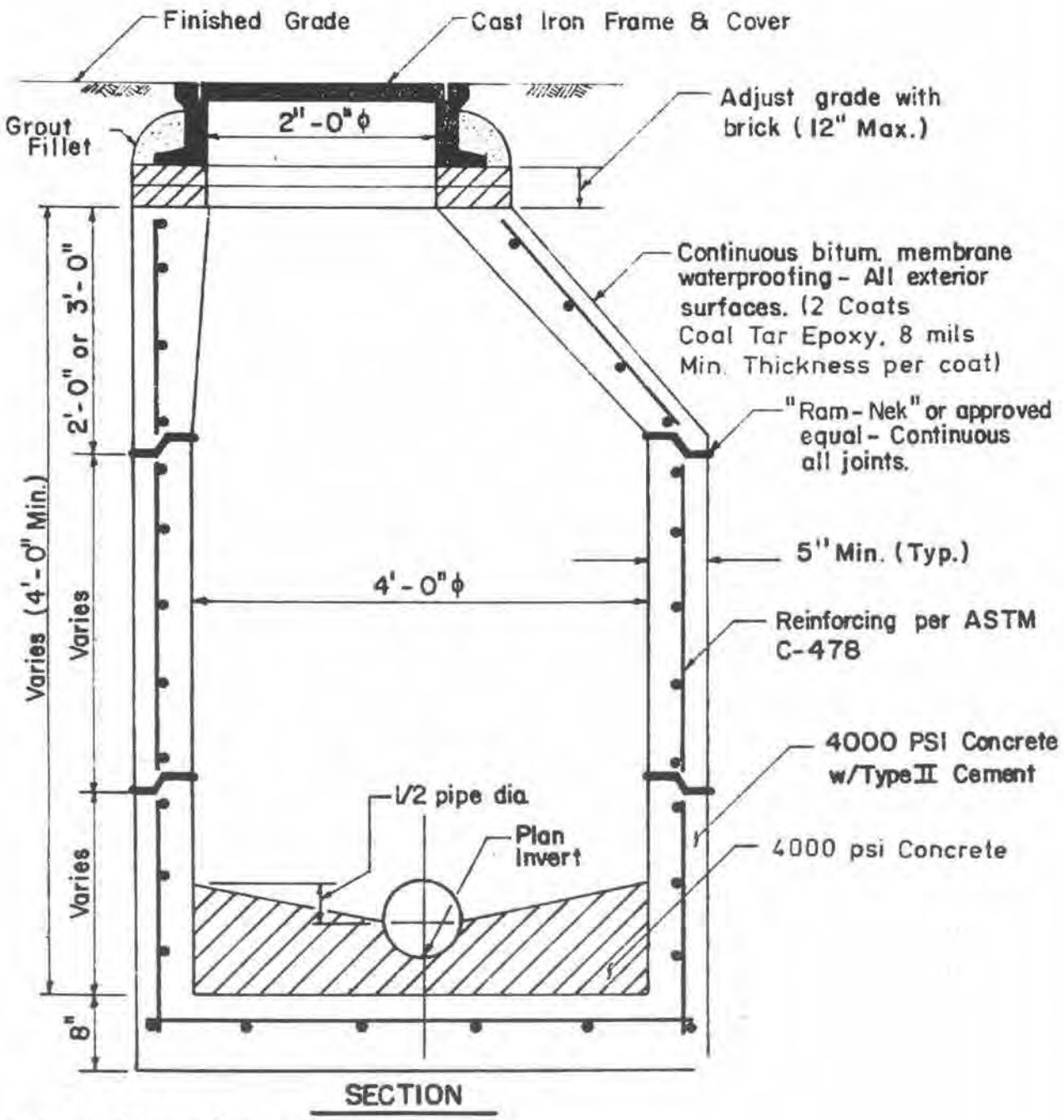
Fig. WS - 10



CITY OF SARASOTA

TYPICAL CONNECTION TO EXISTING LINE

Fig. WS - 11



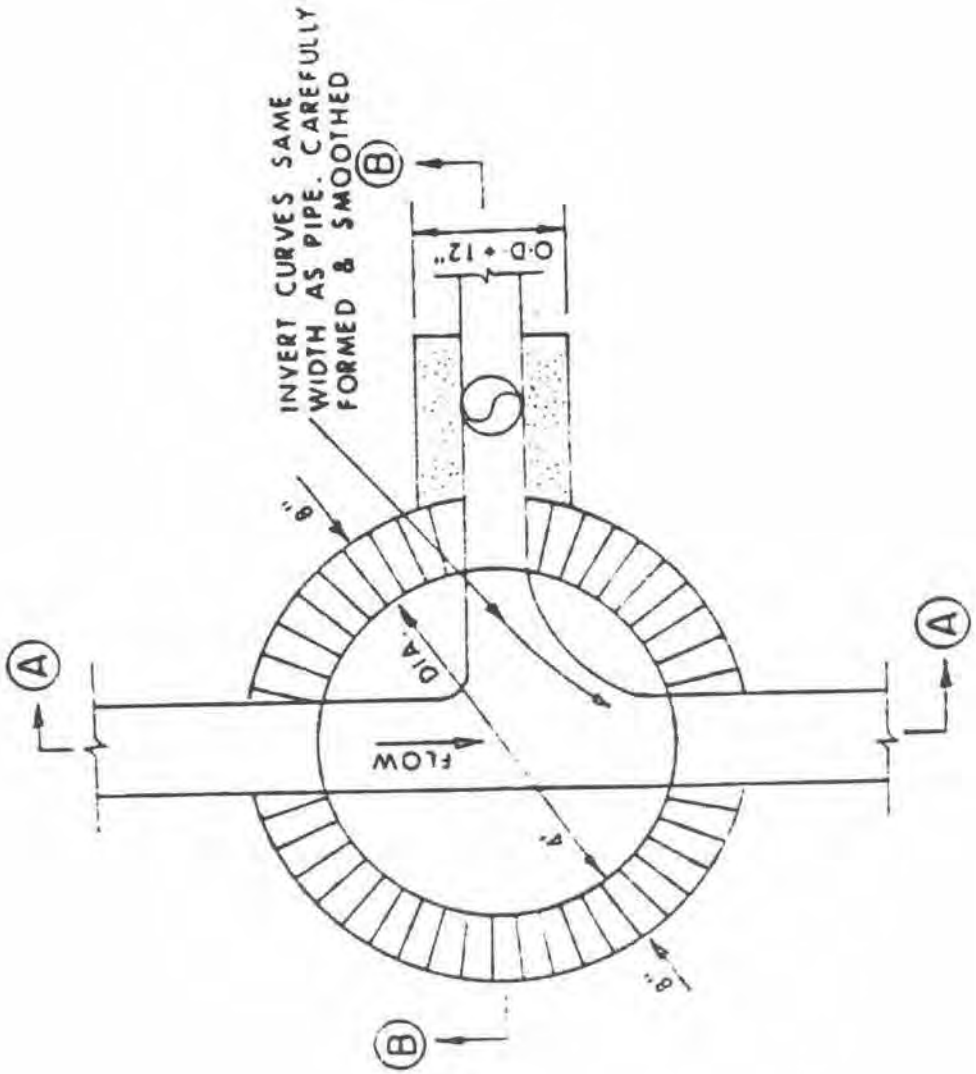
SECTION

Note: All pipe openings to be pipe O.D.+2". After pipe is set, caulk opening with "Embeco" grout or approved equal.

CITY OF SARASOTA

STANDARD MANHOLE (TYPE 'A')

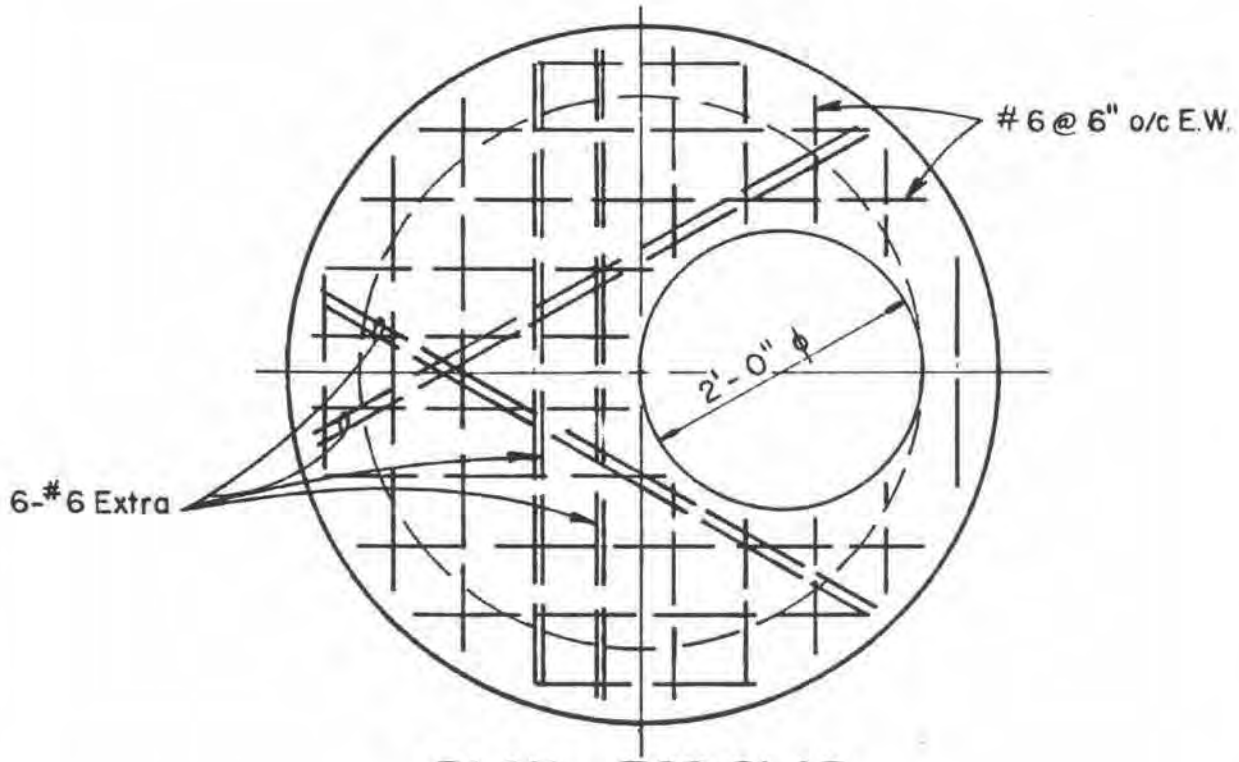
Fig. WS - 12



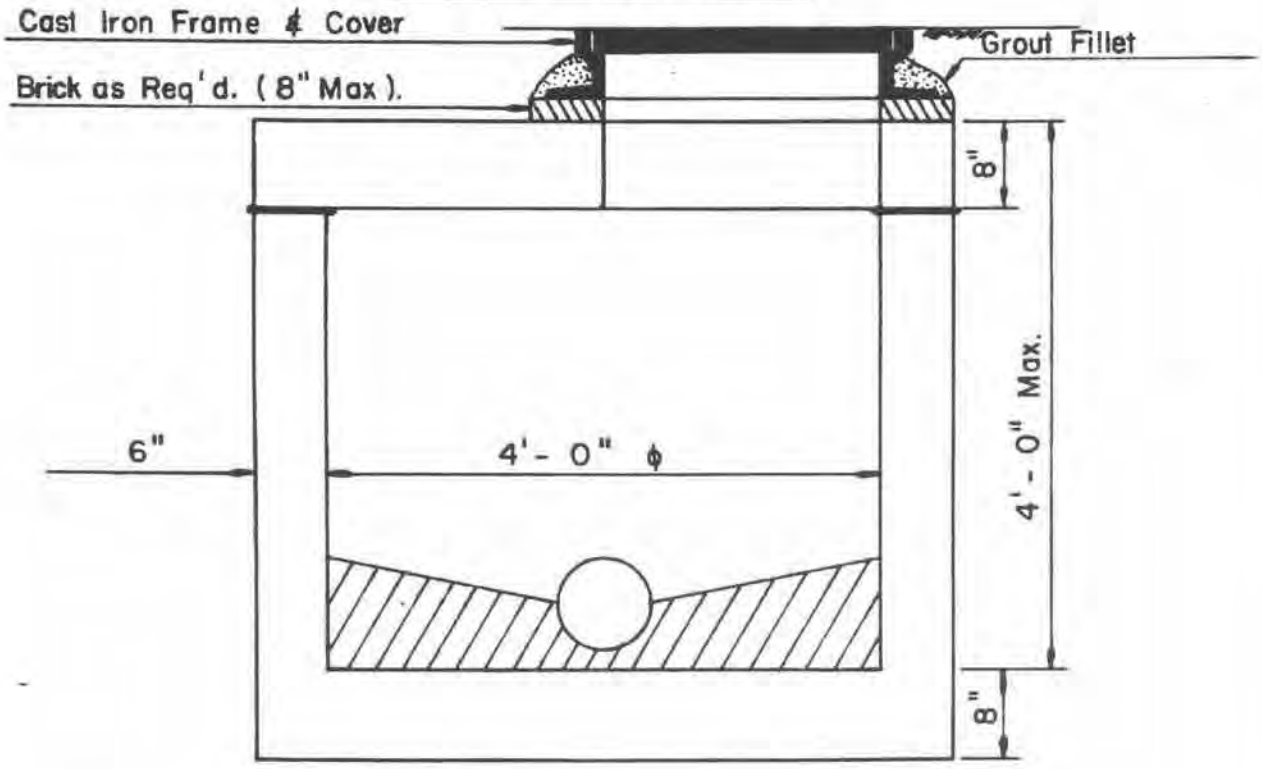
CITY OF SARASOTA

STANDARD MANHOLE (TYPE 'A') PLAN VIEW

Fig. WS - 13



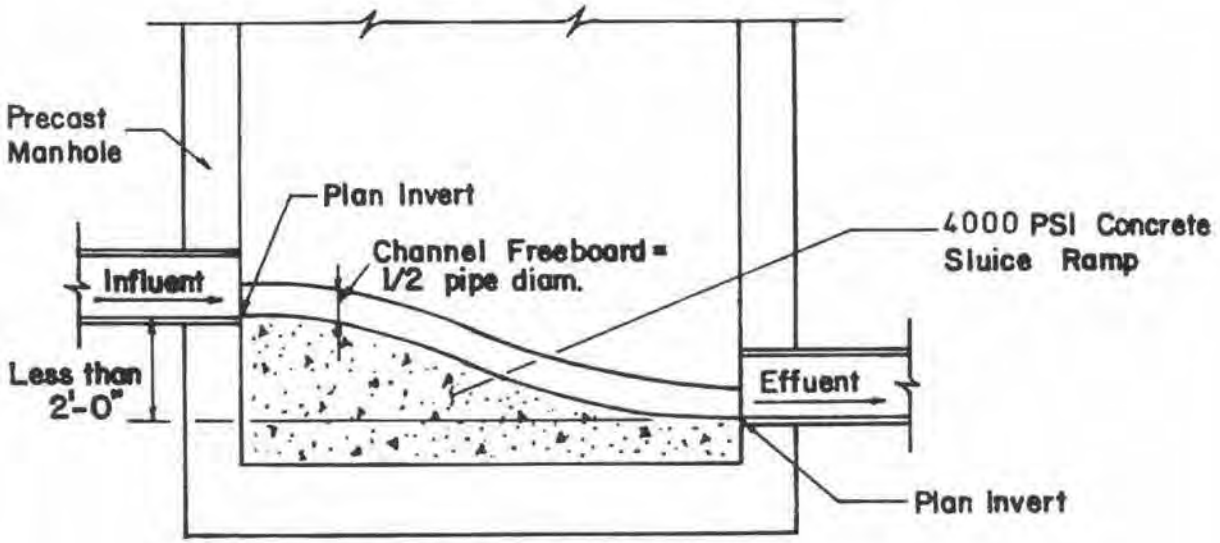
PLAN - TOP SLAB



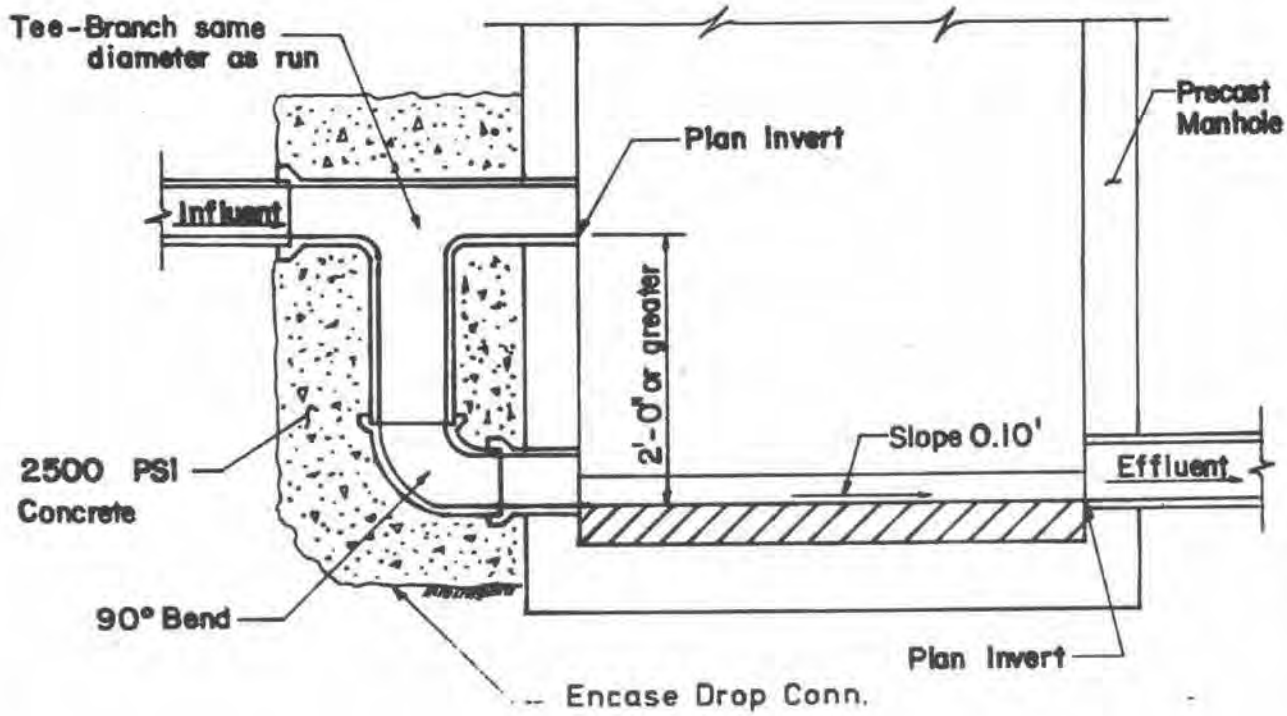
CITY OF SARASOTA

SHALLOW MANHOLE (TYPE 'B')

Fig. WS - 14



SECTION - TYPE 'A'

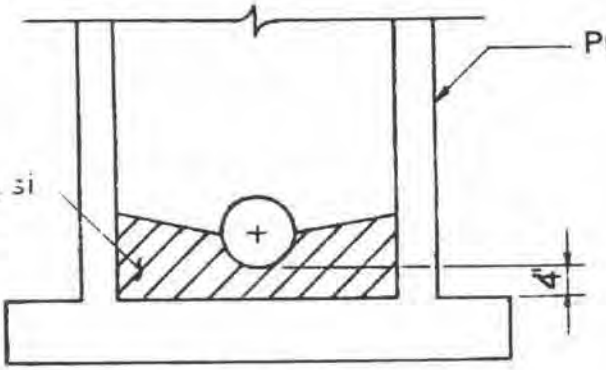


SECTION — TYPE 'B'

CITY OF SARASOTA

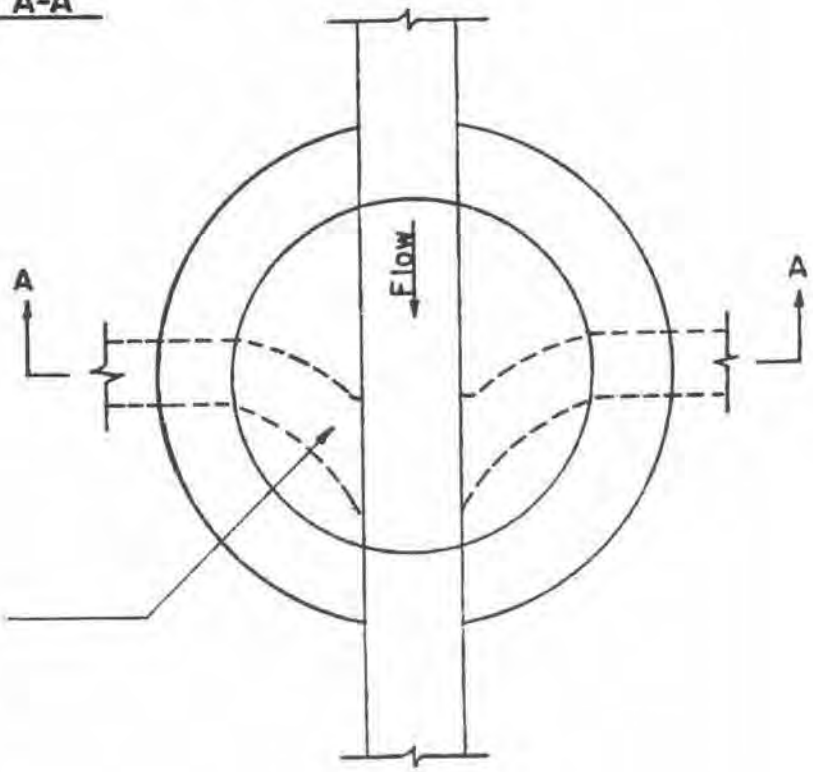
DROP CONNECTIONS

Fig. WS - 15



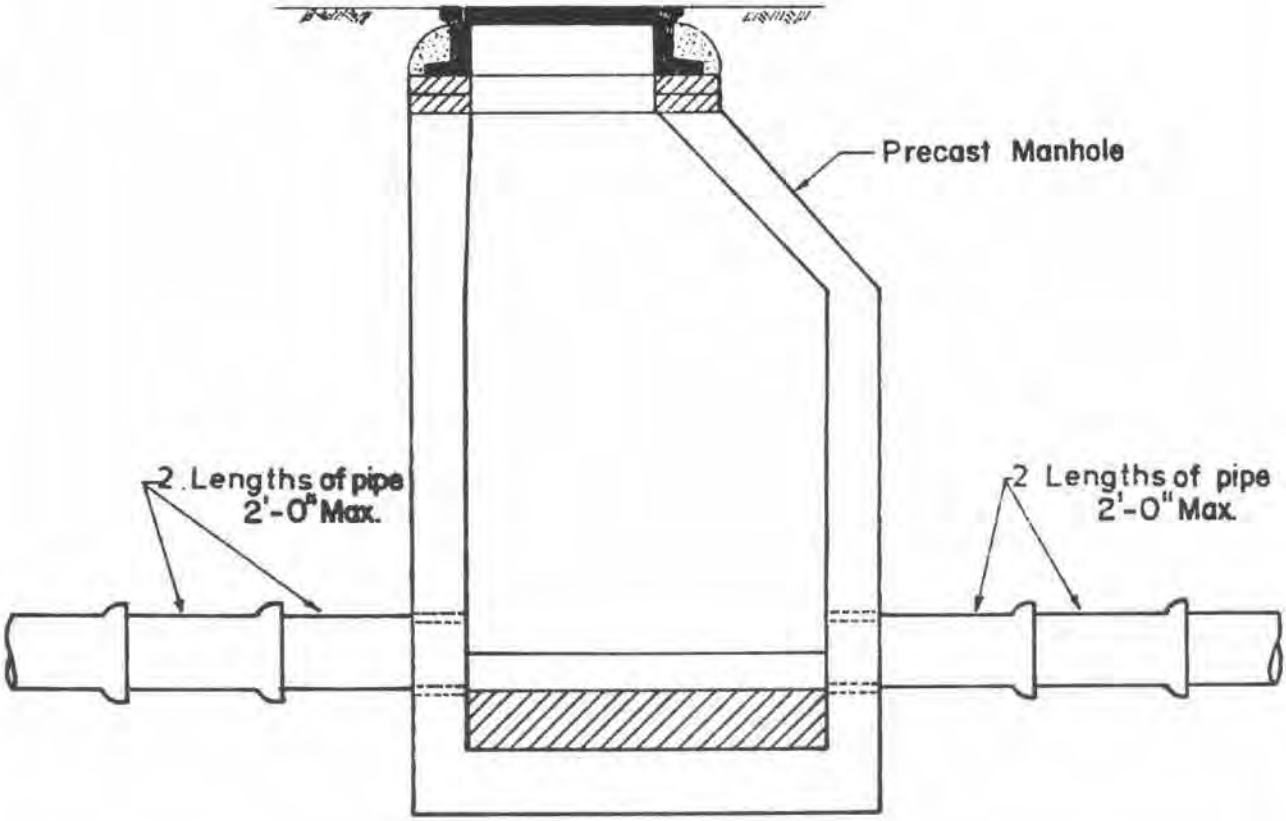
Note: Brick shall be laid on edge with exposed mortar joints not more than 1/4". Sectional radius of channel shall approximate that of pipe.

SECTION 'A-A'



Form Channels for Directional changes or intersecting sewers as required. Construct to maximum practicable radius.

PLAN



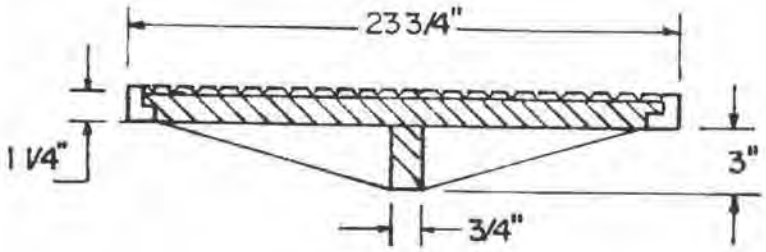
SECTION

(FOR USE WHERE PROPRIETARY MANHOLE OPENING GASKETS ARE NOT USED)

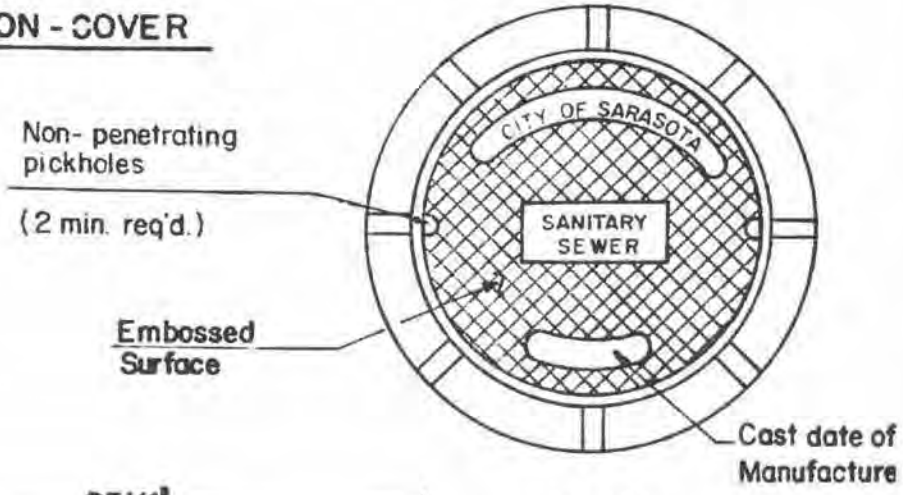
CITY OF SARASOTA

CONNECTION AT MANHOLE

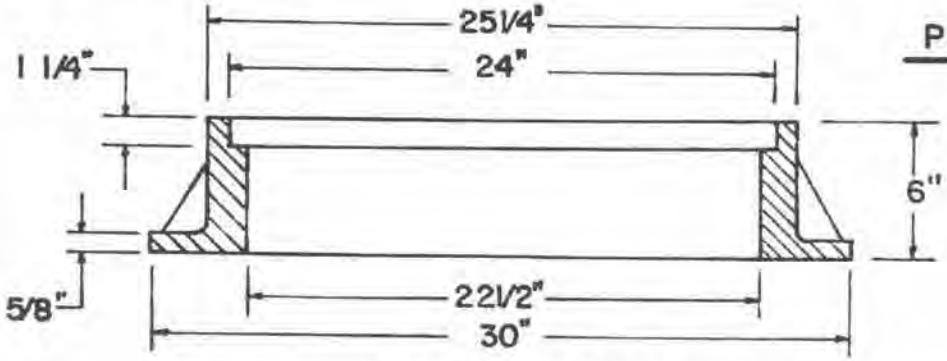
Fig. WS - 17



SECTION - COVER

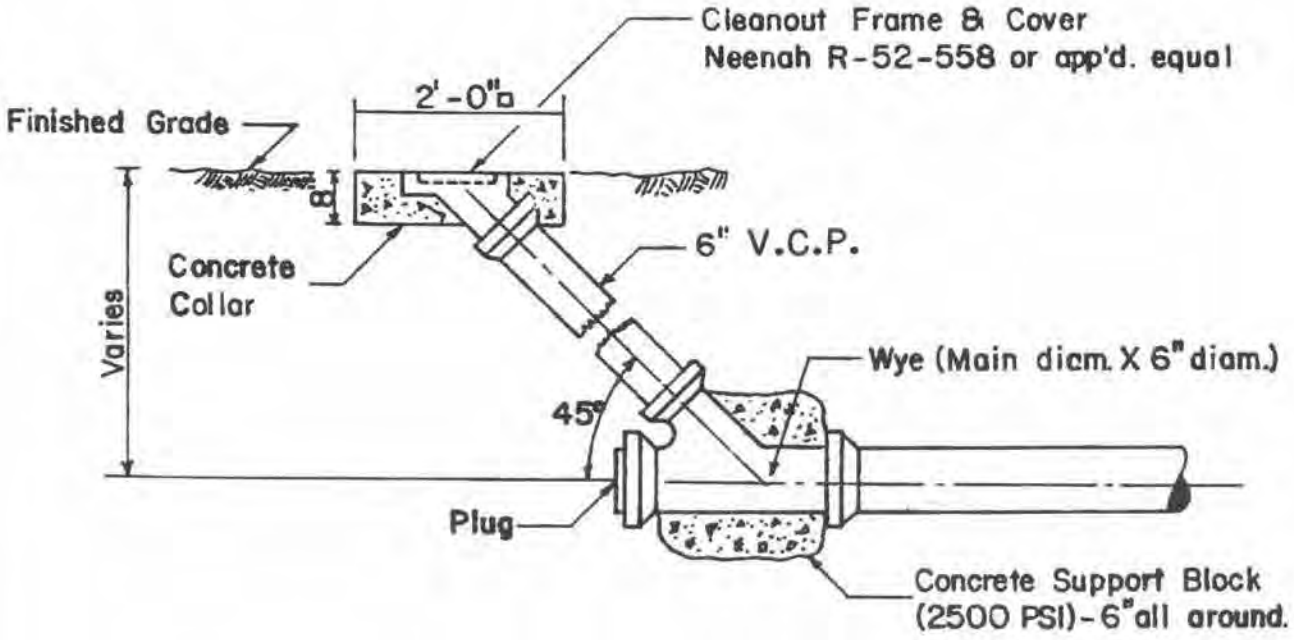


PLAN



SECTION - FRAME

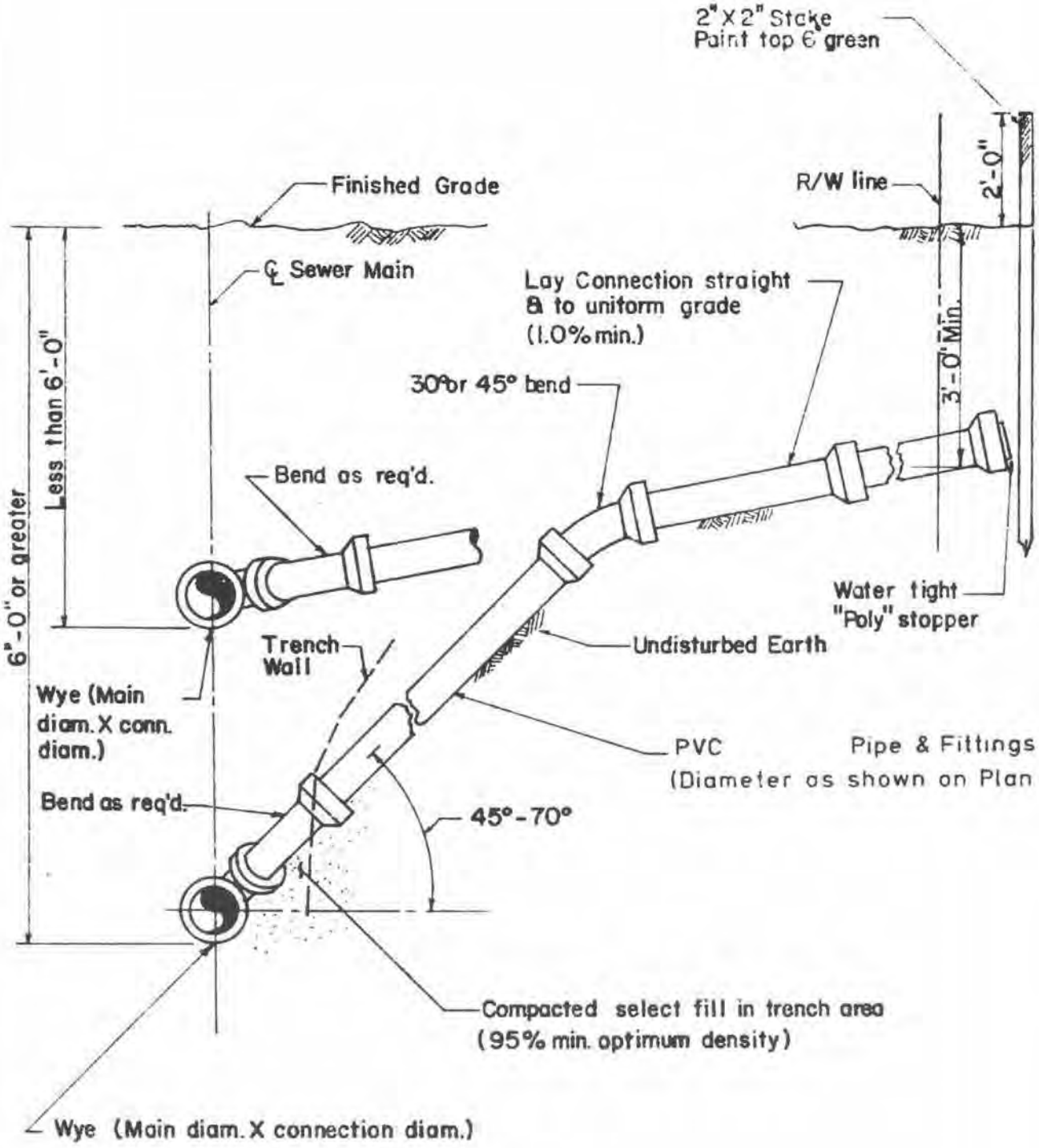
NOTES:
1. Castings shall be of gray cast iron conforming to applicable requirements of ASTM. specification A-48 (latest edition).
2. Format of cover lettering may vary according to manufacturer's pattern.
3. Nominal weights: Frame - 180 lbs., Cover - 165 lbs.



CITY OF SARASOTA

LAMPHOLE

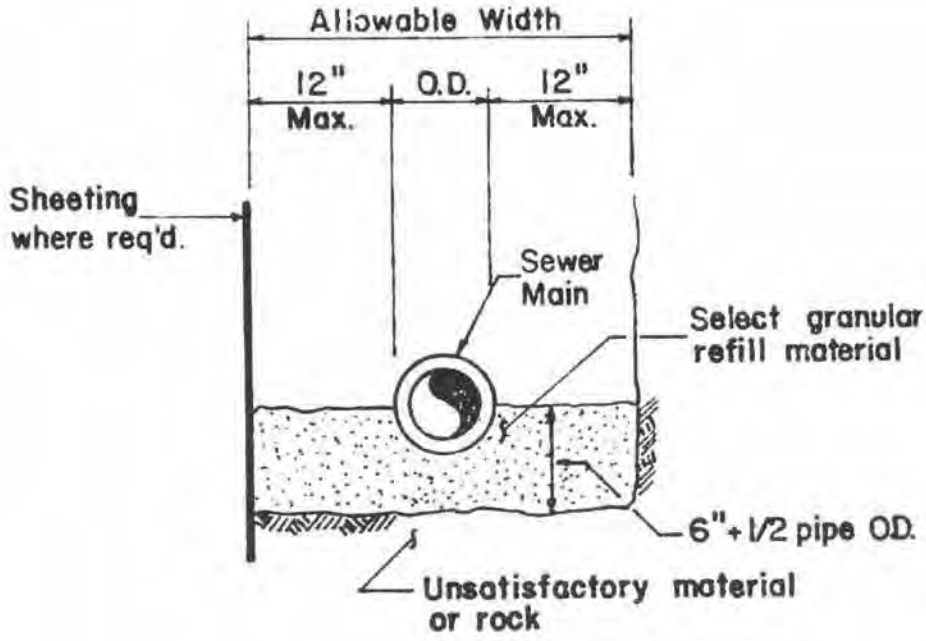
Fig. WS - 19

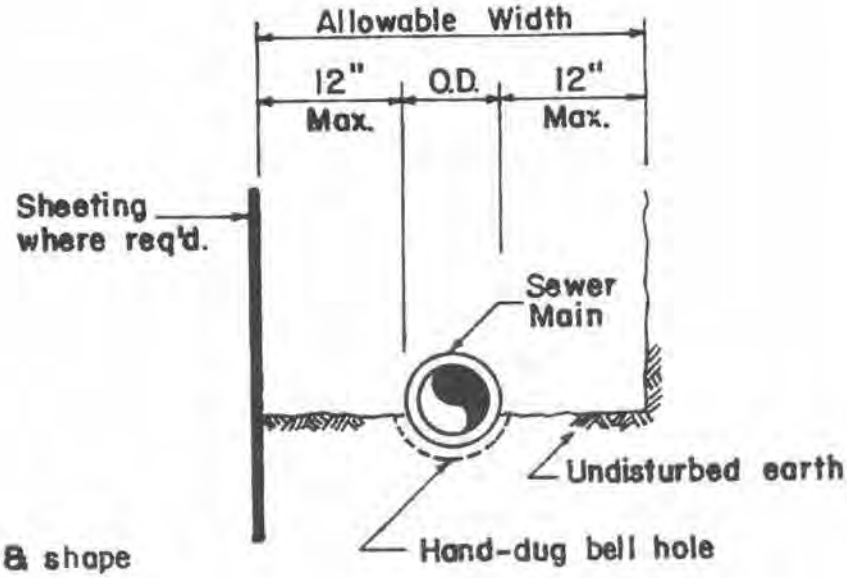


CITY OF SARASOTA

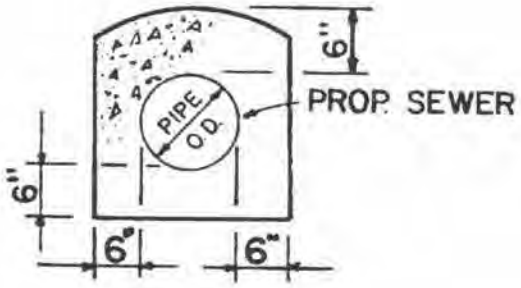
TYPICAL BUILDING CONNECTION

Fig. WS - 20

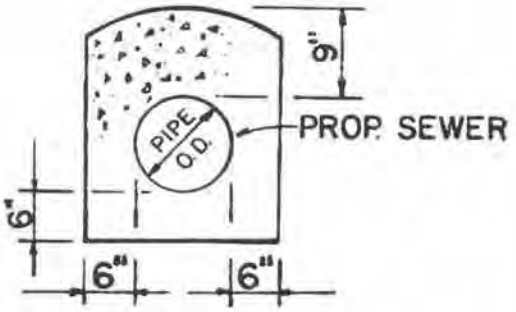




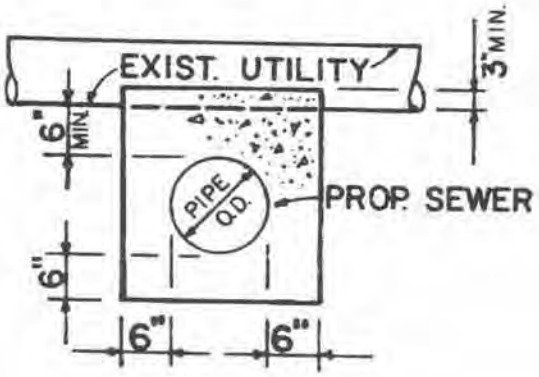
Hand-excavate & shape trench bottom 1/3 of pipe diameter.



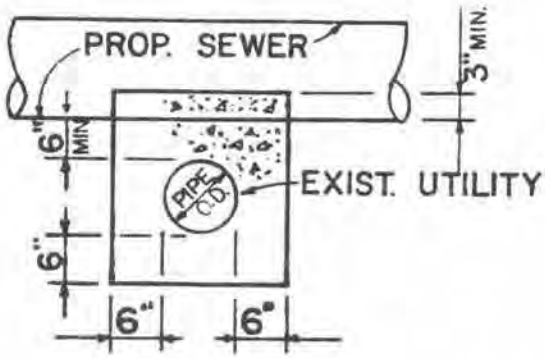
TYPE 'A'



TYPE 'B'



TYPE 'C'



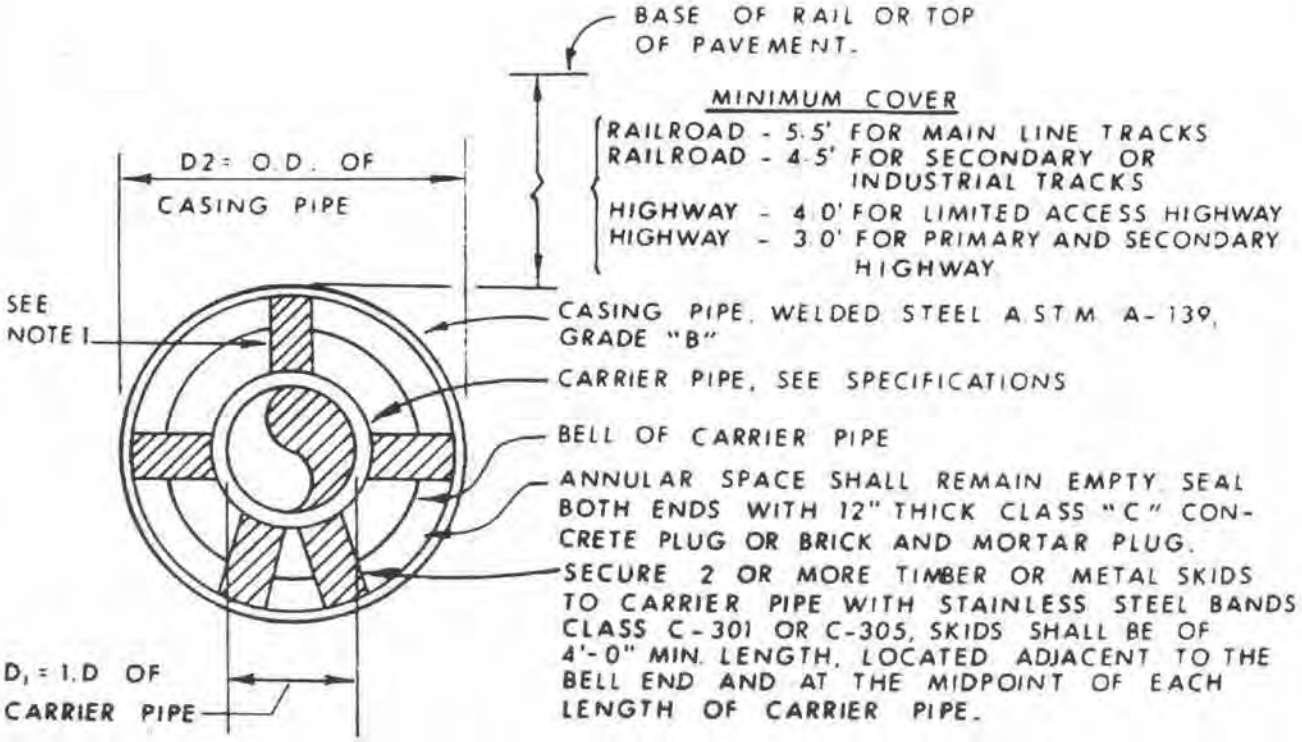
TYPE 'D'

NOTE: ALL CONCRETE 2500 P.S.I. @ 28 DAYS.

CITY OF SARASOTA

ENCASEMENT DETAILS

Fig. WS - 22



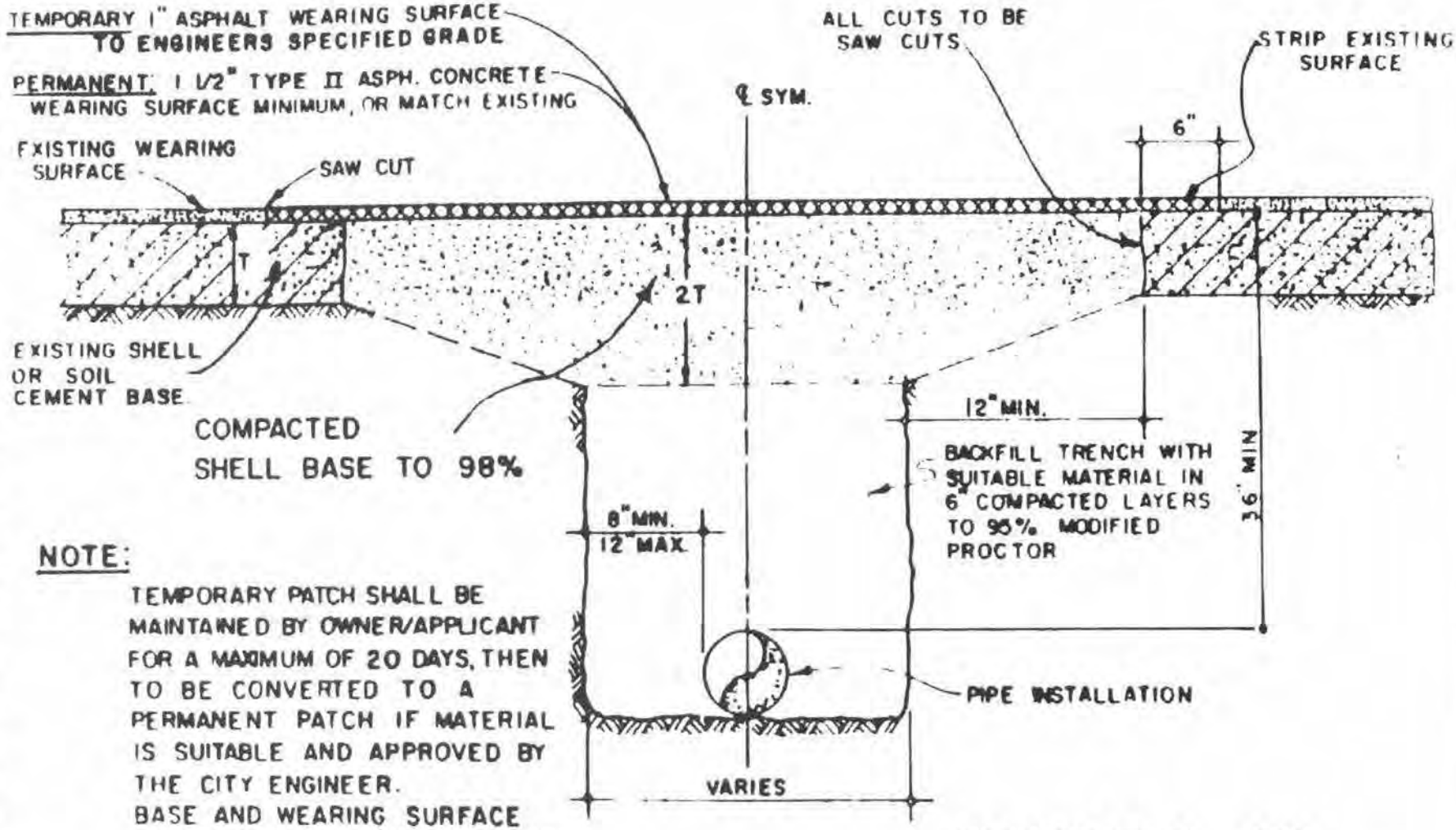
CASING PIPE-MINIMUM SIZE AND WALL THICKNESS										
CARRIER PIPE NOM. DIA (D_1)	4	6	8	10	12	14	16	18	20	24
CASING PIPE MIN NOM. DIA (D_2)	12	16	18	20	24	30	30	30	36	36
CASING PIPE MIN. WALL THICKNESS - INCHES (NOT CATHODICALLY PROTECTED)	.281	.281	.312	.344	.406	.469	.469	.469	.562	.562

NOTES

1.- IN ADDITION TO THE SUPPORT ARRANGEMENT OF TIMBER OR METAL SKIDS, THE CONTRACTOR SHALL PROVIDE 4 FOOT LG. SKIDS FOR EACH LENGTH OF CARRIER PIPE AT THE SPRING LINE AND ON TOP, ADJACENT TO THE BELL END OF THE PIPE DESIGNED TO PREVENT LATERAL OR VERTICAL DISPLACEMENT.

2.- ROTATION OF CARRIER PIPE INSIDE THE CASING PIPE WILL NOT BE PERMITTED.

3.- THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS OF CASING AND CARRIER PIPE INSTALLATION PROPOSED FOR APPROVAL PRIOR FABRICATION OF PIPING, CASING AND APPURTENANCES.

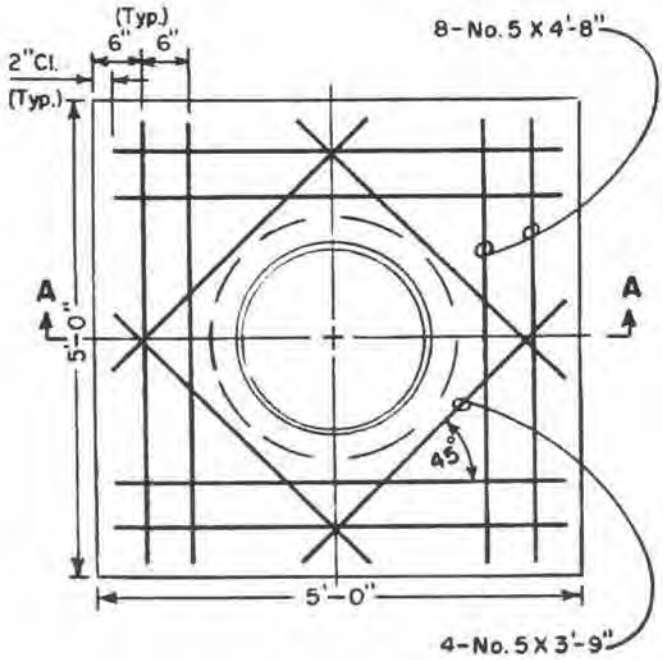


NOTE:

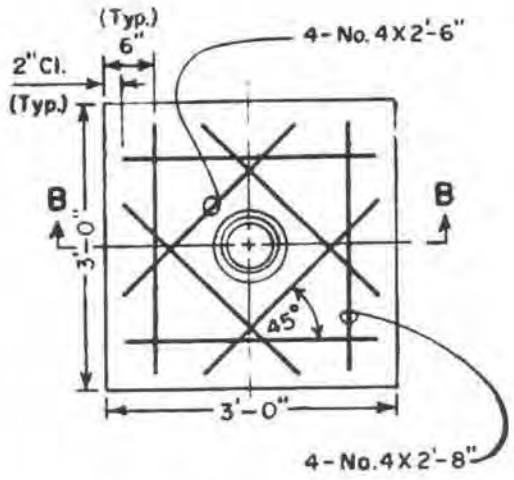
TEMPORARY PATCH SHALL BE MAINTAINED BY OWNER/APPLICANT FOR A MAXIMUM OF 20 DAYS, THEN TO BE CONVERTED TO A PERMANENT PATCH IF MATERIAL IS SUITABLE AND APPROVED BY THE CITY ENGINEER.
BASE AND WEARING SURFACE TO BE APPROVED AND INSPECTED BY THE CITY ENGINEER.
SHELL SURFACED ROADS SHALL BE COMPACTED AS SPECIFIED WITH SHELL BASE AND SURFACED TO MATCH EXISTING GRADES

REQUIREMENTS FOR PAVEMENT RESTORATION

REQUIREMENTS FOR PAVEMENT RESTORATION



PLAN



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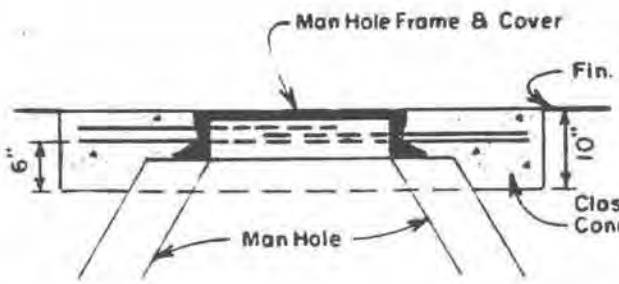
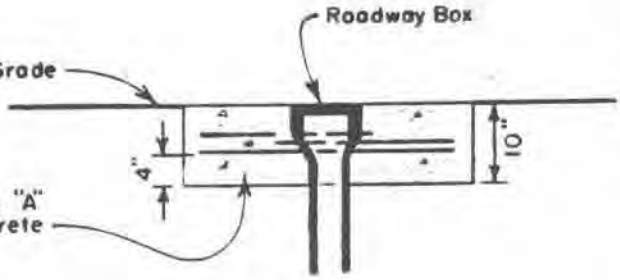


SECTION "A-A"

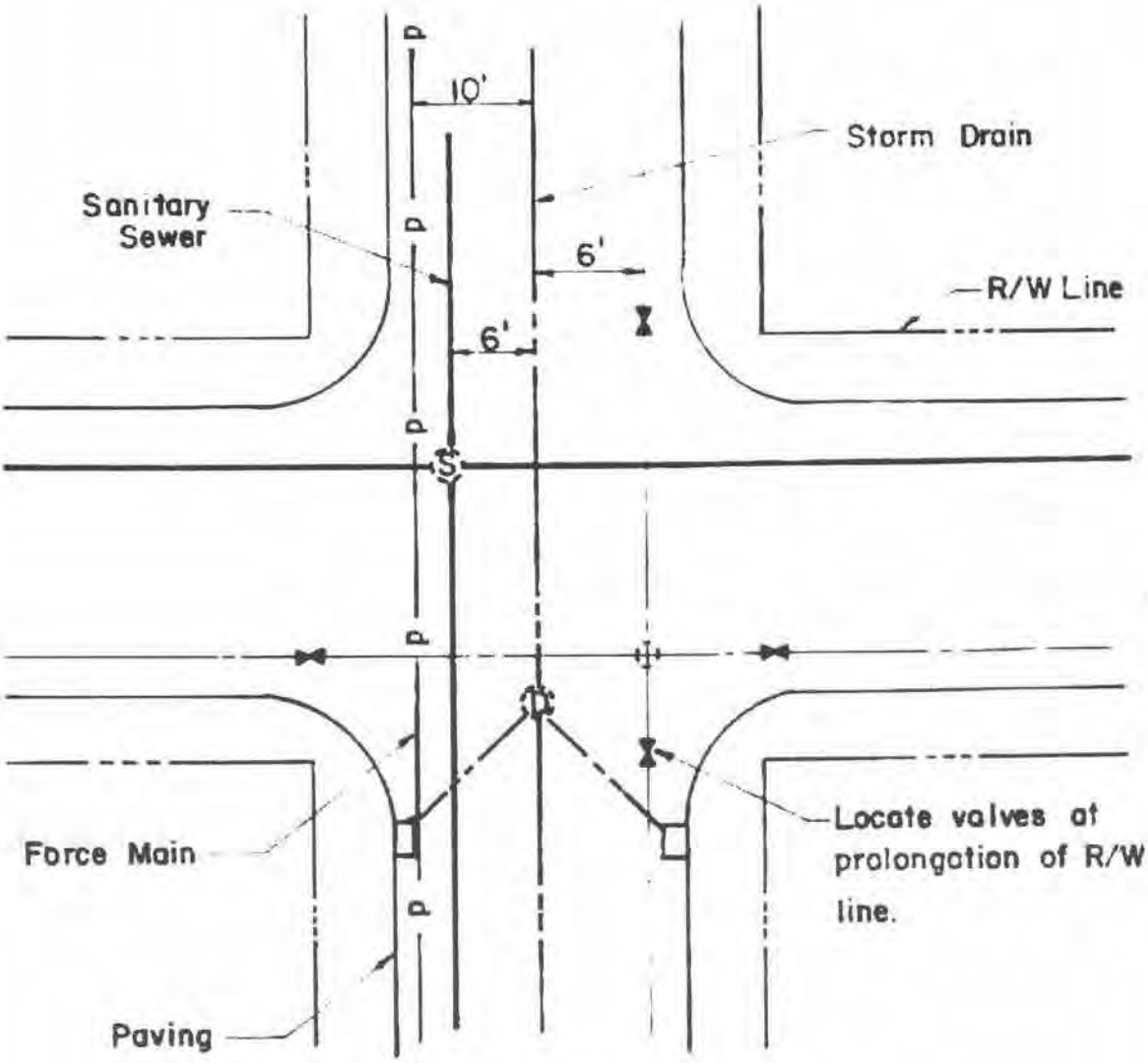


SECTION "B-B"

CITY OF SARASOTA

REINFORCED CONCRETE COLLARS

Fig. WS - 26



CITY OF SARASOTA **TYPICAL LOCATION OF UNDERGROUND UTILITIES**

Fig. WS - 25

END OF DOCUMENT

ENGINEERING

DESIGN

CRITERIA

MANUAL