CITY of TAMPA

STORMWATER

TECHNICAL STANDARDS MANUAL

FOR

PUBLIC DEVELOPMENT

City of Tampa
Department of Sanitary Sewers
Stormwater Management

* WRAPPING PIPE

* STAMPING CL. III PIPE NOT MENTIONED

* HEAVIER LIDS FOR INLET TOPS

SECTION III - PUBLIC IMPROVEMENTS

The purpose of this section of the manual is to provide policy statements on the SMD position for public improvements, procedures for obtaining review of those improvements, and criteria (guidelines) for the design of those improvements.

III.A. Policy Statements

The following sections present policies being enforced by the City of Tampa, SMD as of the publication date of this manual.

III.A.1 Ditch Relocation

If an existing ditch within the City accepts stormwater runoff from public rights-of-way then crosses private property prior to discharging to a receiving body, the SMD will require any proposed relocation of such ditches to be accomplished using suitably sized pipes or ditches for the full length of the relocation. Review and approval of such proposed relocations along with dedication of an appropriately sized drainage easement will be required by the SMD. Guidelines for easement requirements are found in Sections III.E.2 and III.E.6., and Secion IV.A.4.

III.A.2 Use of Grate Inlets

As standard operational policy, the SMD does not accept grate inlets due to the high frequency of required maintenance. Any use of grate inlets will require case-specific approval by the SMD.

III.A.2. Acceptance of Storm Sewer Systems for Future Maintenance

In order for the City to accept any existing or proposed storm sewer systems for future maintenance or ownership, said storm sewer systems must have been designed to SMD standard design criteria for public improvements. In addition, maintenance access requirements must be met and acceptance of such storm sewer systems must be in the best public interest for citizens of the City of Tampa.

III.A.4 Acceptable Materials

Only reinforced concrete pipes are acceptable for use as storm sewers within City of Tampa-right-of-way. Any "special case" uses of materials such as PVC, polyethylene pipe, cast or ductile iron, etc. must be specifically approved by the SMD and must be wrapped with white indicator tape for marking. Corrugated metal pipes may be used for large culverts under selected cases reviewed and approved by the SMD.

III.A.5 Water Quality

All public improvements within the City shall be designed to ensure the highest stormwater quality standards possible. At a minimum, storm sewer systems shall meet with the approval of the Southwest Florida Water Management District (SWFWMD) and/or the City of Tampa Stormwater Management Division, the Florida Department of Environmental Regulation (FDER) and any other environmental agencies which may have jurisdiction on the improvements.

III.A.6 Development within Unimproved Rights-of-Way and Platted Subdivisions

Development of any property along an unimproved right-of-way or within a platted subdivision where a drainage system does not exist or is inadequate, shall be required to provide proper drainage facilities from such development to an acceptable, existing outfall location. Such drainage facilities must be designed to meet standard City design criteria and must be approved by the Stormwater Management Division.

III.A.7 Potential Conflicts with Existing Drainage Facilities During Construction, Maintenance of Drainage During Construction and Damages to Existing Facilities

Existing drainage facilities may be subject to damage as a result of construction, installation or maintenance of any under or above ground utilities. During such construction and in the event damage to existing drainage facilities occurs, the following SMD requirements will be enforced. All items will be the responsibility of the respective utility or their assigns, including any costs incurred as a result of any damages incurred during construction activity.

Drainage must be maintained during construction. Any pipes removed for any reason must be replaced with RCP of the same equivalent size or larger at identical elevations and grade, unless specific written instructions from the Stormwater Management Division indicate otherwise.

Any pipes destroyed during construction must be replaced with same size or larger pipe, using reinforced concrete pipe (RCP).

Any inlets, manholes, culverts, pipes or any other drainage structures removed or damaged during any type construction must (unless specific written instructions from the SMD indicate otherwise) be replaced exactly as found prior to said construction. Dimensions, areas, and material and structural specifications must be duplicated to produce an identical structure. Specifications, standard drawings and other related information may be obtained from the Stormwater Management Division. In addition all construction shall be inspected and accepted by the Stormwater Management Division.

All ditches and swales in the path of, or adjacent to, construction activity must be returned to the original elevations and grades that were present prior to construction.

Conflicts

Any utility, or their assigns, desiring to construct facilities in conflict with existing drainage facilities should immediately notify the SMD of such intent. The SMD can, if approval of a proposed conflict is granted, make available standard conflict structure details (sheet D-10). It shall be the respective utilities' responsibility to design, construct and certify all conflict structures.

Relocations

Requested relocations or off-sets of existing drainage facilities by a utility must be approved by the SMD. All design and construction costs will be borne by the respective utility, and standard drainage design criteria and review procedures will apply.

III.B. **Procedures**

The following are various procedures regarding review by the SMD for various public improvements. Such procedure descriptions are presented as guidelines to provide an insight to various City requirements associated with public improvements and the appropriate channels of review that may be necessary. The following procedures are in place and correct as of the date of publication of this Manual. However, certain procedures may change periodically due to manpower limitations, personnel changes or re-organization of City departments. It is the responsibility of the applicant to verify the most current and applicable procedure as necessary for specific projects.

III.B.1 **Permits for Work in Public Right-of-Way**

During the development of any site within the City of Tampa, if any improvements are required or necessary within City right-of-way or easement a permit to work within said right-of-way or easement will be required. Some examples of drainage improvements that would require a permit for construction within City rights-of-way are as follows:

1. Connection of any private storm water system to the City's storm sewer or ditch system,
2. Driveway culvert installation,
3. Changes and/or additions to any City storm sewer system,
4. Changes and/or additions (including regrading) to any City ditch system,
5. Driveway construction or modification,
6. Changes and/or additions to any existing City pavement, or
7. Any construction, modification or removal of items that occur within the limits of any City right-of-way or easement.

Permit requirements for construction within public rights-of-way may be obtained from the Department of Public Works Transportation Division permit section located on the fourth floor of the City Hall Annex. Questions may be directed to:

Utilities Coordinator
Department of Public Works
City Hall Plaza, 4E
Tampa, FL 33602
(813) 223-8027 or 223-8058

Work in the Right-of-Way Permit requirements related to drainage improvements are found in Section II.C.4.

III.B.2 **Driveway Culvert Permits and Review**

Driveway culverts may be required for either residential or commercial development of a site. Any access driveway to a site that must cross a ditch, swale or any open channel drainage system will require a driveway culvert: Review of these facilities is handled by the R/E Section and is described in Section II.C.4.

III.B.3 **Subdivision Review**

Subdivision of land parcels within the City will require a Preliminary Plat Review, Construction Drawing Review, and a Final Plat Review (see Section IV). All proposed stormwater improvements, public and private, must meet City design criteria for public improvements.

The specific subdivision requirements can be found in City Code Chapter 35, an in the Subdivision Section of this manual. Overall submittal of Subdivision plans follow the outlined procedure in Section IV of this manual.

III.B.4 **Public Improvements Associated with Private Development Plans**

In the event that public or off-site drainage improvements are necessary and are to be constructed by the private development concerns, coordination must be by the SMD Regulation/Enforcement Section.

All public or off-site improvements shall require conformance to design standards for public improvements which are described in Sections III.C, D and E. Any construction within the City owned rights-of-way will require a Permit for Construction within City Rights-of-Way which may be obtained from the Department of Public Works Transportation Division. Permit requirements are discussed in Section II.C.4 and II.C.5.

After review of the various SMD requirements, if any site specific questions are unanswered or if some deviation from standard City design criteria is deemed necessary, a pre-design review may be arranged with the SMD Regulation and Enforcement Section. Requirments for a pre-design review by the SMD are as follows.

(1) Make an appointment with the SMD Regulation and Enforcement Section.

(2) Arrive with sufficient sketches to indicate what you propose to do.

(3) Additional, preliminary design sheets that indicate alignment, pipe sizes, profiles, invert elevations and all relevant engineering calculations to justify your design must also be available at the meeting.

(4) Owner, agent, or engineer should have specific questions and/or justification of why deviation from standard SMD design criteria is necessary. The purpose of the review is to answer specific questions, grant preliminary approvals and indicate if any additional requirements other than those standards specified in this manual will apply.

III.B.5 **Drainage Facility Information**

Drainage structures within City easements and rights-of-way may have "as-built" or "record" drawings on file in D.P.W. Central Files located on the north wing of the 5th floor of One City Hall Plaza, 306 East Jackson Street in downtown Tampa. Such as-built information, and other recorded information is available to the general public.

If only a review of specific "as-built" of City drainage systems is required, the D.P.W. Central Files Clerk can assist in locating desired drawings.

III.B.6. **Plan Submittal Requirements for City-Contracted Design Services**

Consultants providing design services to the SMD must follow the standard submittal requirements outlined below.

Contents of Plan Submittals-The content of stormwater plans for 50%, 90% and 100% submittals varies. Following are guidelines on plan content for the various submittals which along with the Plans Review check lists will be completed.

Storm Sewer Check List-Following is a sample 50%, 90% and 100% storm sewer check list. Appropriate areas will be reviewed and marked prior to submittal to the SMD. This check list will aid in the preparation of plans in terms of content in order to minimize SMD review time and shall be included with the plan submittal package.

Project Completion List-For projects designed for SMD contract or in-house construction, the project completion list must be completed prior to transmittal or acceptance of final plans. For public improvements being constructed in conjunction with private development, completion of selected sections of the project completion list would be helpful.

Preparation of "As-Built" Drawings by Consultants - Upon completion of construction of drainage facilities within public right-of-way, "as-built" drawings must be prepared and the original mylar drawings signed and sealed by the Construction Engineer.

Submittal Requirements for "as-built" drawings on Construction Inspected by Consultants.

A. Field Inspector will compile the following information on one set of plans.

1. Changes from original plans; i.e. details, grades and dimensions to be shown in red. This will not include minor changes in length and dimension unless precise dimensions were required during construction.

2. Utility adjustments and utility locations varying from plans shall be shown in the designated color in accordance with American Public Works Association Standards.

Red -	All Power Systems
Yellow -	Gas and Oil Lines
Blue -	Water
Green -	Storm and Sanitary Sewers
Orange -	Telephone, Cable TV and Communications

3. Locations of adjusted utilities and utility locations varying from plans shall be dimensioned from established project baselines where possible.

4. Reference to applicable DPW change orders, other utility drawing numbers, etc. shall be made by notation.

5. Date and name of the individual verifying construction shall be made on each plan sheet.

B. The Field Inspector shall submit one set of mark-up "as-built" plans to the Project Engineer for the consultant.

C. The Project Engineer should:

Review plans for completeness

Check plans against correspondence and Engineering record set

Examine revisions and makes appropriate field check (it is desirable to inspect project with Field Inspector).

D. Project Engineer forwards mark-up plans to Draftsperson for necessary "as-built" revisions of original design plans.

E. Project Engineer reviews completed "as-builts" and signs and dates "as-built" on plan sheets and cover sheet.

F. Consultant transmits plans to SMD for permanent filing. Field markups and prints should be retained for 1 year or until warranty period for labor and materials is exhausted.

CITY OF TAMPA — STORMWATER MANAGEMENT DIVISION
PROJECT COMPLETION LIST

Project Name: _____ Date: _____

SMD Project Number: _____ SMD File Number: _____

Design Firm Name: _____ Number of Sheets: _____

Type of Plans: _____ Number of Sheets: _____

Summary of Quantities Attached: _____ Specifications Attached: _____

Have plans been signed and Sealed? ☐ Yes ☐ No Name: _____

Florida Registration Number: _____

1. Utilities	No Conflict	Conflict	Resolution
Water			
Sanitary			
TECO			
GTE			
Gas			
Other			

2. Permits	Required?	Applied For By	Applied For Date	Date Recieved	Date Expires
DOT					
SWFWMD (17-25)					
SWFWMD (17-4)					
Port Auth.					
FDER					
Railroad					
Others					

3. Rights-of-Way	Required	Requested By	Date	Date Received
Acquisition				
Easement				
Const. Easement				

Remarks: _____

4. Additional Coordination Required:

Utility Agency: _____

City Agency: _____

Contractor/Developer: _____

Other: _____

Preconstruction Conference: _____

II.B.7 Utility Review for Stormwater Projects

In the preparation or permitting of specific projects, to may be necessary to obtain information or review of plans by certain utilities. The following provides a list of selected individuals and/or agencies to which plans may be submitted.

1. Water Department
   City Hall Plaza, 5E
   Tampa, FL 33602
   Phone: 223-8676
   3-sets of plans

2. Department of Sanitary Sewers
   City Hall Plaza, 6N
   Tampa, FL 33602
   Phone: 223-8935
   3-sets of plans

3. General Telephone Company
   P.0. Box 110, MC 1886
   Tampa, FL 33601
   962-0789
   3-sets of plans

4. Tampa Electric Company
   P.0. Box 111
   Tampa, FL 33601
   228-4111
   3-sets of plans

5. Peoples Gas System
   P.0. Box 2562
   Tampa, FL 33601
   228-9743
   3-sets of plans

6. Florida Gas Transmission
   1544 N. Combee Road
   Lakeland, FL 33801
   (813) 726-3722

7. Tampa Pipeline
   7401 Hoadly Road
   Tampa, FL 33616
   (813) 839-0426

8. Central Florida Pipeline
   1904 Hemlock Avenue
   Tampa, FL 33614
   (813) 247-2772

9. Group W Cable
   6921 E. Hillsborough Avenue
   Tampa, FL 33610

10. Tampa Cable Television
    4400 W. Buffalo Avenue
    Tampa, FL 33614
    877-6805

11. Parks Dept., City of Tampa
    7525 North Blvd.
    Tampa, FL 33604
    223-8230

12. Solid Waste Department
    4010 W. Spruce St.
    Tampa, FL 33607
    877-6031

13. HDC-City of Tampa
    Right-of-Way Section
    City Hall Plaza, 3N
    Tampa, FL 33602

    223-8301*

14. Transportation Division
    Department of Public Works
    City Hall Plaza, 4E
    Tampa, FL 33602
    Attn: 1. Signal Design 223-8062
    2. Chief Street Design 223-8054
    3. Coordination 223-8055

* Work to be done outside City Right-of-Way, required to submit in person.

15. Operation Section-Stormwater
    Management DSS
    612 N. 12th St.
    Tampa, FL 33602
    (813) 223-8588

16. Department of Transportation
    P. O. Box 1249
    Bartow, FL 33830
    (813) 533-8161
    Bartow, FL 33830

17. Seaboard Coast Line RR
    P.O. Box 991
    Tampa, FL 33605
    (813) 621-3031

18. Hillsborough County
    Drainage Engineer
    P.0. Box 1110
    Tampa, FL 33601

19. Public Works - Surveys
    1801 N. Highland Avenue
    Tampa, FL 33602
    (813) 223-8196

20. Chief of Const. Eng.
    1601 N. Marion St.
    Tampa, FL 33602
    (813) 223-8733

Notes:

a. Send one set of plans unless otherwise noted.

b. For 50% plan review, send plan to agencies listed from 1 to 14 for review; and to 16, 17 and 18 if applicable.

c. For 90% plan review, send plan to number 15 and 20 and other affected agencies for review.

d. For 100% plan review, send plan to number 19.

III.C. **Survey Guidelines**

The following presents the specifications and note keeping standards for the Department of Public Works. These specifications should be closely followed by all individuals preparing survey or plans to be constructed by the City of Tampa (through contract or with in-house forces). For those improvements being constructed as a result of private development these specifications should be used as guidelines.

In either case, the items discussed in the various sections such as alignment, detail cross section or utility surveys should be included in the preparation of appropriate base maps. This information is considered to be a minimum for the design of proposed public facilities.

City of Tampa
Department of Public Works

Specifications and Note Keeping Standards for Surveys

Each survey shall have the following statement on the title page, signed and sealed by a Profressional Land Surveyor."A survey of the above description was made under my supervision and the notes are true, accurate and conform to the specifications and standards as set forth by the City of Tampa".

The following format shall be used unless otherwise instructed.

III.C1. **ALIGNMENT SURVEY**

1. Alignment notes shall be kept in loose leaf field books using Dietzgen No. 385-3 paper or equivalent.

2. The front page, hereafter called the title page, shall have the date the "Alignment" is completed on the second line in the upper right hand corner.

   A. The name of the firm making the survey shall be located on the third line in the upper rignt hand corner of the title page.

   B. The names of the survey crew members shall begin on line four and proceed down in the upper right hand corner of the title page.

   C. The word "Alignment" shall be located in the approximate center of the title page and underneath shall be the description, fully described, of the route of the survey or, if a parcel, the bounds of said parcel.

   3. The pages shall be numbered beginning with 1 (circled) in the upper right hand corner of the title page, numbering only the right hand succeeding pages.

   4. The right hand page of page two, and as many as needed succeeding pages, shall contain a sketch of the route of the survey, beginning at the bottom of the page and progressing up the page. This sketch should include all street names, a north arrow, all lots and block numbers adjacent to the survey, along with the subdivision names. All lot corners should be shown in red at their corresponding location on the sketch along with the distance from the baseline to the nearest one hundredth of a foot.

   5. Column one of the left hand page of page two, and all succeeding pages, shall contain the baseline station and columns two through five, a description of the survey marker that corresponds to the distance and symbol on the same line of the right hand page.

      A. All baseline stations to points of intersection (P.I.s) shall be shown to the nearest one hundredth of a foot.

6. Right angle baseline stations for all property corners shall be determined and shown to the nearest one tenth of a foot unless otherwise specified.

A. Distances from the baseline to all property corners, monuments land corners, etc. shall be measured to the nearest one hundreth of a foot and the distance shown between the baseline and the corresponding survey mark on the sketch and on the same line as the baseline station on the left hand page.

Procedure for Alignment Survey

1. Locate all property corners possible within limits of survey.

2. Establish points opposite all property corners, preferably in the centerline of the right-of-way, if not center of right of way use an offset that will make baseline parallel with property line. Prior approval from the Chief of Surveys must be made before changing survey baseline from centerline of right-of-way.

3. Use equal offsets from two property corners on extreme ends of each straight section of survey to check line of remaining property corners. Final control points for baselines must be used so that all remaining lot corners are equal or are the best average of the offset distance used to control survey baseline. If property lines on either side of survey baseline are **not** parallel, establish baseline parallel with property line that is straight for the longest length in blocks and show stations and offsets to markers on non-parallel side even though they may vary considerable. If original corners used to control line do not produce the required accuracy, change to offsets that will. If necessary go beyond the limits of survey any distance required to obtain alignment as set forth above.

4. The above method shall be used for determining location of each straight section of survey baseline unless otherwise stated.

5. The point of beginning of the survey baseline shall be established, unless otherwise stated, by intersecting the centerline of the right-of-way or line parallel with right of way line of the beginning street of the survey request (using numbers 1 thru 3 above for establishing which line to be used as the survey baseline.

6. The angle at all baseline point of intersection stations shall be turned a minimum of two times direct and two times reverse between the back and forward tangents showing first, forth and average angle in notes.

7. All centerline right-of-way of streets within limits of survey shall be intersected with survey baseline and angle between lines shown in the notes. Use numbers 1 through 3 above to establish centerline right-of-way of street to be intersected.

8. Baseline stations shall begin with 10 + 00 and increase south to north or west to east unless otherwise stated.

9. Nails (cut flooring nails, P.K. nails, or common nails with a minimum size of 10d) and caps or discs shall be used in all asphalt paved areas and 2"x 2" hub and tacks shall be used in all unpaved areas for all baseline stations or intermediate points such as points of intersection (P.I.s). A permanent control point such as iron pipe and cap shall be used at all beginning and ending baseline stations and at all P.I.s that are not in asphalt or concrete pavement.

10. All baseline stations (including nail and cap) shall be painted with white traffic paint. The numbers shall be placed under the station, facing the direction of increasing baseline stationing with a maximum height of four inches.

III.C.2. DETAIL SURVEY

1. Detail notes shall be kept in loose leaf field books using Dietzgen No. 385-3 paper or equivalent.

2. The front page, hereafter called the title page, shall have the date the "Detail" is completed on the second line in the upper right hand corner.

   A. The name of the firm making the survey shall be located on the third line in the upper right hand corner of the title page.

   B. The name of the survey crew members shall begin on line four and proceed down in the upper right hand corner of the title page.

   C. The word "Detail" shall be located in the approximate center of the title page and underneath shall be the description, fully described, of the route of the survey, or, if a parcel, the bounds of said parcel.

3. The pages shall be numbered beginning with 1 (circled) in the upper right hand corner of the title page, numbering only the right hand succeeding pages.

4. Column one of the left hand page of page two (and all succeeding pages) shall contain the baseline station at right angle to each "above ground physical feature" within the right-of-way or limits set by job request.

5. Columns two through four shall contain a brief but complete description of object being located.

6. Column six shall contain the direction in reference to the baseline to the object being located (i.e., North, South, East or West).

7. The right hand page of page two and all succeeding right hand pages shall contain a continuing sketch (not to scale), including a north arrow, of all the features described.

   (A) The distance (to the nearest tenth of a foot) from the baseline to the object being located shall be on the same line of the sketch as in the description and adjacent to baseline of sketch.

8. The detail notes shall begin at the bottom of the page and proceed up the page.

9. If more than one object is on the same station, use one line for each object using the same station plus for each.

10. Objects to be located shall include, but not limited to:

   (A) P.C., mid radius, P.T.,, P.I., of edge of pavement or curb and gutter and at every 50 and 100 foot stations or at closer intervals as needed, such as curved streets. Include the type of pavement and the location of any changes in pavement.

   (B) Face of sidewalks, with width.

   (C) Face of approach walks, with size.

   (D) Face of driveways, with complete dimensions. (Additional information needed on non-right angle driveways.)

   (E) Face of fences, including type and height. Show all fences that run laterally to survey baseline, including fences that P.1. with fences running parallel with baseline.

   (F) Centerline hedges, including width and height (beginning and end).

   (G) Centerline trees, including kind and diameter of trunk.

   (H) Centerline, shrubs or bushes, with size (i.e. small, medium large).

   (I) Railroad tracks, centerline or each rail. Show additional ties to tracks that are not perpendicular to survey baseline.

   (J) Buildings, include all corners, dimensions of offsets, show porches and eaves overhang. Include type of construction and number of stories. Show outside perimeter of building using short slash marks around inside of building sketch.

   (K) Centerline of water meters, water and gas valves.

   (L) Centerline of power, telephone, telegraph, light and guy poles. Guy wire anchors. Note if combination. Place dotted line between pole and gu wire anchor.

   (M) Ditches at every 50 and 100 foot stations and P.1.s with dimensions of top and bottom at each place located.

   (N) Face of headwalls, including wingwalls with type of construction and dimensions.

   (O) Culverts, including kind and size (beginning and ending).

   (P) Inlets, including type or size. Locate centerline of all grate type inlets if parallel with baseline. Locate centerline face of all curb type inlets with two ties to non-parallel inlets.

   (Q) Face of walls, including type, width and height.

   (R) Signs, including type and dimensions. Exclude stop, yield, no parking, etc., signs.

   (S) Centerline of fire hydrant.

   (T) Centerline of manhole castings, noting type of sewer.

   (U) Sprinkler heads.

   (V) Boundaries of undergrowth, including type and whether it is light, medium or heavy.

11. The sketch shall include all street names.

12. To obtain detail information in the area that is formed when the survey baseline P.I.s and items to be located are not right angle to either the back or forward tangent, the back tangent shall be extended a sufficient distance to locate all items in said area and so noted in survey notes. Continue detailing of forward tangent on following page.

III.C.3. BENCH MARK AND TEMPORARY BENCH MARK CIRCUITS

1. Bench mark circuit notes shall be kept in loose leaf field books using Dietzgen No. 385-5 paper or equivalent.

2. The front page, hereafter called the title page, shall have the date the "Bench Mark Circuit" is completed on the first line in the upper right hand corner.

   A. The name of the firm making the survey shall be located on the second line in the upper right hand corner of the title page.

   B. The names of the survey crew members shall begin on line three and proceed down in the upper right hand corner of the title page.

   C. The words "Bench Mark Circuit" or "T.B.M. Circuit." (whichever applies) shall be located in the approximate center of the title page and underneath shall be the description of the route of the Bench Mark Circuit or of the survey, if it is a T.B.M. circuit, described fully.

3. The pages shall be numbered beginning with 1 (circled) in the upper right hand corner of the title page, numbering only the right hand succeeding pages.

4. Column one on the left hand page of page two shall be used for the bench mark (B.M.) or temporary bench mark (T.B.M.) number.

   A. Column two is for plus (+) or backsight readings.

   B. Column three is for the height of instrument (H.I.).

   C. Column four is for the minus (-) or foresight readings.

   D. Column five is for bench mark (B.M.) or temporary bench mark (T.B.M.) elevations.

5. The bench mark or temporary bench mark number of the beginning B.M. or T.B.M. shall be on line two, column one of the left hand page of page two, with the elevation on line two column five. if this mark is not a published bench mark, a complete description and source of mark shall be on line two (and as many lines as needed) of the right hand page.

6. The plus (+) or backsight reading shall be on line three, column two of the left hand page or page two, with the height of.instrument (H.1.) on the same line, column three.

7. The first turning point (T.P.), temporary bench mark (T.B.M.) or bench mark (B.M.) number, whichever the case might be, shall be in column one and on a line so that the description on the right hand page has one blank line between it and the previous description.

   A. The minus (-) or foresight reading shall be on the same line as the corresponding T.P., T.B.M., or B.M. number and in column four. The elevation of the T.P., T.B.M., or B.M. shall be on the same line as the aforementioned minus reading and in column five.

   B. On the right hand page and on the same line (and as many lines as needed) as the aforementioned mark number, minus reading and elevation shall be the complete description of that particular mark, including distance (see mark-up).

8. The above described method of bench marks, temporary bench marks and turning points, readings, elevations, and descriptions shall continue throughout the circuit until the circuit is checked into a published bench mark (by the City of Tampa) or to a temporary bench mark with a verified elevation and source of said mark, including distance from mark to centerline nearest intersecting street.

9. Bench marks and temporary bench marks shall be placed on a permanent location that will not move horizontally or vertically.

   A. There shall be no bench marks or temporary bench marks in any kind of pole, utility or otherwise. Manholes are not to be used for temporary bench marks.

   B. Bench marks shall only be used when the circuit is for the City of Tampa bench mark book to be published.

C. All bench circuits shall be run according to the specifications of the National Oceanic and Atmospheric Administration, National Ocean Survey, First-order, Class Standards of Accuracy.

D. The preceding symbol, hereafter known as "The City of Tampa Standard Bench Mark Symbol", shall be used for all bench marks on concrete and shall be chiseled into the concrete to a minimum depth of one-eighth of an inch.

NOTE: THIS SYMBOL IS TO BE USED ONLY WHEN BENCH MARK CIRCUIT IS BEING RUN FOR PUBLICATION IN THE CITY OF TAMPA's "BENCH MARK CIRCUIT BOOK".

E. Temporary bench circuits shall be used for all surveys for the City of Tampa if there is no City of Tampa Bench Circuit present. Bench marks shall be placed at each intersection along the route of the survey. The maximum distance between marks shall be eight hundred feet if there are no intersecting streets.

a. All T.B.M.s shall be placed in a location so as to be readily accessible for the preliminary survey as well as any construction layout that will follow. They shall also be in a location that will not be destroyed by the construction.

F. All temporary bench marks shall be run according to the specifications of the National Oceanic and Atmospheric Administration, National Ocean Survey, Third-order, Standards of Accuracy.

G. The preceding symbol shall be used for temporary bench marks on concrete and shall be chiseled into the concrete to a minimum depth of one-eight of an inch.

H. Only railroad and bridge spikes shall be used in trees for temporary bench marks. Spikes shall not extend out more than two inches from trunk of tree.

I. Concrete porches and slabs on private property may be used for T.B.M.s, if no suitable location is available within right-of-way without cutting a mark, if the location used is a definite point that can be described so that there is no future doubt as to the location of the T.B.M.

III.C.4. CROSS SECTION SURVEY

1. Cross section notes shall be kept in loose leaf field note books using Dietzgen No. 385-5 paper or equivalent.

2. The front page, hereafter called the title page, shall have the date the "Cross-section" is completed on the first line in the upper right hand corner.

A. The name of the firm making the survey shall be located on the second line in the upper right hand corner of the title page.

B. The names of the survey crew members shall begin on line three and proceed down in the upper right hand corner of the title page.

C. The word "Cross-section" shall be located in the approximate center of the title page and underneath shall be the description, fully described, of the route of the survey or if a parcel, the bounds of said parcel.

3. The pages shall be numbered beginning with 1 (circled) in the upper right hand corner of the title page, numbering only the right hand succeeding pages.

4. Column one on the left hand page of page two shall be used for the bench mark (B.M.), temporary bench mark (T.B.M.), or turning point (T.P.) number. This column is also used for the baseline station of the section being taken.

A. Column two is for plus (+) or backsight readings.

B. Column three is for the height of instrument (H.I.).
(1) If a direct elevation rod is used, the notation "Used direct elevation rod" should be written in the place of the plus reading and H.I.

C. Column four is for the minus (-) or foresight reading.

D. Column five is for bench mark (B.M.) temporary bench mark (T.B.M.), or turning point (T.P.) elevations.

5. At the beginning of the cross-section notes the bench mark (B.M.) or temporary bench mark (T.B.M) number shall be on the second line, first column, of the left hand page of page two. The fifth column shall contain the elevation of the B.M. or T.B.M. If the bench mark is not a published mark, a complete description shall be included on the same line (or as many lines as needed) on the right hand page, along with the source of the benck mark or temporary bench mark.

6. Line three, second column shall have the plus reading. Column three, then will have the height of instrument (H.I.) (See 4B(a.)).

7. Line four, column one shall have the baseline station of the section to be taken. Columns two thru five shall contain a brief but complete description of the section being taken. Column six shall contain the direction from the baseline that the section is taken, (i.e. North, South, East, or West).

8. The middle red line of the right hand page will generally represent the survey baseline.

   A. Rod readings taken to the right of the baseline shall be in the columns proceeding right from the centerline of the page and on the same line as the description. The reduced elevation should be written immediately above the rod reading in the top half of the space. An abbreviation of the description of the shot shall be in the bottom half of the same space (i.e. Edge of pavement = E.O.P., top of bank = T. bank, toe of ditch = toe, etc.).

   B. When rod readings exceed number of columns, drop down three lines for rod reading and proceed from center to edge of page, when edge of page is reached, drop down three lines and proceed from center to edge of page. This procedure can be used for as many shots as needed and for either side of baseline.

   C. Baseline stations and descriptions of the following sections should be on a line that will maintain one blank line on the right hand page between sections.

   D. The above procedure should continue down the page. When turning page the height of instrument should be placed on the second line under "H.I." and continue as previously stated.

9. Each turning point shall check into a known B.M., T.B.M., or a set of continuous turning points throughout the cross-section checking into a known B.M. or T.B.M. after the last elevation is taken.

CROSS SECTION PROCEDURE

1. A cross section, at right angle to the survey baseline, of elevations shall be taken at the beginning station and at all fifty and hundred stations thereafter for the entire length of the survey. A typical section shall include: survey baseline, edge of street (asphalt, concrete, shell, dirt, etc.), if curb or curb and gutter exists, flowline of gutter and top of curb (dropcurb) shall be taken, any breaks in grade, top, toe, centerline, toe and top of ditches, face and back of sidewalk, property line and to a distance equal to one-half the width of the right of way beyond the property line. If building exists, to structure with distance. If no right-of-way exists, sections shall extend from survey baseline to a distance set by City Chief of Surveys.

2. All elevations on concrete, asphalt, metal, and water are to be recorded to the nearest .01 foot and all ground elevations to the nearest .10 foot.

3. Sections shall be taken at the following locations:

   A. P.C.s of intersecting streets (if P.C. is edge of intersecting street), cross section shall extend a minimum of 200 feet from the survey baseline along the edge of street (traveled roadway if not paved) at 50 foot interval's and any breaks in grade in between. If curb and gutter exists, elevations of both top of curb and flowline of gutter shall be obtained at each 50 foot.

   B. Centerline of intersecting streets. Cross section shall extend a minimum of 200 feet from the survey baseline along the centerline of said street (traveled roadway) at 50 foot intervals and any breaks in grade in between.

   C. P.T.s of intersecting streets (if P.T. is edge of intersecting street), cross section shall extend a minimum of 200 feet from the survey baseline along the edge of street (traveled roadway, if not paved). If curb and gutter exists, both top of curb and flowline of gutter shall be obtained at each 50 foot.

      (1) If intersecting streets and ditches are not perpendicular to the survey baseline, section shall begin as in typical section, i.e., baseline elevation at station perpendicular to P.C./P.T. of intersecting street, then P.C./P.T. edge of pavement, curb and gutter, if applicable, then along edge of pavement (curb and gutter) the required distance from baseline. Make note in cross section notes that elevations past P.C./P.T. are not at right angle to baseline, but follow edge of pavement.

   D. Along top of both ditch banks, both toe of slopes, centerline of ditches for all ditches that intersect area being surveyed for a distance of 200 feet from survey baseline at 50 foot intervals.

   E. All driveways, to include elevations at survey baseline, edge of street (asphalt, concrete, shell, dirt, etc.). If curb or curb and gutter exists, flowline of gutter and top of drop curb continuing, taking all breaks in grade to garage, car port, etc.

F. All approach walks, beginning at survey baseline including elevations called for in a typical section (1.) extending to building.

G. At all significant changes of grade along the survey baseline.

H. At all inlets to include throat and top elevation.

I. At the beginning and end of all culverts to include invert elevation of culvert and top of headwall, if applicable, if not, natural ground above culvert.

III.C.5. **UTILITY SURVEY**

1. Utility survey notes shall be kept in loose leaf field books using Dietzgen No. 385-5 paper or equivalent.

2. The front page, hereafter called the title page, shall have the date the utility notes are completed on the first line in the upper right hand corner.

   A. The name of the firm making the survey shall be located on the second line in the upper right hand corner of the title page.

   B. The names of the survey crew members shall begin on line three and proceed down in the upper right hand corner of the title page.

   C. The word "Utilities" shall be located in the approximate center of the title page and underneath shall be the desciption of the route of the survey described fully.

3. The pages shall be numbered beginning with 1 (circled) in the upper right hand corner of the title page, numbering only the right hand succeeding pages.

4. Column one on the left hand page of page two shall be used for the bench mark or temporary bench mark (hereafter referred to as B.M. or T.B.M.) number and also the baseline station of the utility whose elevation is being taken.

   A. Column two is for the plus (+) or backsight reading.

   B. Column three is for the height of instrument (H.I.).

      (1) If a direct elevation rod is used, the notation 'Used direct elevation rod" should be written in the place of the plus reading and H.I.

   C. Column four is for the minus (-) or foresight readings.

   D. Column five is for the elevation of the B.M., T.B.M. or elevation of the particular utility being taken.

   E. Column six is for the distance and direction from the baseline of the utility being taken.

5. The set up for the left hand page of page two shall be as follows:

   A. Line two, column one shall be the B.M. or T.B.M. number with the elevation on line two, column five.

   B. Line three, column two shall be the plus reading and in column three the H.I. if direct elevation rod is used refer to (4B(a)).

   C. The baseline station for the first elevation shall be on the second line up from the bottom of the page. The last line will be used to check into a B.M. or T.B.M. when page is complete. (Note, baseline stations increase up the page).

      (1) As a reference to the location of the elevation being taken on the sketch each elevation should be numbered in the following manner: a small number (beginning with number one on each page) circled, shall be placed in the upper half of each line that has the baseline station and the same number (circled) shall be placed on the sketch with a small arrow to the exact location of the elevation. (See number 6 for description of sketch).

      (2) On line with the baseline station, using columns two and three or two, three, and four if a D.E. rod is used, shall be the description of the elevation being taken.

      (3) Column four and on line with the description (unless D.E. rod is used) shall be the minus reading with the elevation in column five.

(4) Column six and on line with the description should be the distance and direction from the baseline. (Example: 13.6 E.)

(5) For succeeding elevations, continue up the page using the above described method.

6. The right hand page shall contain a sketch of all the underground utilities. The sketch shall include all water, gas, storm sewer, sanitary sewer, and telephone lines. Each utility shall be drawn with a double pencil line, coloring between the lines with the following appropriate color: water lines - blue; gas lines - yellow; sanitary sewers - green; storm sewers - brown; telephone - orange; and electric - red. Each utility shall be identified by type (water, gas, etc.) and size on the sketch. The sketch should show the edge of pavement and a north arrow on each page. (The edge of pavement needs no measurements).

   A. A sketch of all underground structures such as, storm, sanitary, and telephone manholes, storm inlets and water valve vaults, must be shown with complete dimensions and the location of all pipes and ducts in each structure. The manhole casting must be related to the structure with measurements.

      (1) When taking invert elevations in a manhole the baseline station and distance to the centerline of the manhole casting shall be used. The description shall then locate the pipe in the manhole. (Example: Inv. 36" R.C.P. (E.), meaning the 36" R.C.P. in the east wall of the manhole).

7. Every water and gas line must be field located, referenced to survey baseline by station and distance, and an elevation taken on top of pipe at every street intersection and on each side of street it crosses. All points of intersection of lines must be located. If the distance between street intersections is greater than 350 feet, all water and gas lines must be located and elevations taken half way between intersections or every 300 feet.

   A. Elevations of top of water valve nut and calculating elevation of top of water line is not permited.

III.D **Plan Preparation Guidelines**

The following presents material which is required in the preparation and submittal of plans for public facilities. The information described may not be required on every submittal, depending on the size and complexity of the project. Therefore, it is suggested that a pre-design meeting be held with the SMD to obtain minimum requirements for specific projects.

III.D.1 **Contents of Plans**

The following sheet types should be used in the order presented. A brief description on sheet content is included and examples of specific sheets are presented.

Title Sheet

This sheet should include the name of the project, project location map, index of sheets and applicable standard drawings, name of consultant, SMD file number and job number. Blank reproducible copies of this sheet may be obtained from the Head Draftsman of the SMD.

Legend, Summary of Quantities and General Notes Sheet

This sheet should include the Standard SMD legend of symbols, summary of quantities table and all applicable general notes. Blank reproducible copies of this sheet may be obtained from the Head Draftsman of the SMD.

Drainage Map

The map is to be prepared on a scale of 1" = 200' or otherwise approved by the SMD. Listed below are the features that are to be included on the drainage map.

1. all areas draining to the proposed project
2. all areas tributary to existing structures
3. all areas tributary to proposed structures
4. all drainage divides shall be well defined and shall include FDOT boundaries, where applicable.
5. existing drainage features (ditches, roadways, ponds, etc.)
6. proposed facilities layout shall include all pipe sizes and drainage structures

7. plan and profile sheet numbers

8. construction area to be shaded (optional)

Typical Roadway Sections

For projects in which street reconstruction is proposed the sheet(s) should include the typical roadway section, pavement section information, cross section information on ROW dimensions, curbing detail, roadway underdrain details, typical acceptable pavement replacement sections and any other information pertinent to the roadway aspects of the project.

Details of Drainage Structures

If standard City of Tampa or FDOT structures are to be used these details do not need to be reproduced, merely referenced on the title sheet. The sheet(s) should include details of any special structures to be included in the project such as headwalls, endwalls, water quality controls, conflict manholes, etc. All details should have a scale, be clear and contain sufficient information to be constructed in the field or precast. Any substantial deviation or modification from the standard drawings may require the seal of a Registered Structural Engineer.

Plan/Profile Sheets

All plan profile sheets should show the following:

1. Bench marks shall be included at the top right corner of every sheet.

2. All manholes shall have station, offset distance, top elevation, type, size. For conflict manhole include bottom manhole elevation.

3. Inlets shall have station, offset distance, throat elevation for curb inlet or grate elevation for grate inlet, type of inlet.

4. Pipe length between drainage structures shall be given.

5. Drainage system to be constructed shall be shaded or covered with adhesive shading.

6. All existing underground utilities (sanitary sewers, storm sewers, water mains, gas lines, electrical buried cables, etc.) in plan as well as profile.

7. Relocations or adjustments to existing utilities shall be so noted on the plans. This shall also include the cases where the relocation to be performed by "others".

8. Top elevations of proposed grate inlets, manholes headwalls/endwalls. Throat elevations of curb type inlets, **if there is no existing or proposed curb.**

9. Storm sewer profile shall show, wherever possible, the crossing/connecting pipes (such as inlet pipes, sanitary sewers, water mains and gas lines).

10. In profile, at junctions where storm sewer elevations are indicated, such shall be designated by INV. ELEV. (or Invert Elevation). The synonymous term F.L. (Flow Line) shall not be used-simply to avoid confusion and to maintain consistency.

11. Drainage flow arrows at intersections, inlets, along ditch and swales, etc.

12. Any and all other features that affect and/or involve construction shall be indicated and/or clarified rather than left in an ambiguous state.

13. Begin construction, end construction and match lines between sheets with match sheet reference numbers.

14. Soil boring locations and reference identification.

15. Vertical scale 1 inch = 2 feet, horizontal scale: 1 inch = 20 feet.

Cross Sections

For complete street reconstruction complete cross sections should be provided every 50 linear feet and half sections (to center line only) at every driveway location. When complete street regrading/reconstruction is not to occur, cross sections can be provided as required for drainage purposes. Cross sections will also be required every 50 linear feet for ditch closures and retention or detention pond design. All cross sections should show the R/W line. A title shall be included on every sheet. Cross section sheets should also contain earthwork information on end area and volume of cut or fill. Cross sections should be plotted at a vertical scale of 1 1nch = 2 feet, and horizontal scale of 1 inch = 5 feet and show existing ground, proposed grade, base line and ROW lines. Cross sections should be plotted to at least 25 feet beyond the ROW line or that which is practical.

III.D.2 **Drafting Standards**

The following information is presented in an attempt to standardize the preparation of engineering drawing production and provide the greatest possible uniformity in appearance, size, and consistency with the type of work involved. All engineering drafting for public improvements should conform to the standards included in this manual.

Anyone involved in drafting or drafting supervision should review this manual and become familiar with the quality and type of drafting required by the SMD. Adherence to these standards should eliminate inconsistencies and excessive effort, and result in time savings during the review process.

General

All drawings shall be prepared in ink on mylar film. Special consideration may be given to the use of shading/pattern materials when deemed beneficial. Specific project requirements or deviations should be discussed with the SMD Draftsman.

Plan Quality

All drawings for construction projects are ultimately revised to reflect as-built conditions upon completion of the project. The drawings are then retained as permanent records for future reference. It is therefore necessary that the drawings be of a permanent nature and easy to make corrections to.

To meet these requirements it is necessary that the following guidelines be adhered to:

1. All plans, plan and profile and detail drawings to be ink on 3 mil, double matte mylar.

2. No splicing of mylar or taping of details to mylar surface.

3. Piping is to be represented by inked lines, as opposed to tape.

4. No rub-on or "KROY" (stick-on) type lettering.

Cover sheet, Summary of Quantities, Drainage Map and Cross Sections are excepted from these criteria. Splicing of vellum and the use of adhesive back transparencies are acceptable for vicinity map, general notes and Summary of Quantities. However, press-on and 'KROY" type lettering is not of a permanent nature and is not acceptable.

Plans Size

The standard size sheet for construction plans submitted to the SMD for review shall be 24"x36". Work sheets and data sheets used in preliminary design work and reviews are not limited to any size, except that which is convenient to handle.

Drawing Organization

Individual drawings should be organized in a logical manner, with all data presented to provide a clear understanding of the work. Drawings must be accurate, explicit, clear, and legible. Unnecessary work, such as duplicating views, notes and lettering and overdrafting in the form of excessive detailing and repetition of details should be avoided. Splicing of mylar is unacceptable and the use of tapes and sticky back should be held to a minimum. When possible, plans should be oriented so that the north arrow points toward the top or to the RIGHT of the sheet. A standard north arrow in proportion to the size of the drawing should be placed in the top center of the sheet when practicable.

Any general notes or legends should be placed near the right side of the sheet. Development of smaller views or details should begin at the right and work left, leaving any blank areas on the left (binding) side of the sheet. All details should be placed on standard 24"x 36" drawing sheets.

Standard details should be referred to whenever practical. When more than one category of details appear on the same sheet, each type shall be grouped together in one area of that sheet. Initial details shall be arranged as to leave blank areas for the addition of future details. Details may be drawn on separate blank sheet of paper and then transferred

to their appropriate location by a "sticky-back" process. Designers should use their discretion regarding the use of "sticky-back" material on final drawings based on: a) possible revisions; b) time savings. However, use of "sticky-back" should be minimized.

When only one subject appears on a drawing, and the subject title appears in the title block, a subtitle should be shown under each view or detail on the drawing. When more than one subject appears on a drawing, a title should be shown under each subject, and a subtitle shown below each view or detail in that group.

Scales

Drawings should be drawn to a scale consistent with the type of work represented. The scales to which plans are drawn should be indicated using the equation method, (i.e. 1"=20'). The scale to which plan views are drawn shall appear along side the north arrow.

Major detention/retention pond plan views should be scaled small enough to provide open areas to accommodate necessary notes, legends and secondary views. However, pond plan views should be scaled large enough to avoid cluttered, hard to interpret drawings. To accomplish this, larger sites may require the use of match lines with portions of the total site placed on more than one sheet.

If all details, etc., on a sheet are drawn to the same scale, that scale should be entered in the block. If not, the space in the title block should contain the words "as noted" and the appropriate scale entered below the title of each detail.

The following provides a guide to the SMD accepted scales:

	Scale
Plan Sheets	1" =20'
Profiles Views	
Vertical Scale	1" = 2"
Horizontal Scale	(Same as Plan) 1" = 20'
Special Details	(As Required)
Cross Sections	
Vertical	1" = 2'
Horizontal	1" = 5'

Line Work

Attention to line work is important to obtain clear and legible drawings. The weight of a line should be suited to the character of the drawing and to what the particular line represents. Dimension and out-of-function lines should be subdued; the important lines should be bold. An appropriate variation in line weight makes plans easier to read and interpret.

Line weights in relation to standard symbols are detailed in the examples which follow on DPW Drafting Standard Sheet 3 of 3 and must be suitable for microfilming. Each type of line has a specific thickness that should be maintained over the length of the line. All lines must be sufficiently opaque to ensure the desired reproduction. All line work must be of a professional nature.

Lettering

Most lettering is to be freehand inclined upper case for proposed features and inclined upper/lower case for existing features. Exceptions can be made for special notes that require extra emphasis or duplication). Freehand useage may include all call-out and notes customarily included. Freehand lettering should be done using a "0" pen with a lettering guide to insure uniformity. The use of guide lines that could be picked up by a reproductive process should be avoided. Minimum letter height should be 1/10 inch. Particular care should be given to character and definition to avoid filled in loops and leaching from character to character during photoreduction.

General notes, construction notes, special notes of great length, and special notes to be used many times over may be word processed or typed and "sticky-backed" to the appropriate location.

Dimensions

For roadway and site work drawings, dimensions should be given in feet and tenths or hundredths of a foot. Field measured distances should be shown as measured; computed or proposed distances should be shown to a hundredth of a foot.

For construction details and drawings of a structural nature, dimensions should be given in feet and inches on the usual arrowed dimension lines. Inches should be used for dimensions up to and including twelve inches (i.e., ¼"; 10 ½"; 12"). Feet and inches should be used for dimensions over twelve inches (i.e., 1'- 0 ½"; 2'-8"; 3'-6 ½"). A cipher should not be used to indicate zero feet or zero inches. Elevations that depict natural ground, whether existing or proposed, should be given to the nearest tenth of a foot. Elevations that depict a manmade object (i.e., pavement, structures, pipe, etc.) should be given to the nearest hundredth of a foot. Foot marks are not to be included in elevation, i.e., EL. 100.00 not 100'.

Bearings should be indicated by degrees, minutes, and seconds. Normally, all bearings are given in the northeast and northwest quadrants except for boundaries, which must be shown in the direction of travel.

Spelling, Abbreviations, and Phraseology

American usage should always be followed (i.e., center, meter, etc.). Improper spellings should not be used (i.e., thru, thoro, etc.). Also, words should be spelled and abbreviated consistently throughout (i.e., either Ex. or Exist). ABBREVIATIONS SHOULD BE KEPT TO A MIMIMUM to avoid cryptic notes.

Symbols and Conventions for Engineering Drawings

Symbols and conventions serve two main purposes: a) they simplify the drawings; and b) they follow or establish a standard which is easily recognized. Symbols should always be shown in the legend of the drawings, usually on the first drawing in a set. Discretion should be used in cases where it would be advantageous to have the legend on each drawing, particularly when different types of symbols appear on different drawings.

A listing of the most commonly used symbols and conventions are depicted on the following pages. Special care must be given to existing and proposed features to show the proper contrast and retain legibility. Special conditions may require slight variations. Symbols may be altered in situations when previously prepared drawings are used for new contract work with similar or duplicated symbols. Other situations may arise when slight variations in symbols and line weights may present a better understanding of the drawing in relation to other features. However, these special situations should be avoided when possible.

III.E **Design Criteria and Engineering Guidelines**

The following section outlines the general criteria governing the design of all public storm sewer systems constructed within the City of Tampa. This criteria is intended to govern not only new systems being constructed by governmental agencies and private developers, but also is for the analysis and/or redesign of existing systems. Individuals are encouraged to utilize the latest design data and information available. However, in those cases where it differs from that included herein, approval from the SMD must be received prior to plan submission or more preferably at a pre-design meeting.

III. E. 1 **Flow Generation and Hydraulic Design**

Rate of Runoff

Storm sewers shall be designed by the Rational Method where the runoff is related to the rainfall intensity by the following formula:

$$Q = CiA$$

Where:
- Q = Peak Flow Runoff (cubic feet/sec.)
- C = Runoff Coefficient
- i = Rainfall Intensity (in./hr.)
- A = Drainage Area (Acres)

Other recognized and generally accepted hydrograph generation methods may be used after review and approval by the SMD.

Runoff Coefficient ("C")

The runoff coefficient, used in computing flow to a point under consideration, shall be a weighted average based on current zoning or future land use plan as specified below.

Individuals may determine "C" factors from zoning maps for the Rational Method or aerial photographs for other methods.

Runoff coefficients as related to current City zoning classifications are as follows:

Zoning Classifications	Use(s)	C
All RS districts	Single-family residential	0.30
RM - 12 & 16	duplex/triplex/quad	0.40-0.60
RM - 24 thru 75	multi-family	0.75
RC	residential office	0.60
OP	professional office	0.80
CN, CG, CI	commercial	0.90
IG, IH	industrial	0.75
MAP	commercial or industrial	0.75-0.90
PD	planned development-various	(refer to file - see site plan)
Water bodies	———	1.00

Rainfall Design Frequency

All rainfall design data shall be obtained using the Florida Department of Transportation Zone VI rainfall curves (see Section V). Other sources of rainfall data may be utilized when other forms of model

Time of Concentration

The time of concentration shall be defined as the sum of the inlet time and the time of flow in drains.

The time of concentration of the first inlet on any system shall be determined by using the Velocity of Runoff Chart (see Section IV), plus ditch or gutter times. A minimum time of 15 minutes to the first inlet shall normally be used.

Rainfall Distribution

For methods requiring use of a rainfall distribution curve, the following criteria apply:

1. For a storm duration of 24 hours, the SCS Type II - Florida Modified curve or the Tampa NURP curve shall be used.

2. For storm durations other than 24 hours, a suitable method of distribution other than the above must be used. One acceptable method is the "Balanced Storm Approach" found in the Florida DOT Drainage Manual, Volume 2A, 5.9.1.

Design Storm Duration

For methods employing hydrographs for convenyance and/or pond design, the following shall apply:

1. Pond and storage element design shall be based on the duration criteria in section III.E.7. (Generally, 24 hours)

2. Pipe, Ditch and other conveyance element design shall be based on the critical-duration storm. Critical Duration shall be determined by obtaining trial resuls for several storms.

Drainage Area

The area used in computations shall be the entire area which is tributary to the point at which the discharge is being determined.

Hydraulic Calculations

The hydraulic calculations for the design of storm sewers shall be based on the Manning formula:

$$Q = V\,A = \frac{A1.486\ R^{2/3}\ S^{1/2}}{n}$$

Where:
Q = flow in cubic feet per second
A = cross section area of water in pipe in square feet
n = coefficient of roughness
R = hydraulic radius $= \frac{\text{wetted area in square feet}}{\text{wetted perimeter in feet}}$

S = slope of hydraulic gradient

Hydraulic Gradient

The hydraulic gradient should usually be determined starting at the downstream end of the proposed drainage system. The hydraulic gradient to the upstream end of the proposed drainage system shall be determined by adding a series of friction losses in sections of drains and losses in structures (if required) to the beginning tailwater condition.

Tailwater Conditions

Where a proposed drainage system is connected to an existing drainage system the hydraulic gradient at the point of junction may be obtained from the hydraulic gradient computations of the existing system if on file at the SMD. Where a proposed drainage system discharges into a stream or ditch the flow conditions of this stream or ditch shall be investigated. In either case when the tailwater elevation is higher than the proposed crown elevation, the hydraulic gradient shall begin at this tailwater elevation. Where free outfall conditions exist, the hydraulic gradient shall begin at the crown of the proposed drain.

Initial starting elevations for hydraulic calculations in existing storm sewer and ditches where actual HGL elevations are not available from the SMD should be estimated by the consultant for review and approval by the SMD.

At tidal outfalls a mean high tide of 2.0 feet above MSL should be used as the beginning HGL elevation.

Hydraulic Grade Line-For design conditions, the desirable hydraulic grade line is to be a minimum of 1.0 foot below the gutter or pavement edge or surrounding low property at each location within the storm sewer system. Exceptions to this may be accepted after review by the SMD.

III.E.2 **Conduit Systems (Pipes and Box Culverts)**

Design frequency Conduit systems shall be designed based on a 5-year frequency storm using FDOT Zone 6 curve (see Section V).

Storm Sewer Tabulations

Where storm sewers are designed using the Rational Formula, the drainage calculations shall include a Storm Sewer Tabulation Form (see Section V).

Submittal of design information to the SMD shall be required and shall include the following:

1. Location and type of drainage structures
2. Type and length of conduits
3. Drainage areas
4. Runoff factors
5. Time of concentration to structures
6. Rainfall intensity
7. Peak discharge used for sizing pipe
8. Hydraulic gradient control elevation
9. Hydraulic grade line, crown elevation and flow line of each pipe
10. Physical drop in pipe
11. Hydraulic gradient loss
12. Diameter of pipe
13. Hydraulic gradient slope
14. Velocity
15. Ground elevation at each drainage structure

Coefficients of Roughness

Coefficients of roughness to be used in the Manning formula are:

Pipes

15" - 30" RCP	n = 0.013
36" - 48" RCP	n = 0.012
54" - and up RCP	n = 0.011
Concrete Boxes	n = 0.010
Corrugated Metal (if approved by SMD)	n = .024

Velocity

Storm sewers shall be designed to produce a minimum velocity of 2.5 feet per second and a maximum velocity of 10 feet per second.

Where velocities greater than 10 feet per second are unavoidable, special provisions shall be made to protect against displacement, erosion or shock.

Minimum Sizes

Minimum stormwater conduit sizes shall be 15" in diameter or equivalent size of oval pipe.

Conduit Alignment

All storm sewer layouts shall avoid abrupt changes in direction or slope and shall maintain reasonable consistencies in velocity. Vertical alignment should include dropping the invert elevation at manholes when the sewer increases in size an amount equal to the difference in size; so that the tops or crowns of the two sewer pipes remain on the same line. In special conditions, approved by the SMD, the centerline or inverts of pipes may be matched.

The location of other existing and proposed utilities and traffic conditions shall be fully considered in determining the location of storm sewers. The consultant should coordinate with utilities and the street design section of DPW.

Where locations of storm sewers would require removal of or damage to trees within parks or public rights-of-way, design engineers shall review storm sewer alignment and trees to be removed with the City Parks Department.

Minimum Material Standards

Reinforced Concrete Pipe shall be used and be at least ASTM 6--76-72A, specifications for reinforced concrete culvert, storm drain, and sewer pipe, class III.

Box Culverts

Pre-cast or poured in place box culverts shall at a minimum be constructed in accordance with the specifications of the Florida Department of Transportation.

Minimum Cover

Minimum Cover over Class III and IV Reinforced Concrete Pipes are as follows:

Storm Sewers-Minimum Cover

Pipe Class	Residential Street	Arterial Street
III	1'-6"	2'-0"
IV	1'-0"	1'-6"

Residential Driveway-Minimum Cover

Pipe Class	Light Traffic	Heavy Traffic or before construction
III	0'-6"	0"-9"
IV	0'-3"	0 - 3"

Commercial Driveways-Minimum Cover

Pipe Class	Light Traffic	Heavy Traffic or before construction
III	1'-0"	1'-6"
IV	0'- 6"*	0' -6"*

* Consider A concrete "pad" over the pipe may be required.

NOTE: Cover greater than minimum is to be provided wherever possible. Pipes with less than minimum cover shall require additional protection and approval.

Minimum Pipe Clearances

The following minimum clearances shall be used when determining pipe elevations. Should it be impossible to maintain these separations, then adequate means must be utilized to protect both the storm sewer system and the obstructing facility. Clearances shall be per individual utility requirements and shall be measured between the outside of pipe.

When the storm sewer cannot be buried deep enough to meet the above requirements, utilities should be relocated to provide this separation. The use of conflict manholes is not suggested due to the continuous maintenance problems which result. If no other solution is available, use of conflict manholes is discussed in Section III.E.4.

Drainage Easement or Right of Way Requirements

Storm sewers shall be located in a drainage easement or right of way dedicated to the City of Tampa. For storm sewers not within street right of way, the drainage easement or right of way width shall be sufficient to accommodate a work trench with 1:1 side slopes and with a bottom width of 2.0 feet wider than the storm sewer width. In no case shall the drainage easement or right of way width be less than 15 feet. The following are guidelines for determining easement widths: (See Figure-Section IV)

Less than Five Feet of Cover Over the Pipe

Diameter equal to or less than 30" round or equivalent. Easement shall be 7.5 feet either side of the centerline of the pipe.

Diameter greater than 30" round or equivalent. Easements shall be 15 feet plus the outside diameter of the pipe in width (rounded up to the nearest 5 foot increment) and centered on the centerline of the pipe.

Equal or Greater than Five Feet of Cover Over Pipe

Easement will be equal to the outside diameter of the pipe plus twice the distance from the ground surface to the trench bottom measured at the deepest point along the path of the proposed easement (rounded up to the nearest five foot increment) and centered on the centerline of the pipe.

Box Culverts

The easement width for box culverts shall be twice the sum of the depth of cover and box height plus the box width. All easements shall be rounded up the nearest five foot increment. All dimensions shall be external box measurements. The depth of cover is measured from the ground to the top of the box. The minimum easement width is to be 15 feet.

III.E.3 **Inlets.**

Location

Inlets shall be located in such a manner as to **accept 100 percent** of the design runoff. Inlets shall be placed in accordance with good engineering practices so that the accumulation of water above thepoint where flooding of the shoulders or roadside property will not occur. Inlets shall be constructed in all low areas and at all intersections where conditions of street crown and/or quantity of flow require. Inlets shall be spaced so that gutter flow limitations as described below are not exceeded. When absolutely necessary to carry water across intersections, valley gutters will be utilized.

Generally, water should not be carried across intersections or in gutters for distances exceeding 400 feet. A maximum inlet spacing of approximately 300 feet may be required on steep grades (2.0/or greater) to prevent a large accumulation of high velocity water which will bypass the inlets.

A maximum spacing of approximately 300 feet also may be required on an extremely flat grade (0.20% to 0.40%) to reduce the spread of water onto the highway. This is true especially where no parking is provided and traffic lanes are adjacent to the gutter.

Where inlets are located on returns in which one of the intersection roadway grades exceeds one (1) percent, a return profile shall be included in the construction plans.

Other than at intersections and at lots which are wider than one hundred (100) feet, inlets shall be located as near as possible to common lot lines. However the primary priority is that they be located at the low point.

For maintenance purposes, curb inlets shall not be placed on radii of curb returns, if possible. All stormwater shall be removed prior to pedestrian crossing or bicycle facilities. Inlets shall be placed at all points where the cross slope on a roadway reverses from negative to positive to prevent stormwater from crossing the roadway. No stormwater runoff will be allowed to enter the roadway gutter from large impervious areas outside of the roadway limits. This flow will be intercepted by inlets prior to or at the right-of-way line.

Inlets, where required at intersections, shall be 5' upgrade from P.C. of curb (or proposed curb). B.R. inlets may be used on the radius where the 5' upgrade of P.C. with special approval.

When no curb and gutter is used, inlets should be offset a minimum of 2 feet from the edge of the pavement.

Types and Specifications

On new street construction, as well as, on existing streets with concrete curb and gutter, the following City type inlets are to be used where appropriate:

1. Type-1
2. Type-2
3. Type-3
4. B-R-1
5. B-R-2

With approval, in locations where R/W limits are constrained, the following curb inlets may be used where appropriate:

D.O.T. Type:
1. Type-5
2. Type-6

NOTE: For further data on inlet types, please refer to DPW standard details shown in Section V and DOT Standards.

Use of GRATE TYPE inlets is specifically prohibited, unless reviewed and approved by the SMD. Slot opening for inlets shall be 6".

Inlets and manholes will be designed so as not to have standing water when not functioning.

All inlets are to have lids for maintenance access in accordance with City standards.

Pipes are to be cut flush with inside wall of inlet.

Throat elevation at the face of the inlet of curb inlets should be indicated on the plans when curb type inlets are used on streets without curb.

Capacities and Spacing

For design purposes general inlet capacity may be assumed as follows:

Grate Inlet *	4 CFS
No Wing Type	5 CFS
Single Wing Type	7-8 CFS
Double Wing Type	9-10 CFS

* Subject to SMD's approval only.

III.E.4 **Manholes**

Location and Spacing

Manholes shall be used at all changes of pipe size or where there is a change in alignment. Manholes shall also be used at all changes of pipe grade.

The standards for length of pipe to be used without an access structure are:

15" pipe	100 feet
18" pipe	300 feet
24" to 36" pipe	400 feet
42"and larger and all box culverts	500 feet

Standards

All manholes shall be traffic bearing D.0.T. type per City of Tampa Specifications.

Conflict Manholes

When conflict structures become necessary, the structure shall be controlled according to standard D-10 and the appropriate affected utilities.

III.E.5 **Culverts**

Minimum Pipe Size

The minimum size of pipes to be used for culvert installations shall be 15 inches or equivalent oval.

Lengths of Structures

The minimum length of culvert shall be 24'. The maximum length of culverts without access shall be as allowed in Section III.E.4.

Design Tailwater

All culvert installations shall be designed taking into consideration the tailwater of the receiving facility or body of water. Generally, the tailwater must be determined by calculations based upon the standard design criteria and frequencies contained in Section III.

End Treatment

Headwalls shall be provided at all inlet or outlet pipes. The headwalls shall be bagged sand cement, rip-rap, poured in place concrete, acceptably reinforced or other approved structures placed in accordance with the specifications and standard drawings of the Florida Department of Transportation. Where flow velocities from pipes discharging to open channels exceed permissable velocities for the soil conditions in the receiving channel, suitable energy dissipating structures shall be installed to prevent erosion.

Where shallow ditches or storm sewers intersect deeper drainage ditches, erosion control shall be provided.

Allowable Materials

Reinforced concrete pipes, and concrete box culverts, are allowable as culvert materials in the City of Tampa.

Aluminum pipes may be used if following requirements are met:

1. A large size culvert is required (over 48" diameter).
2. The culvert is located outside the pavement and appropriate shoulder width.
3. The City has no immediate plans (within 5 years) to close the ditch.
4. The culvert is adequately sized to convey the design flow.

5. Minimum cover over the pipe is 12".

6. The gauge of the pipe should be related to fill height. Permitted deflection and minimum factor of safeties shall be per manufacturer's specification.

7. Pipe shall have smooth or (paved) inverts.

8. The bedding and backfill shall be as per manufacturers specifications.

9. Every case shall be considered on its individual merit and the SMD shall have the authority to approve or reject the design.

III.E.6 **Ditches**

General

Grassed swales and open channels may be used in lieu of a closed, conduit system to convey stormwater runoff when sufficient drainage easements or rights- of-way are available. Open conveyance systems are often desirable to assist in the mitigation of pollution problems. Ditches shall be sized using Manning's formula and in all cases data on velocity and depth of flow shall be included in the drainage calculations.

Cross Section

Open channels may be designed as either a trapezoidal or "V" cross section. The steepest side slope of either type section shall be 2 horizontal and 1 vertical (2:1). Desirably, 4 horizontal to 1 vertical (4:1) shall be utilized. All open channels should have a minimum bottom width to two (2) feet wider than the culvert or storm system for which it serves as an outfall.

Location and Alignment

Ditches within street rights-of-way shall have side slopes and be located and designed in accordance with the requirements in Section IV.

Channel Curvature

Channel protection shall be provided when channel alignment changes may produce erosion.

Minimum Freeboard

A minimum freeboard of one (1) foot shall be maintained between design water surfaces and the edge of pavement, gutter line or adjacent property lines, whichever is lower.

Design Flows

Flows for an open channel system shall be determined using 5 year frequency.

ROUGHNESS COEFFICIENTS FOR USE IN MANNING'S EQUATION

Channel Lining	Description	Design "n"
Bare Earth, Fairly Uniform	Clean, recently completed	0.022
Bare Earth, Fairly Uniform	Short grass and some weeds	0.028
Dragline Excavated	No vegetation	0.030
Dragline Excavated	Light Brush	0.040
Channels not Maintained	Dense weeds to flow depth	0.10
Channels not Maintained	Clean bottom, brush sides	0.08
Maintained Grass or Sodded Ditches	Good Stand, Well Maintained 2-6"	0.06
Maintained Grass or Sodded Ditches	Fair Stand, Length 12-24" 2-6"	0.20
Concrete Paved	No Finish	0.016
Concrete Paved	Finished	0.014
Concrete Paved	"Roughened"	0.020
Concrete Paved	Gunite	0.020
Concrete Paved	Over rubble	0.023
Asphalt Concrete	Smooth	0.013
Asphalt Concrete	Rough	0.016
Rip-Rap	Fairly Uniform	0.03

Maximum Velocities

Maximum Allowable Velocities for Unlined Open Channels.

Soil Type	Allowable Velocity (f.p.s.)
Silt or fine sand	1.50
Sandy Loam	1.75
Silt Loam	2.00
Firm Loam	2.50
Stiff Clay	3.75
Hardpans	6.00

Maximum Allowable Velocities for Lined Open Channels.

Type	Allowable Velocity (f.p.s.)
Standard Sod	4.0
Lapped Sod (25% overlap)	5.5
Asphaltic Concrete	8.0
Concrete Ditch Paving	10.0

Ditch Erosion Protection

Ditches shall be provided with permanent erosion protection. Such protection may be sod, sand/cement, rip-rap or approved ditch pavement may be utilized. When turf protection is used, ditches shall be sodded to two feet past the top of the bank.

Areas adjacent to ditches shall be graded to preclude the entrance of excessive storm water runoff except at locations properly constructed to accept such runoff.

Where small ditches or storm sewers intersect deeper drainage ditches, erosion control shall be provided by use of culvert pipes, concrete swales, sandbag rip-rap, headwalls with spillways, or other suitable means both adjacent to and across from the ditch, culvert or storm sewer approved by the SMD.

Ditch pavement shall be in accordance with the Standard Indexes and the Florida DOT Standard Specifications for Road and Bridge Construction, latest edition.

Ditch Easement Requirement

A minimum drainage easement or right-of-way 15.0 feet in width shall be dedicated to the City wherever needed for ingress and egress.

Guidelines for minimum ditch access requirements along the length of the ditch are as follows.

Absolute minimum maintenance access is a 15 foot berm. If the top width of the ditch is less than or equal to 15 feet, access is only necessary from one side. If the top width of the ditch is greater than 15 feet maintenance access will be provided from both sides.

Utility Crossing Ditches

Where it is necessary for a utility to cross a ditch, the following minimum requirements shall be adhered to:

Aerial Crossing: Minimum of 1.0' clearance to design high water with the area underneath the crossing to be concrete lined to prevent vegetative growth.

Underground: Minimum of a 2.0' clearance to the invert of the ditch.

No aerial supports shall be allowed in the confines of the ditch cut unless authorized by the SMD.

Utility crossings of all floodways, open channels and ditches shall be clearly labeled on-site with suitable markers or permanent signs.

III.E.7 Detention/Retention Facilities

General

When constructing detention/retention basins for a drainage system, the design shall make such facilities an asset and not a liability to the community by:

Making them useful for recreation, parks and other public purposes when possible. Eliminating hazardous and unhealthy conditions normally associated with such facilities.
Facilitating maintenance with standard equipment at minimum expense, landscaping and installation of recreation facilities.

Utilizing existing trees and landscaping wherever practicable.

Design Frequency

Detention basins with outlet pipes are designed to be based on inflow curves using the 25-year Frequency Rainfall Intensity Duration Curve for Zone 6, Tampa, as shown in Section V. Design will be based on rainfall of 24 hours duration unless maximum capacity requirements are obtained under less duration.

Retention basins (without outlet) are designed based on the 50-year Frequency Rainfall Intensity-Duration Curve for Zone 6, Tampa, as shown in Section V and for a rainfall of 24 hours duration.

Basin Analysis

The Basin Analysis Sheet (see Section V) shall be completed for each basin and shall be included in the Drainage Calculations.

For ponds designed using other inflow/outflow routing techniques, appropriate computer printouts or other information must be provided to the SMD for review and approval.

All areas on or off site contributing runoff to a basin shall be included in design.

Design High Water

Design high water elevation will be established in consideration of adjacent properties and facilities, but normally a minimum of one foot below any surface which drains to the basin.

Design Low Water

For detention basins the design low water shall be the elevation of the control or positive outfall. Design low water elevation for retention ponds will be established in consideration of ground water table and other contingencies. The unreliability of the actual low water elevation at the beginning of a storm emphasizes the importance of the requirement to use the 50-year frequency when there is no outlet.

Detention Time and Draw Down

The facilities shall be designed to recover the total retention volume within 72 hours of the design storm occurrence. Drawdown of the facility may be accomplished by one of the following methods. The methods listed do not preclude other methods which may be shown to accomplish the results required.

(1) Percolation — Percolation rates must be submitted by a qualified Geotechnical Engineer (See Section III.E.9).

For retention facilities dependent entirely on percolation of volume recovery, the minimum depth to the seasonal high groundwater shall be two feet.

(2) When groundwater conditions prohibit percolation or, if the designer prefers, a method using an underdrain system shall be designed to lower the groundwater table to a minimum of two feet below the retention facility.

(3) The use of other manmade filtration systems.

(4) Controls with positive outfalls such as weirs, inlets, slots, bleed down holes, etc. A full discussion of control structures is provided subsequently.

Tree Removal

In keeping with the City tree regulations to retain as many of the trees growing on basin sites as is practicable, trees of four-inch or larger diameter growing above the design high-water elevation shall remain and some of the larger trees located below the design high water may be designated to remain, and necessary allowance made in the basin design.

All trees four (4) inches or more in diameter existing within the basin sites shall be shown on the construction plans and designated to remain, be removed or transplanted; and, such plans shall meet the approval of the Parks Department.

The maintenance berm should be clear of all trees in order for equipment to have the ability to manuever.

Excavation

Basins shall be designed to comply with the provisions of Section II.E., entitled "Grading, Excavation, Setback and Fencing"

When basins are designed to remain dry except during rainfall, they shall be constructed to have bottom elevations above the ground water table at the end of the rainy season (September) with the bottom graded to drain all detained water to the controlling outlet structure, and shall be sodded.

The final grading of the basin bottom shall remove the final six (6) inches and shall be the last work in the construction of the road, bridge and drainage facilities. It is suggested that a sediment deposit area be excavated in the immediate area of all inflow points. This area should be designed to collect sediment deposits, eliminate mounding, and be interfaced with the pond so as not to be a health, safety or asthetic problem.

It is suggested that the required detention/retention facility be constructed in such a manner that it will become an amenity rather than a detriment to the City. It is also suggested that these facilities be used as recreational or park areas wherever practical.

Water Quality Enhancement

For purposes of water quality enhancement all retention and detention basins shall be stabilized to the normal water line with suitable vegetation to prevent erosion and subsequent sedimentation of the basins and to provide assimilation of pollutants.

Basin Stabilization

Normally, basins should have a single inlet and single outlet structure with concrete splash pads to minimize erosion, silting and maintenance constructed in accordance with the City standard design.

The plans and specifications shall provide for berms, side slopes, bottoms and other locations to be sodded and grassed as necessary to prevent erosion, silting and maintenance problems.

When basin slopes or soil conditions warrant, sod should be staked to insure stabilization.

Off-Site Overland Flow

Areas adjacent to the basin shall be graded to preclude the entrance of excessive storm water runoff overland flow into the pond causing erosion of berms and side slopes. Runoff from property abutting the basin shall be collected in an intercepter swale designed to drain dry in less than 24 hours and discharge to the pond by an inlet, pipe and mitered headwall system.

Outflow Control Structures

The outlet of detention basins shall have a water level control structure that enables the basin to function as shown on the Basin Analysis Sheet. The water level control structure shall not be a pipe riser and shall not be adjustable unless previously reviewed and approved by the SMD. The water level control structure shall be an endwall or ditch bottom inlet constructed in accordance with the Standard Indexes and the Florida DOT Standard Specifications for Road and Bridge Construction, latest edition, unless an endwall or ditch bottom inlet will not enable the basin to function as shown on the Basin Analysis Sheet. In the event an endwall or ditch bottom inlet will not enable the basin to function as shown on the Basin Analsyis Sheet, the water level control structure shall be a weir or other method approved by the SMD.

In the event the water level control structure is an endwall, the design low water elevation of the detention basin shall be the endwall invert elevation. In the event the water level control structure is a ditch bottom inlet, the inlet shall have a slot, and the design low water elevation of the detention basin shall be the slot invert elevation or invert of a bleed down hole. For detention basins with standing water below the design low water elevation, the minimum basin depth shall be 5.0 feet below the design low water elevation to discourage undesirable growth over the entire pond area.

Conditions downstream of the water level control structure shall be such that will enable the water level control structure to function as shown on the Basin Analysis Sheet.

In order to recover the detention volume required in areas where soil conditions do not permit total percolation, a low volume bleed down device may be incorporated in the discharge structure. Such bleed downs include, but are not limited to, V-notch weirs, slots, underflow gates, circular orifices, etc. All design of the above devices shall be in accordance with recognized formulas and constants for the bleed down configuration used.

All detention facilities shall discharge design flows through structural discharge facilities. Direct discharge over weir structures, into storm drains or through culverts will be permitted if the receiving systems have the capacity for such discharges. Such systems may be defined as storm sewer systems, manmade ditches, natural streams, marshes and wetlands naturally receiving sheet flow. The discharge structure shall direct the flow to an intermediate spreader swale system if any erosion to a natural system is anticipated.

Drainage Easement or Right-of-Way

Sufficient drainage easement or right-of-way shall be dedicated to the City to allow for installation of the basin plus an unobstructed 15.0 foot width maintenance berm around the perimeter of the basin unless otherwise approved by the SMD. The 15.0 foot width is measured from the top of the bank. However, a basin with sideslopes of 6:1 or flatter may have a maintenance berm 5.0 feet in width. A drainage easement or right-of-way 15.0 feet in width shall be dedicated to the City from the street to the basin wherever needed for ingress and egress.

III.E.8 **Underdrains/Exfiltration Systems**

General

Underdrains or exfiltration systems may be required to facilitate ground water control or for water quality permitting. When the use of these facilities is required, the plans shall include all details necessary for construction.

Piping

Pipes shall be of sufficient size to effectively transmit the design flow. Pipes may be corrugated aluminum, polyvinylchloride (PVC), corrugated polyethylene or other material approved by the SMD. All underdrain shall be in accordance with the Florida DOT Standard Specifications for Road and Bridge Construction, latest edition.

Piping shall be placed with compacted backfill. An attempt should be made not to place piping under the street pavement.

Minimum accceptable pipe diameter is 8 inches for PVC or corrugated polyethylene, 12 inches for corrugated aluminum and 18 inches for concrete.

Aggregrate for Exfiltration Systems

Sand or gravel shall have pore spaces large enough to provide sufficient flow capacity so that the permeability of the aggregate is greater than the surrounding soil. The design shall ensure that the particles within the system do not move. Aggregate for exfiltration trench shall comply with FDOT Specificaton Section 901 for coarse aggregate size number 4, except that no limestone, dolomites or sandstones shall be used.

Aggregate for Underdrain Systems

When sand or other fine textured aggregate other than natural soil are used the material should be of a quality sufficient to satisfy the minimum requirements of the SWFWMD.

Filter Fabric

A filter fabric envelope shall be used with underdrains or exfiltration systems and shall be a porous nylon, polyester, polypropylene or other fabric approved by the SMD.This material should cover the top and sides of exfiltration systems and completely cover the underdrain surface in such a way as to prevent infiltration of surrounding material. Storage and handling of the filter fabric shall be in accordance with the manufacturer's recommendations. Torn or punctured filter fabric shall not be used. The filter fabric shall not be exposed to sunlight for periods exceeding the manufacturer s recommendation.

Application of Exfiltration Systems

The clearance between the exfiltration trench bottom and the seasonal high ground water shall be at least 1 foot unless specifically approved by the SMD. Borings to 5 feet below the trench bottom should indicate no clay, clayey sand, or sandy clay, muck, hardpan, silt, marl, rock or other unsuitable soils, and the soil should be defined by the SCS as having rapid internal drainage.

Exfiltration System Standards

Perforated pipe shall be installed in filter material of washed and screened gravel, slag, rock or similar material of equivalent strength and durability varying in size from one-half (1/2) inch to two (2) inches free from fines, dust, sand or clay. Limerock will not be accepted as exfiltration aggregrate.

Filter material shall encase the pipe with a minimum depth of twelve (12) inches under the pipe and have a total depth of at least twelve (12) inches extending throughout the width of trench.

Filter material in place shall be protected from infiltration of earth backfill by an effective barrier of acceptable filter fabric.

Minimum depth from invert of exfiltration pipe to inlet invert shall be 6 inches. Minimum earth cover over or above the top of the trench shall be 24 inches. The inlet shall be of the open bottom type to prevent standing water within inlet catchment. Pipes used in exfiltration systems shall be not less than eight (8) inches inside diameter with material conforming to standards previously described with one-quarter (1/4) inch open joints or minimum perforated area one and five-tenths (1.5) square inches per linear foot of pipe. Perforated pipe shall be installed with an adequate portion of the perforations on the bottom.

Exfiltration trenches shall be graded with a downward slope of one-quarter (1/4) inch to one-half (1/2) inch per ten (10) feet and in no case shall exceed six (6) inches per one hundred feet.

Maximum length of trenches shall not exceed 75 feet with a long sweep elbow and cleanout for maintenance purposes.

Minimum width of trench bottoms shall be twenty-four (24) inches; maximum width of trenchs within the R.O.W. shall be forty-eight (48) inches.

Trenches may not be used in areas of heavy conflict with trees, utility poles or underground utilities.

A drain field may be used in lieu of trenches where space permits, as follows:

1. Distance between centers of distribution lines shall be a minimum of three feet or 3 feet plus the diameter of distribution pipes larger than 8 inches. Distance between side wall of bed and outside distribution lines shall be one foot.

2. Where two or more laterals or lines of drain pipe are required, a distribution box shall be provided between the inlet and drainfield.

3. Boxes shall be of reinforced concrete, of adequate structural strength and of sufficient size to accommodate the required number of drain pipe and provide for proper maintenance.

4. Each drainfield line shall connect individually to box.

5. Invert to box shall be at least one inch above invert of outlets and invert of outlets level.

6. In lieu of required distribution box, a header pipe may be used when approved by the SMD and installed with sufficient cleanouts to allow proper maintenance.

III.E.9 **Percolation and Soils Investigations**

Results of all percolation and soils investigations shall be certified by a Florida Registered Professional Engineer.

Test boring shall be made by a certified testing firm to a minimum depth of ten (10) feet below the bottom elevation of the basin or exfiltration system in order to determine the groundwater table and soil classifications. Should a high groundwater table or clayey soil be encountered, additional test borings may be required.

The seasonal high groundwater table shall be determined based on the rainy season in the months of August or September. (The SMD maintains a groundwater monitoring network and makes available such data to engineers to aid in their design.) The Registered Engineer shall make a statement estimating the seasonally adjusted high groundwater elevation.

Percolation tests shall not be made in filled ground unless the soil has been thoroughly and mechanically compacted or allowed to settle for a periods of six months or more.

For the double ring infiltration test (DRI) the actual field rate may be used on the bottom of the pond or drainfield and 50% on the horizontal component of the sides with no additional adjustment.

The percolation rate in either case shall be reduced by ten (10) percent for each foot the water table rises above the elevation ten feet below the bottom of the basin or bottom of drain field.

There shall be at least one soils investigation per 10,000 square feet of pond bottom and one infiltration test per 20,000 square feet of pond bottom placed at appropriate test locations. If multiple ponds are used, at least one one soil boring and infiltration test will be required per site. In addition, multiple borings or tests immediately adjacent to each other will not be accepted.

III.E.10 **Roadway Standards Associated with Drainage Improvements**

General

Roadway design and construction criteria shall conform to the DPW Transportation Division requirements. Criteria contained herein and those criteria contained in the following publications are to be used as guidelines;

Florida DOT Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways, latest edition.

Florida DOT Procedures Manual for Flexible Pavement Design, latest edition.

U.S.Dept. of Transportation, Federal Highway Administration -Manual on Uniform Traffic Control Devices for Streets and Highways, latest edition.

Florida DOT-Standard Specifications for Highway Bridges, latest edition.

Improvements Within the Rights-of-Way
No walls, fences, gates, signs or other obstructions to drainage shall be constructed or placed within the right-of-way. Some existing trees may be allowed to remain and others planted, if approved by the SMD.

Permanent improvements in street right-of-way, including but not limited to curb inlets, poles, fire hydrants, and trees shall not be located in such a manner as to block access to drainage easements or rights-of-ways leading away from street right-of-way.

Design Criteria for Horizontal and Vertical Alignment and Pavement Width

Horizontal and vertical alignment and pavement widths shall be in accordance with the DPW Transportation Division standards or the Florida DOT Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways, latest edition. Under no circumstances will pavement widths be less than ten (10) feet per lane unless reviewed and approved by the SMD and Transportation division. Rights-of-way at intersections shall be rounded with a twenty-five (25) foot radius for local streets and a minimum of thirty-five (35) foot radius for other street classifications. The minimum curb radius at intersections for local streets shall be twenty-five (25) feet and for other classification streets shall be a minimum of forty-five (45) feet.

Roadway Subgrade

With the exception of subgrade for soil cement base, shall in no case have a Limerock Bearing Ratio less than forty (40), a density less than ninety-eight (98) percent Modified Proctor and a depth less than:

Type of Street	Stabilized Subgrade Minimum Depth
Arterial	12''
Collector	8''
Local	6''

Subsoil Investigation for Roadways

A subsoil investigation report shall be submitted with the plans and shall include:

(a) Seasonal high and existing groundwater elevation data.

(b) Borings a minimum of 5.0 feet below the profile grade. The borings shall be at a maximum of two hundred (200) foot intervals. There shall be no less than one (1) boring per street. The borings shall be taken to determine the soil classification in Accordance with AASHTO M-145-73 unless the SMD determines that they are not required. Additional borings may be made as necessary to determine limits of unsuitable material. Depth and horizontal limits of muck areas shall be determined. Unsuitable material shall be removed and replaced.

Minimum Groundwater and Highwater Clearances

All arterial streets shall be designed to provide a minimum of two (2) feet between the bottom of the base and the seasonal high water table elevation.

The clearance required for residential and collector streets under the same conditions shall be one (1) foot. Should this criteria not be met, underdrains or other appropriate subgrade should be used after review of the SMD and Transportation Division.

Underdrains

Where road construction incorporates curbs and gutters, underdrains may be required for certain water table soil conditions. The underdrains shall be 18 inches outside of the curb and a minimum of 24 inches below the bottom of the curb and with a slope to a positive outfall.

Roadway Drainage

Roadway Grade

A minimum grade of 0.30% is required for all sections.

Minimum Roadway Cross-Slope

For drainage purposes minimum cross slopes and/or super elevation rates of .0208 ft/ft (1/4''/ft.) shall be utilized for design of all roadways.

Streets shall not be designed with an inverted crown.

Open Roadway Ditches or Swales

Minor ditches or swales may be considered as an acceptable method of conveying pavement runoff and other stormwater when used parallel to the traveled roadway. Open ditches or swales may be used as outfalls for storm sewer systems, if they meet the definition and criteria in Section III.E.6.

Roadways-Guttered Section

Concrete Curb, Gutter and Sidewalks

Details of concrete curb, gutter and sidewalks shall conform to the City of Tampa standards.

Materials and installation shall conform to the Florida DOT Standard Specifications for Road and Bridge Construction, latest edition.

Use of Valley Gutters to convey stormwater across and/or through an intersection is prohibited.

Roadways-Non-Guttered Section

Grassing and Mulching, Sodding

All right-of-ways other than the roadway area shall be grassed and mulched in accordance with the Florida DOT Standard Specifications for Road and Bridge Construction, latest edition, except that the area located within two (2) feet of the edge of pavement shall be sodded in accordance with the Florida DOT Standard Specifications for Road and Bridge Construction, latest edition.

III.E.11 **Erosion and Sediment Control**

General

Erosion is the process of transporting particulate substances from one location on the surface of the land to another location by the dynamic force of moving air or water. Erosion and the subsequent transport of sediments with adhering chemical nutrients is a constantly recurring phenomenon of nature, which is greatly accelerated by the development of lands for urban uses, the removal of vegetative cover, loosening of the soil surface and the concentration of stormwater runoff.

Erosion during and immediately following the construction phase is a major contributor to the siltation of drainage ways, conduit systems and detention basins and is a major factor in the degradation of the water quality in receiving water bodies. The eroded soil not only clogs drainage ways and reduces the holding capacity of retention/detention facilities, but also transports organic debris and chemical nutrients to water bodies, which leads to increased biological activity, reducing water quality and contributing to subsequent eutrophication. Stormwater control measures to minimize the impact of this erosion sedimentation shall be incorporated in the plan of development for all projects in the City of Tampa with detailed description of these measures included with the final engineering plans submittal.

Prior to the site preparation work, the Engineer of Record and/or the contractor (who will do the work) shall submit the detailed construction sequence, including earthwork operations, and confer with the SMD for approval of the same.

Interim or temporary control measures shall be designed, constructed and maintained during the construction period in accordance with the current Florida Department of Transportation Standard Specifications for Road and Bridge Construction and Road Design Standards and the current recommendations of the United States Soil Conservation Service. Where conflicts exist between the Florida Department of Transporation and the United States Soil Conservation Service the more restrictive will govern, relative to construction sequences, limitations of exposed erodable earth, clearing, grubbing, sodding, grassing, mulching, matting, sand-bagging, slope drains, sediment basins, berms, dikes, diversions, terracing, retaining devices such as baled hay or straw, or other structures, gabions, soil binders, dust controls and other imterim measures to preclude off-site flooding, erosion, sedimentation or pollution to receiving waters or on abutting properties during the construction periods. The SMD may waive the reouirement for detailed plans to be submitted for formal approval of the interim or temporary erosion/sedimentation or pollution control measures to be implemented during the construction period.

No earthwork operations, including clearing, dredging, filling or other land disturbance shall be permitted by the City prior to approval of the SMD and shall not commence until applicable permits from County, State and Federal agencies having jurisdiction over the receiving waters or waterways are acquired, with a copy of such authorization submitted to the City.

Upon completion of all permanent structures to control stormwater, all interim or temporary structures will be removed, permanent collection piping and roadways will be cleared of all sediment and/or debris, erodable areas will be stabilized with acceptable ground cover to preventable erosion, and detention areas will be cleared of accumulations of construction sediment to provide design storage capacity prior to formal acceptance of the development.

When projects are planned to be constructed in separate phases or increments, the submittal of a construction sequence of the entire development is required to insure such incremental plans are compatible with proper stormwater management until the entire project is completed.

Erosion Control Plan

The erosion control plan, details and calculations shall document all the measures necessary to limit the transport of sediments outside the limits of the project to the volume and amount that was transported prior to the commencement of construction. This condition will satisfy the total anticipated construction period.

No disturbed area will be denuded for more than thirty (30) calendar days unless otherwise authorized by the SMD. During construction, denuded areas shall be covered by mulches such as straw, hay, filters or by sodding or seed and mulch with temporary or permanent vegetation.

A temporary diversion at the top of slopes of greater than 3% will be required. Sod or staked straw bale diversions, interceptor ditches or other approved cohtrol measures are to be placed as shown on the construction plans, prior to or as the first step in excavation.

During construction, all storm sewer inlets will be protected by sediment traps, such as bales of hay, sod, stone, etc., which shall be maintained and modified as required by construction progress.

Where stream crossings are required, temporary culverts will be provided by the contractor and removed when construction is completed.

Areas three (3) acres or greater will require temporary sediment basins used as a positive remedy against downstream siltation. Permanent detention ponds may be used in place of silt basin but must be maintained to the satisfaction of the SMD as work progresses. It will be required that permanent detention ponds be totally cleaned out at final inspection.

Limits of clearing and grading shall be well defined and shown on construction plans along with all protected areas.

All swales, ditches, channels leading from the site will be sodded immediately after excavation. All other swales, etc. including detention areas will be sodded prior to issuance of Certificate of Occupancy.

The following erosion controls will be detailed and located on site and final plans:

Diversion berms and interceptor ditches
Temporary seeding and mulching
Sediment barriers-straw bales, gravel, weirs, etc.
Sediment basin (3 acre or greater development)
Sodding
Any other control structure

All erosion and siltation control devices will be checked after each rainfall and will be cleaned as required.

Provision must be made to preserve the integrity and capacity of check weirs, sediment basins, slope drains, grading patterns, etc. required to meet this provision throughout the life of the construction.

Specific items which may be incorporated with the erosion control plan are as follows:

Stockpiling Material

No excavated material shall be stockpiled in such a manner as to direct runoff directly off the project site or into any adjacent water body or stormwater collection facility.

Exposed Area Limitation

The surface area of open, raw, erodible soil exposed by clearing and grubbing operations or excavation and filling operations shall not exceed 10 acres. This requirement may be waived for large projects with an erosion control plan which must demonstrate that opening of additional areas will not significantly affect off-site deposit of sediments.

Inlet Protection

Inlets and catch basins shall be protected from sediment laden storm runoff until the completion of all construction operations that may contribute sediment to the inlet.

Temporary Seeding

Areas opened by construction operations and that are not anticipated to be dressed and receive final grassing treatment within thirty days shall be seeded with a quick growing grass species which will provide cover during the season in which it is planted, and will not later compete with the permanent grassing. The rate of seeding shall be 30 lb. per acre.

Temporary Seeding and Mulching

Slopes steeper than 6:1 that fall within the category established in the subsection above, shall additionally receive mulching of approximately 2 inches loose measure of mulch material cut into the soil of the seeded area to a depth of four inches.

Temporary Grassing

The seeded or seeded and mulched area(s) shall be rolled and watered as required to ensure optimum growing conditions for the establishment of a good grass cover.

Temporary Regrassing

If, after fourteen days, the temporary grassed areas have not attained a minimum of 75% good grass cover, the area will be reworked and additional seed applied sufficient to establish the desired vegetative cover.

Maintenance

All features of the project designed and constructed to prevent erosion and sedimentation shall be maintained during the life of the construction so as to function as they were originally designed and constructed.

Permanent Erosion Control

The erosion control facilities of the project should be designed to minimize the impact on off-site facilities. All stormwater discharge from the project limits shall be routed through detention basins to trap suspended sediments. Discharge facilities from these basins shall be provided with a skimming device to trap floatable debris. The following describes permanent items to be included in the project for long term stabilization.

Permanent Seeding

All areas which have been disturbed by construction will, as a minimum, be fertilized and seeded. The fertilizer shall be of 12-8-8 proportions and shall be uniformly spread at a rate of 400-500 lb. per acre and mixed with the soil to a uniform depth of four inches. Included with the fertilizing operation, will be the application of amendments, if necessary, such as dolomitic limestone or aluminum sulfate to correct the pH factor to within the limits of 6.0-7.0. The grass seed shall be uniformly spread at a rate of 100 lb. per acre while the soil is moist. The grass seed mixture shall be of 20 parts bermuda and 80 parts bahia, with the addition of 30 parts rye in the winter season.

Permanent Seeding and Mulching

In addition to the minimum requirements of the subsection above, slopes of from 6:1 to 4:1 inclusive will be mulched with a uniform thickness of approximately two inches, loose measure, of mulch material incorporated into the soil by mixing to a depth of four inches.

Permanent Sodding

All retention/detention basins shall be solid sodded within their limits. All exposed areas within public rights-of-way will be solid sodded. Other areas with slopes steeper than 4:1 will be sodded.

Strip Sodding

Strip sod shall be placed adjacent to all curbs, walks and pavements.

Regrassing

All grassed areas will be maintained to assure a good stand and sufficient ground cover to minimize erosion. If, after 60 days an adequate ground cover has not been established, the area will be regrassed

Erosion Control Guidelines

The following are suggested guidelines commonly used for erosion control:

1. **Headwalls/Endwalls**

   (a) cement-sand bags:
   Use DOT Standard 258 for guidance

   (b) concrete:
   Use DOT Standard 250 or 266, as applicable, for guidance

2. **Retention Basins**

   (a) cement-sand bags:
   Use DOT Standard 268 for guidance

   (b) concrete:
   Use DOT Standard 261, modify as necessary (with or without grates and baffles)

3. **Ditches**

   (a) cement-sand bags:

   (i) minimum two layer (1.0') thick-total

   (ii) full ditch bottom to be protected (through the extent of rip-rap)

   (iii) on side slopes,bags shall extend minimum 6'' above the top of pipe (keyed, lapped and secured by steel rods see attached typical cross sections-two sheets)

   (iv) extend upstream minimum 2 pipe diameters: downstream minimum 4 pipe diameters

   (v) provide weep holes as per attached cross-section

(b)concrete:

The lining shall be minimum 4" in thickness with 4x4x4 wire mesh in ditches less than 7' sq. ft. in cross-section area. In ditches equal to or greater than 7 sq. ft. in cross-section area, minimum concrete lining thickness shall be 6" with 4x4x4 wire mesh.

NOTE:

1. Protective work in major ditches shall be evaluated on individual basis for severity.

2. These are only guidelines. Sound engineering judgement should be exercised during the review process.

3. Cement-Sand Bags

   Synthetic fibre shall not be used for cement-sand bags. Bags shall preferably be made of jute.

III.F **Contract Documents**

The purpose of this section is to familiarize interested individuals and/or firms with the Contract Administration process of the Department of Sanitary Sewers. Within this section is an outline of the procedures followed during the Contract Administration process. Specific requirements and/or assistance in the preparation of Contract Documents and Specifications can be obtained from the Department of Sanitary Sewers, Contract Administration Section (CAS) located on the east wing of the sixth floor of One City Hall Plaza.

III.F.1 **Contract Administration Process**

Below is the process usually followed by the Department of Sanitary Sewers in the administration of contracts for public improvements. It should be noted that the actual level of involvement in this process by individuals or firms will depend upon the Scope of Services agreed upon with the Stormwater Management Division. The process below begins with the completion and subsequent approval by the Stormwater Management Division of construction drawings prepared for any public drainage improvements as described in Section III of this manual. Hereafter, those person(s) who may become involved in the process of contract document preparation and administration will be referred to as Consultants.

1. The Consultant must prepare a quantity list for all bid items including contingent items necessary for the planned drainage improvement. The format required for quantities can be obtained from the Contract Administration Section of DSS, and will become part of the Contract Document Proposal. Quantities must be identical to those indicated on the respective construction drawings quantity sheet and plans.

   An initial estimation of quantities should be prepared and submitted to the SMD at the 90% review. These quantities should be finalized at the 100% submittal and indicate all items in the construction process as shown on the final plans. Proper care and good engineering judgement should be exercised in preparation of quantity takeoffs. In addition, contingent items should be included which are not part of the specific project. By obtaining contract unit prices the City will be protected in the change order process.

2. The Consultant should select appropriate and applicable Specific Provisions for the planned project from the compiled master listing of Specific Provisions on file with the Contract Administration Section. The Specific Provisions together with revisions, and any additional provisions prepared by the Consultant, will be recorded on the Specific Provision "checklist".

3. The Consultant must review bid items, quantities and Specific Provisions with the respective Project Engineer and they will be transmitted to the Contract Administration Section.

4. The Consultant may then be required to provide additional information to the Contract Administration Section as deemed necessary, such as the following:

   Estimate of Total Project Cost

   A "short scope" description of the project

   Estimate of days required to complete construction

   Special "non-technical" requirements of construction

   Any special bidders the Consultant feels may be qualified for the project who are not listed on the City Bidders Listing

5. Upon completion of Items 1 through 4 above, the Contract Administration Section will prepare the Bidding Documents (books, plans, etc.)

6. The Contract Administration section will schedule a Pre-Bid Conference and Bid Opening Date and submit to Tampa City Council for authorization to advertise.

7. Upon approval by City Council, a Notice to Bidders will be published and interested bidders may purchase the respective bid documents from the Contract Administration Section.

8. A Pre-Bid Conference will be held where specific questions concerning the bid documents and project may be raised by interested Contractors. The Consultant may be required to attend the Pre-Bid Meeting in order to respond to questions on the design or plans.

9. The Consultant may be required to respond to subsequent inquiries regarding the planned project. Any issues that require plan or specification amendments will require a Bid Document Addendum. Preparation of Addendum items may be the Consultant's responsibility.

10. An Addendum, if required, shall be submitted to the Contract Administration Section for finalization and distribution to bidders.

11. After the bid opening the Consultant may be required to review bids and make a final recommendation award of contract

12. City will award contract by resolution passed by City Council.

13. A Pre-Construction Meeting will be arranged for the project by the City Construction Engineer. The consultant may be required to attend and answer questions regarding the plans or construction process.

14. The Consultant may be required to provide Construction Observation Services. In such case, Consultant shall report directly to the City Construction Engineer.

15. The Consultant may be required to review shop drawings and as-built drawings, schedule changes or change orders until construction is completed.

III.F.2 **Content of Contract Documents**

Contract documents required for contracted public improvements for the Department of Sanitary Sewers include complete construction drawings and the bound bid documents. Construction drawing requirements are dicussed extensively within Section III of this manual. The bound bid documents are generally composed as follows:

	ITEM	RESPONSIBILITY
	Notice to Bidders and Instructions to Bidders	City/Consultant
Proposal	Proposal	City/Consultant
"Boiler Plate"	Bid Bond	City
"Boiler Plate"	Form of Notice of Award	City
"Boiler Plate"	Agreement	City
"Boiler Plate"	Performance Bond	City
Provisions	General Provisions	City/Consultant
"Provisions"	Specific Provisions	Consultant

Notice to Bidders-A standard format notice that is prepared by DSS, Contract Administration Section.

Instruction to Bidders Special instructions for particular projects that may require input from Consultant, such as a time frame for completion of construction, etc., Generally this section is prepared by DSS Contract Administration.

Proposal - A standard set of forms that the bidder must complete that essentially provide the contracting firm's offices and address, unit and total cost quotations, and commitment of the firm to such quotes if awarded the bid. During production of this part of the bid document, Consultant is responsible for preparing quantities sheets for materials and work activities to be supplied by contractor. These quantities follow a standard DSS format that is available from the Contract Administration Section.

Boiler Plate - Completely prepared by City staff, this portion of the Bid Document is standard for all projects and covers items such as Bid Bond requirements, Performance Bond requirements, and standard agreements between the contractor and the City.

Provisions - Specific (technical) Provisions are prepared by the Consultant from appropriate and applicable specific provisions and is the master provisions listing on file at the DSS Contract Administration Section offices. The Consultant will review the master file and select necessary provisions by filling out the special provisions "checklist". The checklist indicates whether a provision is usable as-is, whether it is not applicable or whether it is necessary with revisions. The Consultant must submit the checklist to the SMD for review along with any additional provisions deemed necessary by the Consultant that are not on file with DSS. Upon approval by SMD, the Contract Administration Section will extract the necessary provisions from the file as-is or to be revised and include any extra provisions provided by the Consultant. A current listing of the standard bid item list, Standard Provisions master checklists is available from the CAS. The specific provisions master catalogue follows.

In addition to this master catalogue, there is a Specific Provisions Project Reference Manual (SPPRM) which includes specialized or infrequently used specific provisions. This manual has been compiled and is maintained for the engineer's convenience and review by the Contract Administration Section. The SPPRM is divided into ten chapters as follows:

1. Bridges
2. Drainage
3. Excavation and Fill
4. Fencing
5. Landscaping
6. Paving
7. Signs
8. Traffic Control
9. Utilities
10. Miscellaneous

General provisions are normally prepared by the City, however, consultants may be required to provide some input. Consultants should provide any general provisions which they feel are necessary on a project site specific basis.

III.F.3 Support Material for Preparation of Contract Documents

The following presents material which may be used by the consultant in preparing contract documents for the DSS. This material includes:

Cost estimate work sheet with item numbers

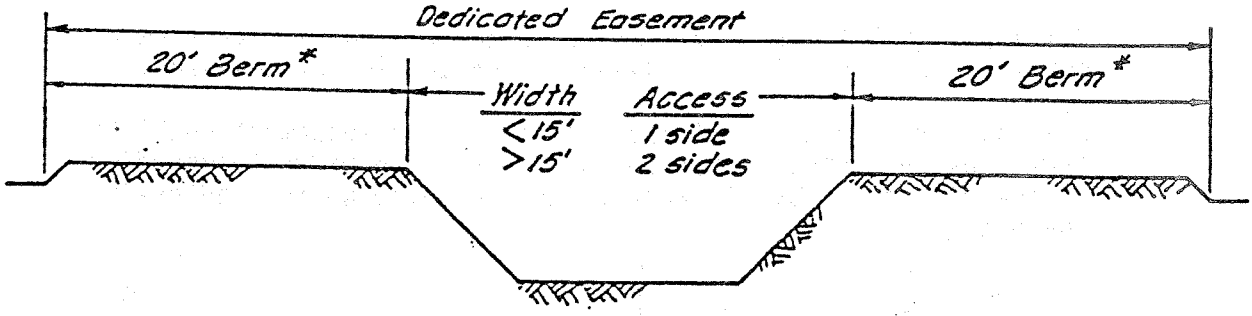
DSS specific provisions master catalogue

Specific Provisions master

It should be noted that this material is periodically updated and that this information is presented for illustration purposes only. It is the responsibility of the Consultant to verify with the SMD and Contract Administration Section that the most updated and applicable information is being used.

DEPARTMENT OF SANITARY SEWERS
Stormwater Management Division

DITCH ACCESS REQUIREMENTS



* Absolute minimum 15' - Not desirable

Other Criteria:

1. Velocity: Maximum allowable as directed by Chief Design Engineer

2. Ditch Protection:

   + Rip rap all bends ± 25' from bend
   + Ditch grade 0.1 - 1% seed and mulch
   1 - 2% grass (sod)
   >2% structural

3. Utility crossings:

   + Aerial - Same as street
   + Underground - 18" min. below flow line

4. No permanent structure within ditch easement

5. Maximum side slope: 2 to 1

6. Headwalls at all culverts

7. Free board @ major storm: 1'-2' minimum

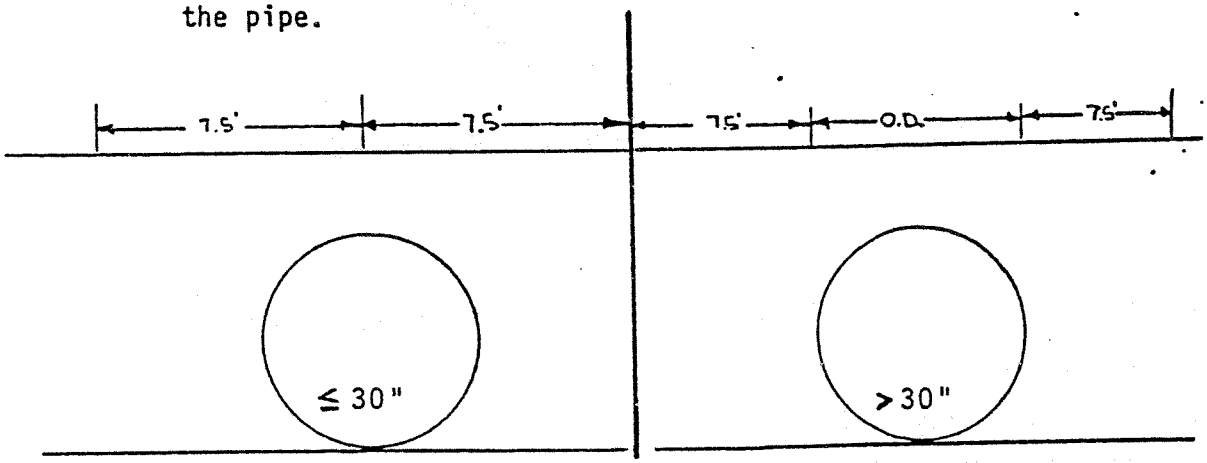
*Requests for exceptions to these standards shall be submitted in writing to the Stormwater Management Division Chief who shall have the authority to waiver specific provisions of the standard if the conditions warrant.

EASEMENT GUIDELINES FOR PIPE SYSTEMS

I. LESS THAN FIVE FEET OF COVER OVER THE PIPE

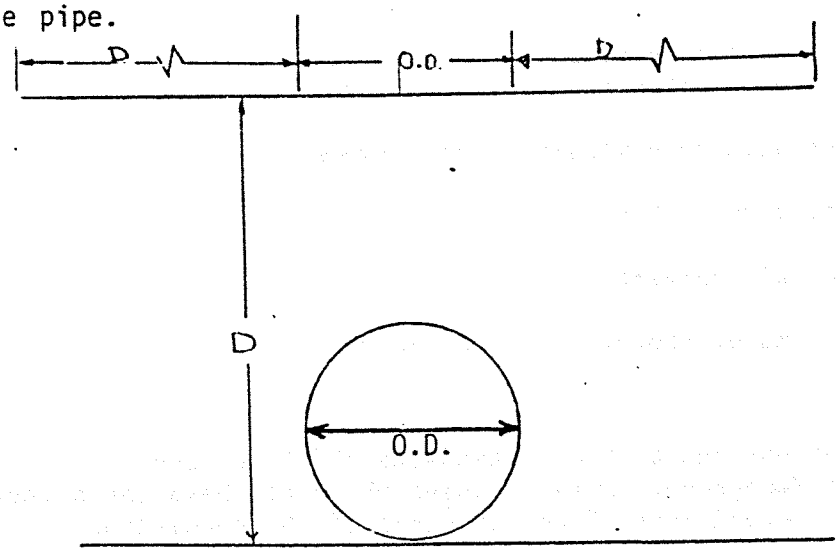
A. Diameter equal to or less than 30" round or equivalent- easement shall be 7.5 feet either side of the centerline of the pipe.

B. Diameter greater than 30" round or equivalent-easement shall be 15 feet plus the outside diameter of the pipe in width (rounded up to the nearest 5 foot increment) and centered on the centerline of the pipe.



II. EQUAL TO OR GREATER THAN FIVE OF COVER OVER THE PIPE

Easement will be equal to the outside diameter of the pipe plus twice the distance from the ground surface to the trench bottom measured at the deepest point along the path of the proposed easement (rounded up to the nearest five foot increment) and centered on the centerline of the pipe.

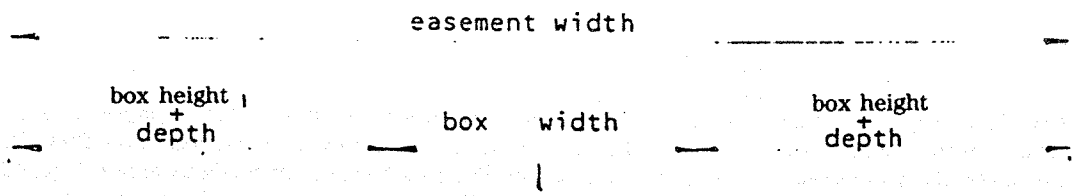


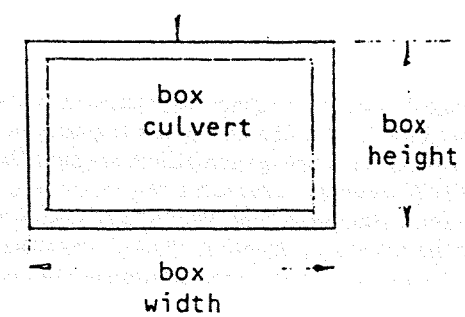
EASEMENT GUIDELINES FOR BOX CULVERTS

1. All dimensions shown are EXTERNAL dimensions.
2. Depth of cover is measured from the ground surface to the top of the box culvert.
3. Minimum easement width is 15 feet.

EASEMENT WIDTH = 2 X (DEPTH OF COVER + BOX HEIGHT) + BOX WIDTH

Resultant Easement Width must be rounded UP to the nearest five-foot increment.





SECTION V - ENGINEERING DATA

V.A Design Aids

The following section provides figures, tables, forms and information that may be either required or useful in the design of public or private stormwater management systems. An attempt has been made to provide only the most pertinent and applicable information, or information that is specific to the City of Tampa. Other information such as design charts, nomographs, hydraulic equations, etc. are not included. It should be noted that copies of any equations, charts, etc. used in a design to be reviewed and approved by the SMD may be requested as part of the required material to be submitted.

RUNOFF COEFFICIENTS FOR VARIOUS LAND USES:

Description	Runoff Coefficients
Water Bodies	1.00
Business	
Downtown	0.80 to 0.95
Neighborhood	0.70 to 0.90
Residential	
Single Family	0.30 to 0.50
Multi-Units, detached	0.40 to 0.60
Multi-Units, attached	0.60 to 0.75
Residential, suburban	0.25 to 0.40
Apartment	0.50 to 0.70
Industrial	
Light	0.50 to 0.80
Heavy	0.60 to 0.90
Parks, Cemeteries	0.10 to 0.25
Railroad Yard	0.20 to 0.35
Unimproved Areas	0.10 to 0.30
Pavement	
Asphalt or Concrete	0.95
Brick	0.85 - 0.95
Roofs	0.95

NOTE: These ranges of coefficient values are provided as guidelines and may vary depending on actual physical conditions. Values beyond these ranges may be used providing sufficient substantiating data was submitted to the SMD for review and approval. For methods of determining runoff other than the Rational Method, impervious area estimated from aerial photographs and adjusted for ultimate land use should be used. These values may range for the total impervious area to the hydraulically connected impervious area depending on the solution approach. These items should be reviewed and approved by the SMD prior to completing the analysis or design.

Percent Impervious Relationships — Percent Imperviousness of a basin can be measured fairly accurately from aerial photographs and/or land use maps. Sampling techniques, such as taking very careful measurements for representative areas and extrapolating for the remaining areas are a practical means for measurement. Impervious areas are those areas that are hydraulically connected to the drainage system. In other words, the runoff that they generate passes over impervious surfaces prior to entering the storm sewer system. For existing percent imperviousness values, use the City of Tampa aerials and field data. For future percentage values, use City of Tampa Zoning maps to project future land uses and refer back to City of Tampa aerial photographs to estimate percent imperviousness. Do not substitute runoff coefficients for percent impervious values.

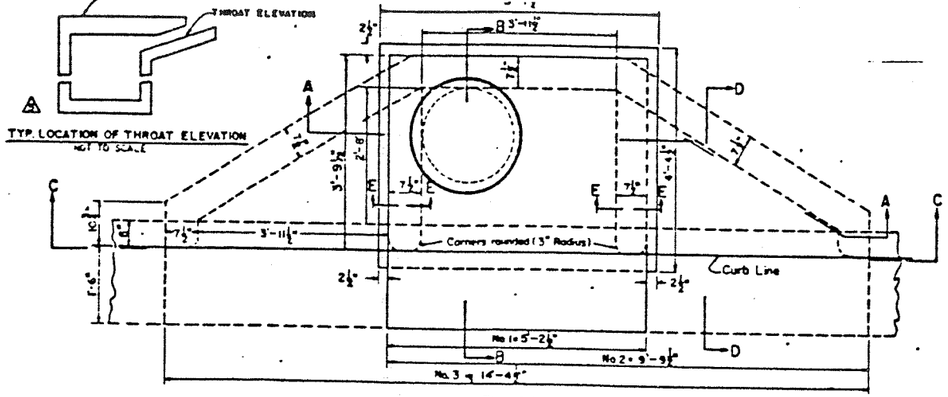
V.B. Standard Drawings

The following are typical examples of standard details for drainage structures accepted by the SMD. These drawings are also available as a set entitled Standard Drawings for the City of Tampa Department of Public Works. This publication presents details to City standard structures. Additional drainage structures are available from the State of Florida Department of Transportation, however, not all FDOT drainage structures are acceptable for use within the City of Tampa. An attempt should be made to use City of Tampa standards first, then FDOT standards and finally, if required, prepare an original designed structure and detail for the specific application. Should other than City of Tampa standards be used, review and approval of the SMD is required. Reproduction and presentation of standard details in construction drawings has been discussed in previous sections.

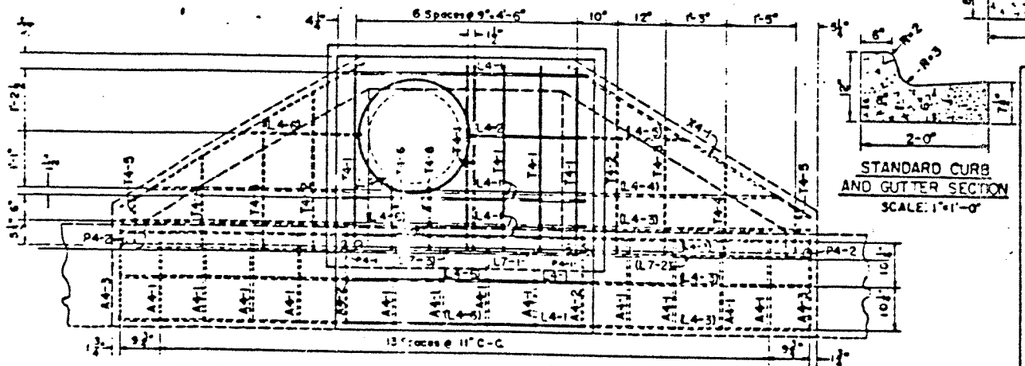
Standard drawings **not** included here are as follows:

DPW P-2	Paving Standard Drawing	Median Storage Lanes and Traffic Separators
DPW P-4	Paving Standard Drawing	Driveway Details
DPW P-5	Paving Standard Drawing	Parking Lot Details
DPW S-1	Sanitary Sewers Standard Drawings	Manhole Details
DPW S-2	Sanitary Sewers Standard Drawings	House Connection Details
DPW S-3	Sanitary Sewers Standard Drawings	Misc. Standard Details
DPW W-1	Water Department Standard Drawing	Construction Details
DPW W-2	Water Department Standard Drawing	Construction Details

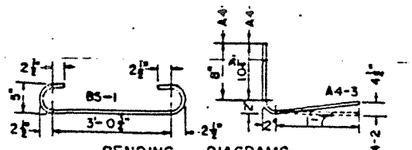
Full size blue line prints of all standard City drawings are available through the chief draftsman of the SMD, City Hall Plaza, 5N.

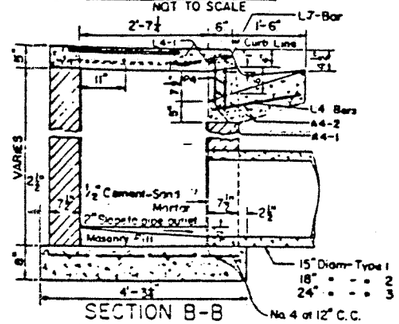


PLAN



PLAN of SLAB and APRON REINFORCEMENT

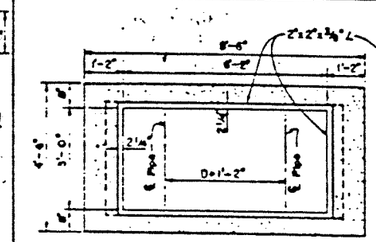




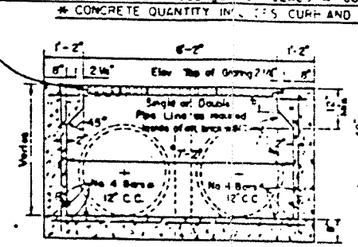
SCHEDULE OF REINFORCING STEEL BARS

TYPE 1						TYPE 2						TYPE 3					
MK.	SIZE	NO OF BARS	LENGTH EACH	WT EA.	TOTAL WEIGHT	MK.	SIZE	NO OF BARS	LENGTH EACH	WT EA.	TOTAL WEIGHT	MK.	SIZE	NO OF BARS	LENGTH EACH	WT EA.	TOTAL WEIGHT
T4-1	NO 4	6	3'-7"	2.394	14.364	T4-1	NO 4	6	3'-7"	2.394	14.364	T4-1	NO 4	6	3'-7"	2.394	14.394
T4-6	"	2	1'-3"	0.835	1.670	T4-2	"	1	3'-0"	2.004	2.004	T4-2	"	2	3'-0"	2.004	4.008
L4-1	"	7	4'-11½"	3.312	23.184	T4-3	"	1	2'-5½"	1.642	1.642	T4-3	"	2	2'-5½"	1.642	3.284
L4-2	"	1	2'-6"	1.670	1.670	T4-4	"	1	1'-8¾"	1.155	1.155	T4-4	"	2	1'-8¾"	1.155	2.310
L7-1	NO 7	1	4'-11½"	10.135	10.135	T4-5	"	1	1'-6½"	1.044	1.044	T4-5	"	2	1'-6½"	1.044	2.088
A4-1	NO 4	5	1'-9"	1.169	5.845	T4-6	"	2	1'-3"	0.835	1.670	T4-6	"	2	1'-3"	0.835	1.670
A4-2	"	2	2'-9¼"	1.851	3.702	L4-1	"	5	4'-11½"	10.135	50.675	L4-1	"	2	4'-11½"	10.135	20.270
P4-1	"	4	1'-1½"	0.752	3.008	L4-3	"	4	9'-6½"	6.374	25.496	L4-2	"	1	2'-6"	1.670	1.670
						L4-4	"	1	8'-9"	5.845	5.845	L4-5	"	1	4'-6½"	3.034	3.034
						L4-5	"	1	4'-6½"	3.034	3.034	L4-6	"	4	11'-1½"	9.436	37.744
						L7-2	NO 7	1	9'-6½"	19.503	19.503	L4-7	"	1	12'-6"	8.350	8.350
						A4-1	NO 4	8	1'-9"	1.169	9.352	L7-3	NO 7	1	14'-1½"	28.872	28.872
						A4-2	"	2	2'-9¼"	1.851	3.702	A4-1	NO 4	12	1'-9"	1.169	14.028
						A4-3	"	2	2'-4½"	1.600	3.200	A4-2	"	2	2'-9¼"	1.851	3.702
						P4-1	"	4	1'-1½"	0.752	3.008	A4-3	"	2	2'-4½"	1.600	3.200
						P4-2	"	1	0'-9"	0.501	0.501	P4-1	"	4	1'-1½"	0.752	3.008
						B5-1	NO 5	2	4'-8¾"	4.889	9.778	P4-2	"	2	0'-9"	0.501	1.002
						X4-1	NO 4	1	5'-9¼"	3.855	3.855	B5-1	NO 5	4	4'-8¾"	4.889	19.556
												X4-1	NO 4	2	5'-9¼"	3.855	7.710
TOTAL WEIGHT IN POUNDS					63.578	TOTAL WEIGHT IN POUNDS					159.828	TOTAL WEIGHT IN POUNDS					179.870
CU. YDS. CLASS "A" CONCRETE					1.088	CU. YDS. CLASS "A" CONCRETE*					1.551	CU. YDS CLASS "A" CONCRETE*					2.015

* CONCRETE QUANTITY INCLUDES CURB AND APRON

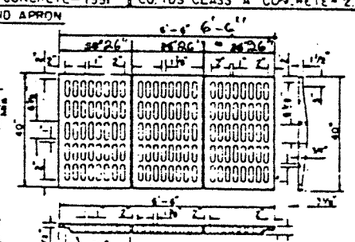


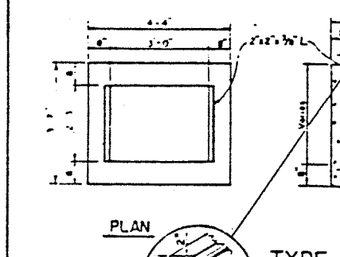
⚠ NOTE: Wherever possible 6'-0" x 3'-0" inside dimension inlet Substructure may be used with Engineer's approval. (See Sheet DPW D-8)



TYPE "H" GRATING INLET

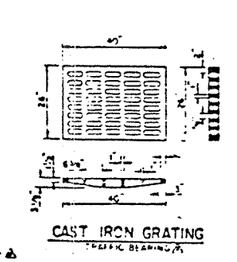
SCALE: - ½" = 1'-0"

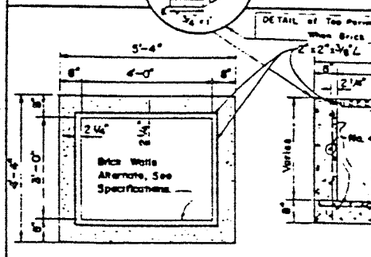


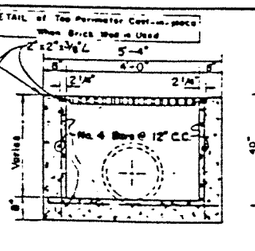


TYPE "T" GRATING INLET ⚠

SCALE: - ½" = 1'-0"

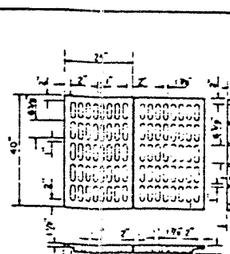




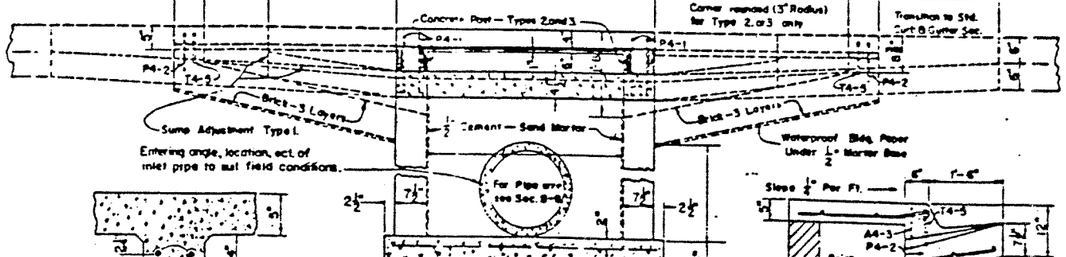


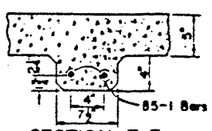
TYPE "E" GRATING INLET

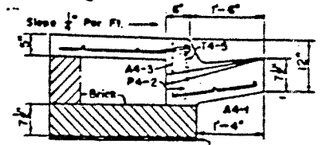
SCALE: ½" = 1'-0"

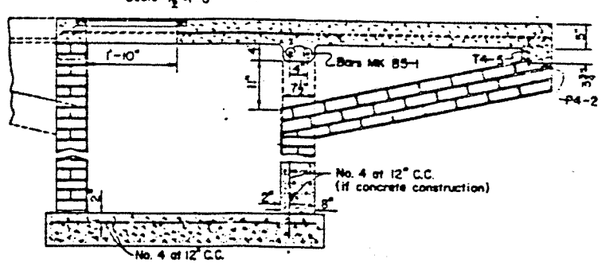


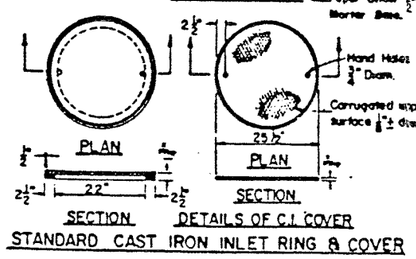
⚠ NOTE: For Grate Specifications See Sheet DPW D-8











STANDARD CURB INLETS TYPE 1,2 & 3

SCALE: ¾"=1'-0"

CONSTRUCTION NOTES

⚠ All grate inlets shall be furnished with an approved metal frame at the top to seat the grates.

A Conc. for all types of inlets shall be Class "A" conforming to the requirements of section 55 of the Specifications. Reinforcing steel shall meet the requirements of section 56 of the Specifications, with bar placement and spacing as indicated. Top Slabs shall be cast-in-place and conc. shall be poured until the reinforcing bars have been properly placed, inspected, and approval obtained to proceed.

B Connecting pipes may enter inlets any direction provided the full width of pipe terminates within the inside face of the box. Projecting sections shall be broken off and mortared smooth to fit the inside contour of the wall.

C Inside surface of all brick walls shall be plastered with ½" min. thickness of 1:2 Mix Cement - Sand Mortar.

D For brick walls with height greater than 6' between bottom of Manhole Casting and top of bottom Slab, the min. thickness shall be 7½". For depths greater than 6' the min. thickness shall be 11½". Brick shall be laid in stretcher courses, with every sixth course a header course. For conc. walls, all rough surface irregularities on the inside face shall be removed by chipping if necessary, and mortared to a smooth finish.

E Inside box measurements for curb inlets are based on the following min. brick dimensions 3¾" width, 7½" length, 2¼" thickness, and assuming mortar thickness of ½" between brick and ¾" between layers.

F Min. clearance for all reinforcing bars shall be 1½" from nearest side of conc. member, except as otherwise noted or required.

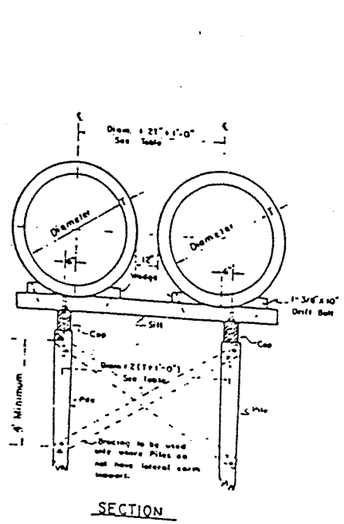
G Wing for Type No. 2 shall be placed on upstream side of corner box, with plan reversed if necessary because of direction of gutter flow.

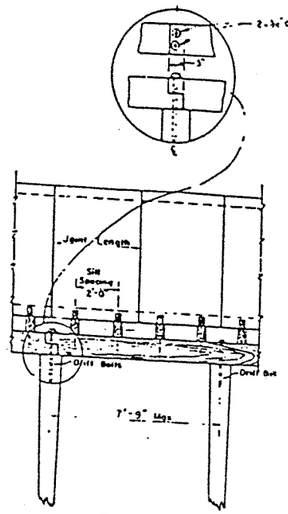
PUBLIC WORKS DEPARTMENT
CITY OF TAMPA, FLORIDA

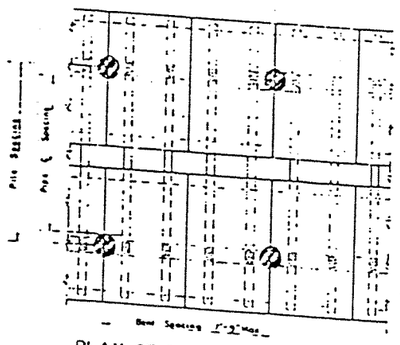
STANDARD INLETS
TYPES 1,2,3,"T","E", & "H"

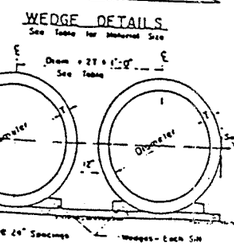
Scale	AS NOTED	Book No.	
Drawn	R.L. HAMILTON	Date	12-26-68
Designed	R.M. JOHNSON SR.	Date Revised	12-26-68
Reviewed		Date	
Approved		Date	

DRAINAGE STANDARD DRAWING DPW D-2









PLAN OF PILE BENT FOUNDATIONS SUPPORT ON MUD SILLS ONLY
FOUNDATIONS FOR DOUBLE PIPE LINES
NOT TO SCALE

SECTION

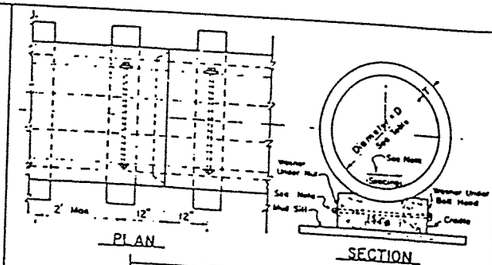
WEDGE DETAILS
See Table for Material Size

TABLE OF STRUCTURAL DIMENSIONS

INSIDE DIAM OF PIPE	SHELL THICKNESS	SINGLE PIPE LINES: MUD SILL SIZE	MUD SILL LENGTH	PILES: SIZE & LENGTH	PILES: SUPPORT ON CRADLE: MIN BUTT DIAM	PILES: CAP SIZE	PILES: CRADLE SEE	PILES: CRADLE LGTH	PILES: CRADLE SIZE	PILES: CRADLE No.	PILES: CRADLE SPAN	WEDGES: WIDTH SIZE	WEDGES: TAPER LENGTH
72"	7"	2"X12"	7'-6"	13"	8"X8"-6'-6" 12"X12"-2'-3"	12"	6"X6"-5'-0"	12"X12"-2'-0"	6"X6"	6	6'-0"	6"X6"	15"
66"	6½"	2"X12"	7'-0"	12"	8"X8"-6'-0" 12"X12"-2'-3"	12"	6"X6"-5'-0"	12"X12"-2'-0"	6"X6"	6	6'-0"	6"X6"	15"
60"	6"	2"X10"	6'-6"	12"	8"X8"-6'-0" 12"X12"-2'-3"	12"	6"X6"-5'-0"	12"X12"-2'-0"	6"X6"	6	6'-0"	6"X6"	15"
54"	5½"	2"X10"	6'-0"	10"	6"X6"-5'-0" 8"X8"-6'-0"	12"	6"X6"-5'-0"	8"X8"-1'-7"	6"X6"	6	6'-0"	4"X6"	10"
48"	5"	2"X10"	5'-6"	10"	6"X6"-5'-0" 8"X8"-6'-0"	12"	6"X6"-5'-0"	8"X8"-1'-7"	6"X6"	6	6'-0"	4"X6"	10"
42"	4½"	12"X8"	5'-0"	10"	6"X6"-5'-0" 8"X8"-6'-0"	12"	6"X6"-4'-0"	8"X8"-1'-5"	6"X6"	6	6'-0"	3"X6"	9½"
36"	4"	2"X8"	4'-6"	10"	6"X6"-4'-0" 8"X8"-6'-0"	12"	6"X6"-4'-0"	8"X8"-1'-0"	6"X6"	6	6'-0"	3"X6"	9½"
30"	3½"	2"X8"	4'-0"	9"	6"X6"-3'-6" 8"X8"-5'-9"	12"	6"X6"-3'-6"	8"X8"-0'-8"	6"X6"	6	6'-0"	3"X6"	8"
27"	3¼"	2"X8"	3'-6"	9"	6"X6"-3'-6" 8"X8"-5'-9"	12"	6"X6"-3'-6"	8"X8"-0'-8"	6"X6"	6	6'-0"	3"X6"	7½"
24"	3"	2"X6"	3'-6"	9"	6"X6"-3'-0" 8"X8"-5'-9"	12"	6"X6"-3'-0"	8"X8"-0'-8"	6"X6"	6	6'-0"	3"X4"	7"
21"	2¾"	2"X6"	3'-6"						2"X6"				6"
18"	2½"	2"X6"	3'-0"						2"X6"				5¾"
15"	2¼"	2"X6"	2'-6"						2"X6"				4½"
12"	2"	2"X6"	2'-0"						2"X4"				4½"
									2"X4"				4½"

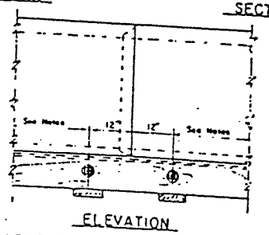
INSIDE DIAM OF PIPE	DOUBLE PIPE LINES: DIST C-C OF PIPE	PILE BENT FOUNDATION: MIN BUTT DIAMETER	PILES: SIZE & LENGTH	PILES: BENT SPACING	SILLS: SIZE OF CAP	SILLS: SIZE	SILLS: LENGTH	DRIFT BOLTS: CAP	DRIFT BOLTS: SILL	MUD SILL: SIZE	MUD SILL: LENGTH
72"	8'-2"	13"	9'-2"	7'-9"	12"X14"	6"X10"	14'-0"	¾"X24"	¾"X20"	2"X12"	14'-0"
66"	7'-7"	13"	8'-7"	7'-9"	12"X14"	6"X10"	14'-0"	¾"X24"	¾"X20"	2"X12"	14'-0"
60"	7'-0"	12"	8'-0"	7'-9"	12"X12"	4"X8"	13'-0"	¾"X24"	¾"X18"	2"X10"	13'-0"
54"	6'-5"	11"	7'-5"	7'-9"	10"X12"	4"X8"	12'-0"	¾"X22"	¾"X17"	2"X10"	12'-0"
48"	5'-10"	10"	6'-10"	7'-9"	8"X12"	6"X6"	11'-0"	¾"X22"	¾"X15"	2"X10"	11'-0"
42"	5'-3"	10"	6'-3"	7'-9"	8"X10"	6"X6"	10'-0"	¾"X20"	¾"X15"	2"X8"	10'-0"
36"	4'-8"	10"	5'-8"	7'-9"	8"X10"	4"X6"	9'-0"	¾"X20"	¾"X15"	2"X8"	9'-0"

* See Construction Notes



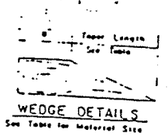
PLAN

SECTION

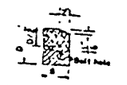


ELEVATION

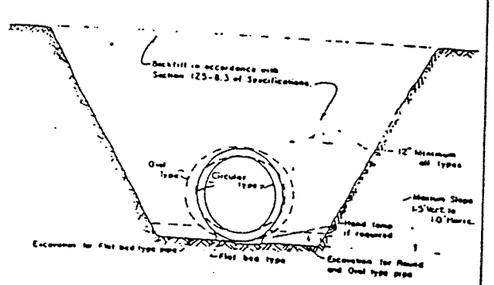
CRADLE SUPPORT ON MUD SILLS
FOR SINGLE PIPE LINES



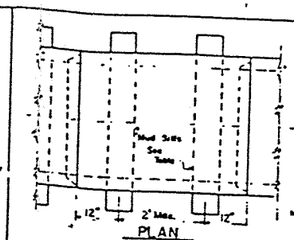
WEDGE DETAILS
See Table for Material Size



CORNER BEVEL
FOR ALL CRADLES

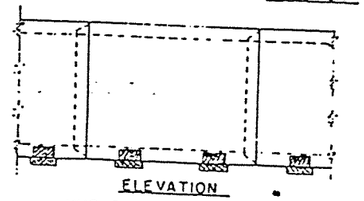


SECTIONAL DETAILS SHOWING BACKFILL REQUIREMENTS FOR ALL TYPES OF STORM SEWER PIPE LINES. SEE SPECIFICATIONS AND CONSTRUCTION NOTES THIS SHEET.
NOT TO SCALE



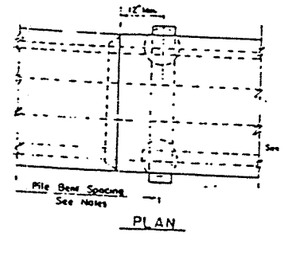
PLAN

SECTION

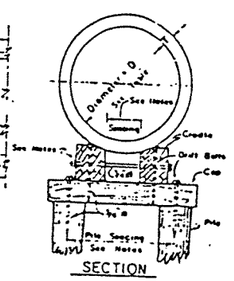


ELEVATION

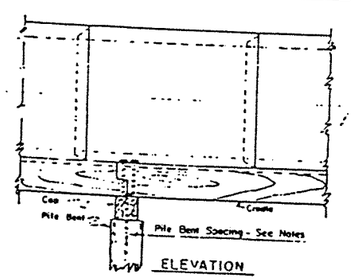
MUD SILL FOUNDATION
FOR SINGLE PIPE LINES



PLAN



SECTION



ELEVATION

CRADLE SUPPORT ON PILE BENTS
FOR SINGLE PIPE LINES

CONSTRUCTION NOTES

Dimensions, spans, etc. shown in table are minimum allowable, based on average soil conditions and 5'-0" Maximum depth of cover over top of pipe. Where unusual conditions are encountered, including substantial increase in depth of cover, necessary changes in appropriate structural data as shown hereon may be required and will be as determined by the Engineer. Maximum spacing of pile bents for single pipe lines shall be not greater than the allowable cradle span as indicated in the table. Side clearance at ditch bottom for multiple pipe lines shall be the same as shown for single pipe lines. Clear space between cradles, where supported on either Mud Sills or Caps, shall be equal to the distance computed by the following formulae: $2[(D/2+T)\sin 20°-(0.125\text{ cm }20°)]$ where "D"- inside diameter of pipe and "T"- thickness of barrel- Tie bolts through cradles shall be spaced not greater than 4'-0" pipe length from each side of pipe joints. All hardware shall be hot-dipped galvanized in accordance with Section 962-7 of the Specifications. Holes shall be drilled for all bolts, the bit for this purpose to be 1/16" less in diameter than the bolt or dowel to be used. Transverse distance between pipe centers for single pipe lines shall be at least 12" greater than the distance between cradles shown in table. For additional requirements, see Specifications.

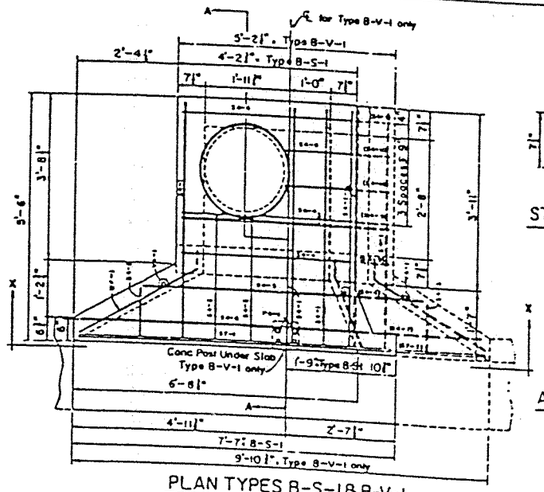
PUBLIC WORKS DEPARTMENT
CITY OF TAMPA, FLORIDA

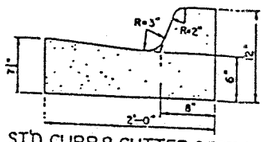
STANDARD FOUNDATIONS FOR PIPE LINES

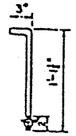
Scale NONE	Book No.	
Drawn R. GOINS		Date Sept. 1969
Designed R.M. JOHNSON Sr.		Date Sept. 1969
Reviewed		Date
Approved		Date

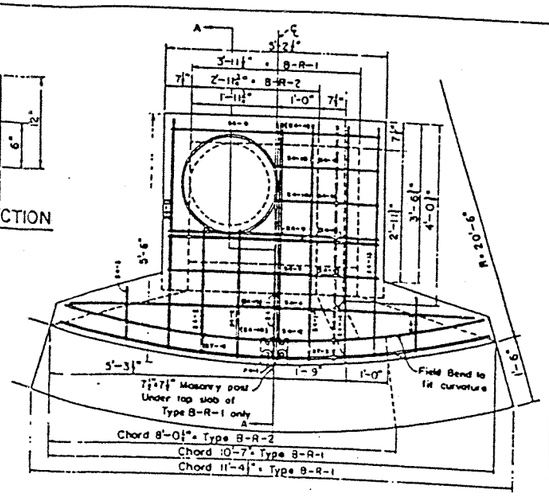
DRAINAGE STANDARD DRAWING

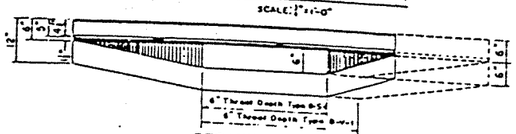
DPW D-6

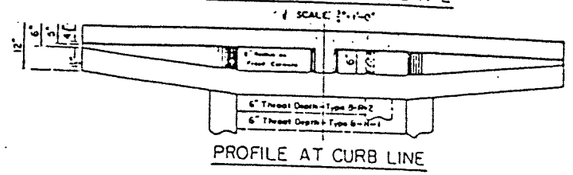


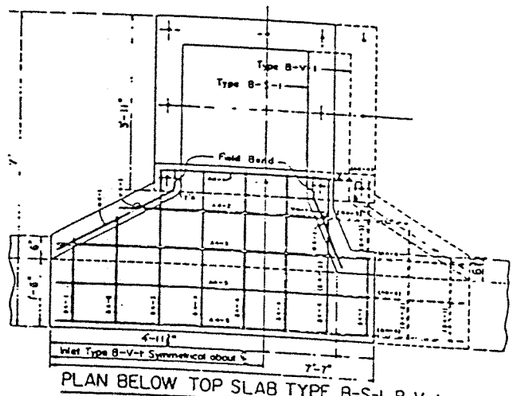


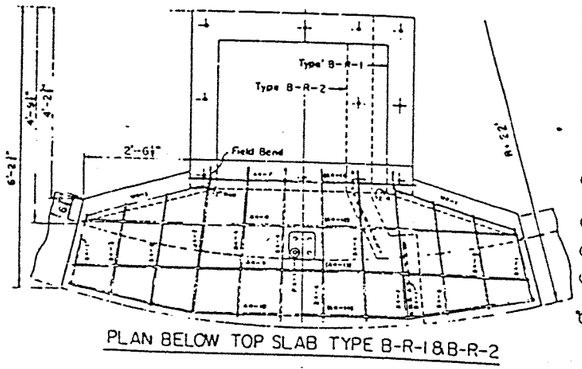


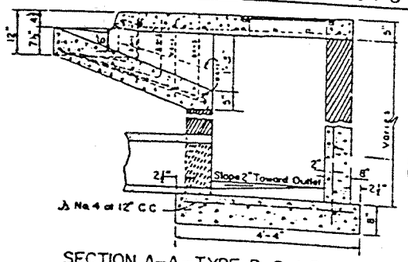


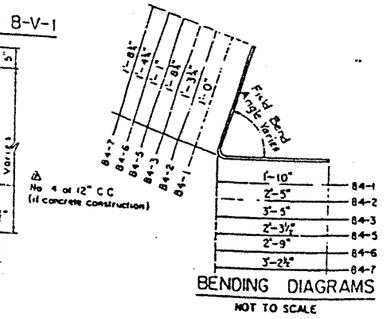


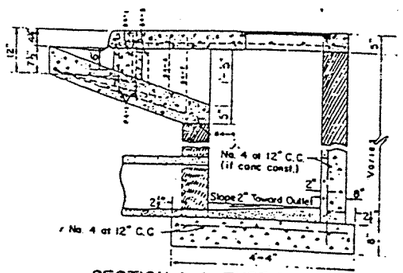


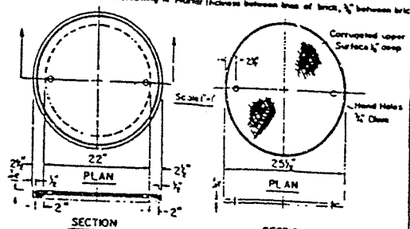












SCHEDULE OF STEEL REINFORCEMENT

MARK	SIZE	LENGTH EACH	WEIGHT EACH	TYPE B-S-1 NO	TYPE B-S-1 TOTAL WT	TYPE B-V-1 NO	TYPE B-V-1 TOTAL WT	TYPE B-R-1 NO	TYPE B-R-1 TOTAL WT	TYPE B-R-2 NO	TYPE B-R-2 TOTAL WT	LOCATION-REMARKS
A4-1	NO 4	3'-11½"	2.658	1	2.658							Long'l-Apron-Straight Bar
A4-2	"	4'-11"	3.284	1	3.284							Ditto
A4-3	"	7'-4"	4.899	3	14.697							"
A4-4	"	4'-11½"	3.312			1	3.312					"
A4-5	"	6'-7"	4.398			1	4.398					"
A4-6	"	9'-7½"	6.443			3	19.329					"
A4-7	"	5'-4"	3.563									"
A4-8	"	10'-3½"	6.875							1	3.653	"
A4-9	"	10'-9½"	7.209							1	6.875	"
A4-10	"	11'-2½"	7.487							1	7.209	"
A4-11	"	4'-2"	2.783							1	7.487	"
A4-12	"	6'-11"	4.620					1	2.783			"
A4-13	"	8'-1"	5.400					1	4.620			"
A4-14	"	8'-5"	5.622					1	5.400			"
B4-1	"	2'-9"	1.837	2	3.674	2	3.674	1	5.622			"
B4-2	"	3'-7½"	2.435	2	4.870			2	3.674	2	3.674	Trans. Apron-Straight Bar
B4-3	"	5'-0½"	3.382	2	6.764	2	6.764					Ditto
B4-4	"	5'-5½"	3.780	3	7.140	4	9.520	3	7.140			Apron-Bent Bar
B4-5	"	3'-3"	2.199					2	4.398	1	2.199	" - - Str. -
B4-6	"	4'-0½"	2.714					2	5.428	1	2.714	" - - Bent -
B4-7	"	4'-0½"	3.257					2	6.514	1	3.257	" - - " -
P4-1	"	1'-5"	0.835			4	3.340					" - - " -
S4-1	"	5'-3"	3.507	5	17.535	6	21.042	3	7.521		7.521	Vert. Bars in Post
S4-2	"	2'-11"	1.948	2	3.896	2	3.896	2	3.896	2	3.896	Trans. Top Slab-Str Bar
S4-3	"	1'-2½"	0.807	1	0.807	2	1.614	2	1.614	1	0.807	" - - " -
S4-4	"	3'-11½"	2.558	4	10.632					4	10.632	" - - " -
S4-5	"	4'-0½"	3.257	1	3.257							Long. - - " -
S4-6	"	6'-8"	4.453	1	4.453	1	4.453					" - - " -
S4-7	"	9'-7½"	6.443			1	6.443					" - - " -
S4-8	"	1'-7½"	1.086	2	2.172							" - - " -
S4-9	"	4'-11"	3.312			4	13.248	4	13.248	2	2.172	" - - " -
S4-10	"	2'-6"	1.670			2	3.340	2	3.340			" - - " -
S4-11	"	9'-7"	6.402					1	6.402			" - - " -
S4-12	"	10'-2"	6.791					1	6.791			" - - " -
S4-13	"	5'-1½"	3.424					2	6.848	1	3.424	Trans. Top Slab-Str. Bar
S4-14	"	5'-2½"	3.479					2	6.958	1	3.479	" - - " -
S4-15	"	6'-4½"	4.259							1	4.259	" - - " -
S4-16	"	7'-9"	5.121							1	5.121	" - - " -
S7-1	NO 7	7'-4"	14.989	1	14.989							Long - - Curb Edge
S7-2	"	9'-7½"	19.716			1	19.716					" - - " -
S7-3	"	10'-4½"	21.249					1	21.249			" - - " -
S7-4	"	7'-9½"	15.969							1	15.969	" - - " -
V4-1	NO 4	1'-9"	1.141	2	2.282	2	2.282					Vert. in Wing - Str. Bar
W4-1	"	3'-5"	2.336	2	4.676	4	9.352	4	9.352	2	4.676	Hor. in Wing - Bent Bar
W4-2	"	2'-1"	1.392	2	2.784					2	2.784	" - - " -

ESTIMATED QUANTITIES

ITEM	UNIT	INLET TYPE B-S-1	B-V-1	B-R-1	B-R-2
CONCRETE-CLASS "A"	CU YD	0.927	1.404	1.660	1.147
CONCRETE-CLASS "B"	CU YD	0.598	0.724	0.724	0.588
REINFORCING STEEL	LB.	110.570	135.723	138.518	118.872
BRICK	1,000	0.794	0.907	0.907	0.794
C.I. RING & COVER	EACH	1	1	1	1
ANCHOR RODS	EACH	8	8	8	8

CONSTRUCTION NOTES

(1) Concrete for top slabs, aprons and curb and gutter sections shall be Class "A" and for all bottom slabs shall be Class "A", conforming to Section 55 of the Specifications, with reinforcing bars placed as indicated hereon. Top slabs shall be cast-in-place after reinforcing steel bars have been placed, inspected and approval obtained to proceed.

(2) Connecting pipes may enter from any direction, provided the full width of pipe terminates within the inside area of the box. Any projecting portion of such pipe shall be broken off and mortared to a smooth finish in line with the inside surface of the wall. Inside surface of all brick wall shall be plastered with one-half inch minimum thickness of 1:2 mix cement-sand mortar and left with a smooth finish.

(3) Minimum wall thickness, except where indicated otherwise on the Plans, shall be 7½" when the depth from top of manhole casting to top of bottom slab does not exceed 6' and 11½" when such depth exceed 6'. Brick shall be laid in stretcher courses, with every sixth course a header course.

(4) Number of brick shown in table of estimated quantities is based on a total of 18 courses on 7½" walls, or an approx. depth of 3'-11½" to top of bottom slab, with no deduction for brick within area occupied by inlet pipe. For each additional 7½" wall course, add 42 brick for Type B-S-1, 46 for Types B-V-1 and B-R-1, and 42 for Type B-R-2. For each additional 11½" wall course, add 69 brick for Type B-S-1, 78 for Type B-V-1 and B-R-1 and 69 for Type B-R-2. Brick quantities include 5% added for breakage and waste.

(5) Anchor rods shall be located approx. as shown on the Plan, with the three hook rods extending into the inlet slab below throat opening as indicated on the Detail Drawing.

(6) Inside box measurements are based on Standard Concrete Brick dimensions as follows: Width 3½", Length 7½", and thickness, 2¼"; and assuming ½" mortar thickness between box of brick, ½" between brick ends and ½" between layers of courses.

3	3-28-62	Side Bottom Bars and Wall Dimensions	JDA
2	5-14-62	Changed Inlet Code TIPE	JDA
1	9-15-61	Changed Construction Joints.	JDA
No.	Date	Revisions	By

PUBLIC WORKS DEPARTMENT
CITY OF TAMPA, FLORIDA

STANDARD CURB INLETS TYPE B-S-1, B-V-1, B-R-1 AND B-R-2 S.R.D. STANDARD, MODIFIED

Scale As Shown	Book No.
Drawn A.L. Hawkins	Date 1-29-48
Designed A.W. Johnson Sr.	Date 12-30-48
Numbered	Date
Approved	Date

DRAINAGE STANDARD DRAWING

DPW D-4

PIPE ENCASEMENT QUANTITIES ALLOWED FOR PAYMENT

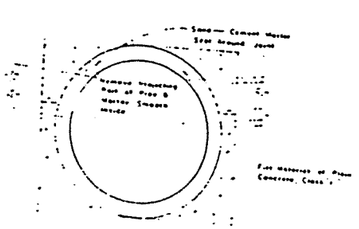
CIRCULAR PIPE

CONCRETE			CORRUGATED METAL		
DIAM IN INCHES	CU FT LIN FT	CU YDS LIN FT	DIAM IN INCHES	CU FT LIN FT	CU YDS LIN FT
12	4.048	0.150	12	3.210	0.119
15	4.817	0.178	15	3.833	0.142
18	5.622	0.208	18	4.480	0.166
21	6.463	0.239	21	5.153	0.191
24	7.341	0.272	21	5.860	0.217
27	8.256	0.306			
30	9.207	0.341	30	7.340	0.272
36	11.219	0.416	36	8.930	0.331
42	13.377	0.495	42	10.630	0.394
48	15.681	0.582	48	12.400	0.459
54	18.131	0.672	54	14.350	0.531
60	20.726	0.768	60	16.400	0.607

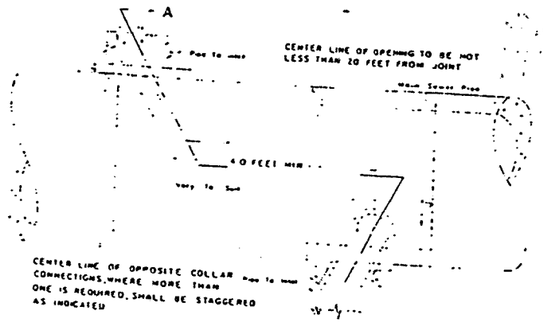
OVAL-TYPE PIPE

CONCRETE				CORRUGATED METAL		
HOR DIAM IN INCHES	VERT DIAM IN INCHES	CU FT LIN FT	CU YDS LIN FT	HOR DIAM IN INCHES	VERT DIAM IN INCHES	CU FT LIN FT	CU YDS LIN FT
23	14	5.826	0.216	18	11	3.692	0.137
					13	4.303	0.159
30	19	7.554	0.280	25	16	4.993	0.185
34	22	8.605	0.319	29	18	3.742	0.213
38	24	9.553	0.354				
45	29	11.725	0.434	36	22	6.933	0.257
53	34	14.048	0.520	43	27	8.496	0.315
60	38	16.160	0.599	50	31	9.814	0.363
68	43	18.805	0.696	58	36	11.933	0.442
75	48	21.501	0.800	65	40	13.304	0.500
				72	44	15.067	0.558

NOTE: ABOVE TABLE INDICATES THE MAXIMUM AMOUNT WHICH WILL BE ALLOWED FOR COMPLETE ENCASEMENT. FOR PARTIAL ENCASEMENT, THE AMOUNT TO BE ALLOWED PER FOOT OF PIPE SHALL BE REDUCED ACCORDINGLY

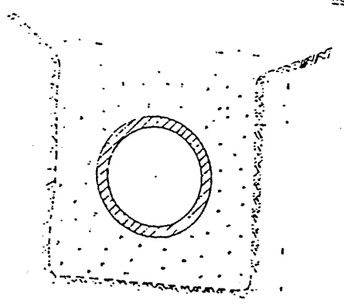


SECTION A-A



DETAILS OF STANDARD CONCRETE COLLAR

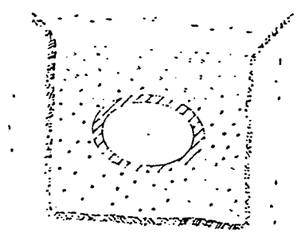
NOT TO SCALE



DETAILS OF CONCRETE ENCASEMENT

FOR ALL TYPES AND SIZES OF SEWERS WHEN ORDERED OR SPECIFIED

NOT TO SCALE



DETAIL OF CONCRETE ENCASEMENT OF OVAL-TYPE PIPE

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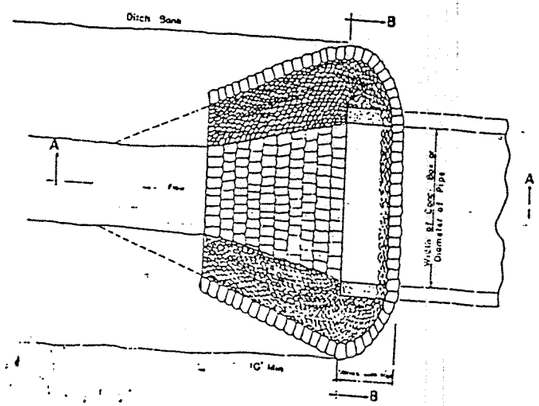
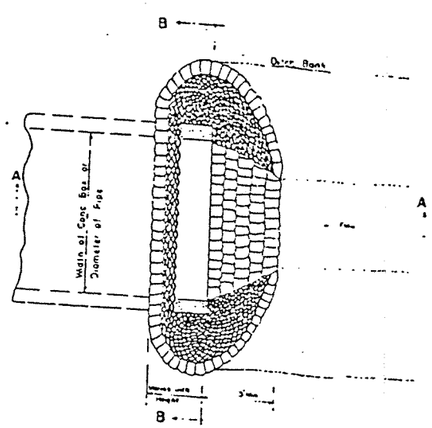


PLAN OF RIP-RAP OUTFALL

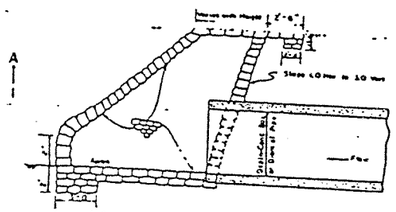
Conc Box or Pipe



PLAN OF RIP-RAP INTAKE

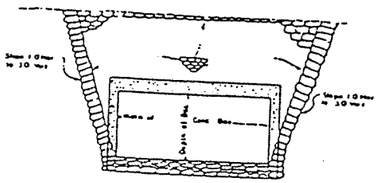
Conc Box or Pipe

NOT TO SCALE



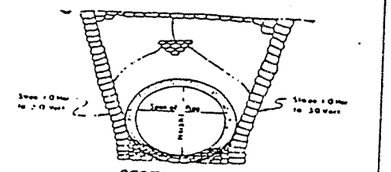
LONGITUDINAL SECTION A-A

Conc Box or Pipe



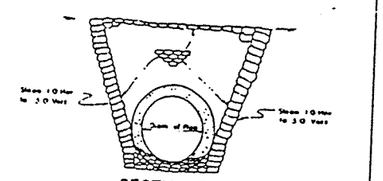
SECTION B-B

Conc Box



SECTION B-B

Oval Pipe



SECTION B-B

Circular Pipe

CONSTRUCTION NOTES

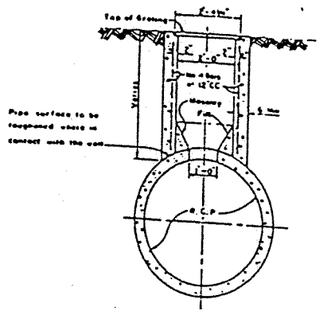
Plan and section details of rip-rap as shown hereon is necessarily of general shape and dimensions only since exact conditions at each site cannot be anticipated However the Contractor will adjust and vary such size and shape of the finished structure as the Engineer may direct in order to provide complete protection against erosion and bank caving at the ends of the culverts Final quantities will be calculated accordingly after construction is completed

PUBLIC WORKS DEPARTMENT
CITY OF TAMPA, FLORIDA

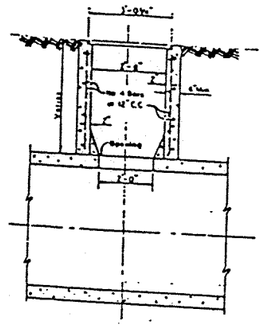
MISCELLANEOUS STANDARDS FOR STORM SEWERS

DRAINAGE STANDARD DRAWING

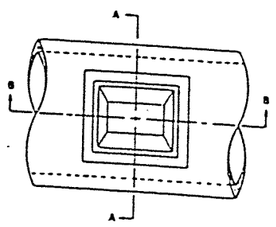
DPW D-7



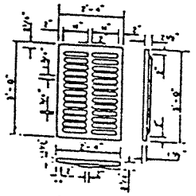
SECTION A-A △



SECTION B-B △

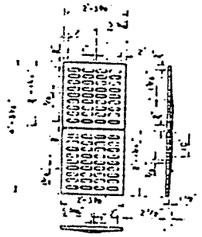


PLAN

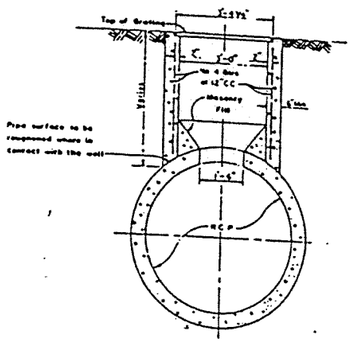


GRATING △△
NON-TRAFFIC BEARING

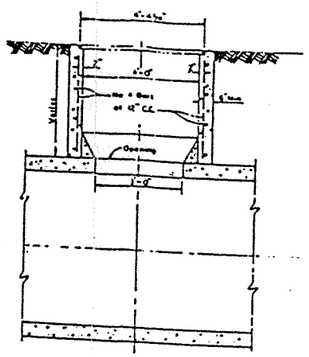
TYPE "C" GRATE INLET (MODIFIED)



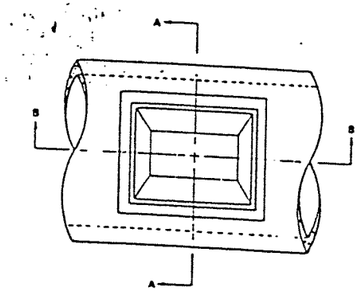
TYPICAL TYPE "D" GRATING △△
TRAFFIC BEARING



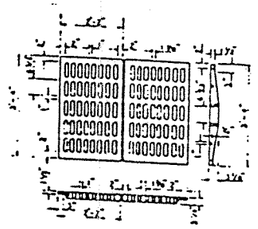
SECTION A-A △



SECTION B-B △



PLAN



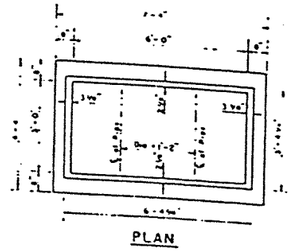
GRATING △△
TRAFFIC BEARING

TYPE "E" GRATE INLET (MODIFIED)

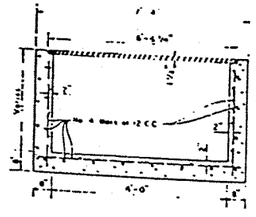
NOTES

Inlet Grates and Manhole Covers

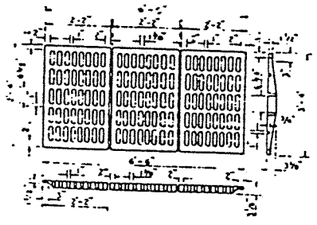
1. Unless otherwise specified the inlet grates as well as the manhole covers and frames shall be traffic type, capable of carrying traffic loadings and shall be subject to testing in accordance with Federal Specification RR-F-621C for traffic loads, i.e., 25,000 lbs. proof loading applied on a 9 inch square area selected to incur maximum stress. Where such proof loading is determined necessary by the Department of Public Works, City of Tampa, such test will be performed on samples grates or structures supplied by the supplier and tested by certified testing laboratory selected and paid by D.P.W. In the event that the sample fails under the test, the applicable testing cost shall be paid by the supplier. The tested unit, if satisfactory, will be purchased by D.P.W. at the unit bid price.
2. The grate design configuration as shown in the standard drawings may be modified by the supplier, provided:
   a) The grates meet the Traffic Loading Conditions and satisfactorily withstand the Proof Loading Test.
   b) Openings shall be in the same general alignment and configuration as DPW standard drawings D-2 and D-8 and provide equivalent net opening area.
   c) The size and configuration, particularly at bearing and support, shall not change so that the grate will fit and can satisfactorily be used with existing frames.
   d) Consideration shall be given to minimize hazard to bicycle traffic.
3. Also see DPW standard sheet D-2.



PLAN

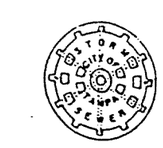


SECTION △

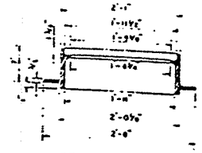


GRATING △△
TRAFFIC BEARING

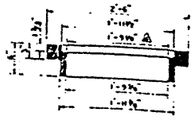
TYPE "H" GRATE INLET (MODIFIED)



COVER



STANDARD FRAME



INVERTED FRAME

MANHOLE FRAMES AND COVER △
TRAFFIC BEARING

△ 4-20-78 Added Grate Inserts to Standard Drawing
△ 7-24-78 Added "Use of Existing and Approved Grate Inserts"
△ 9-5-78 Re-arranged Notes
△ 10-2-78 Traffic Bearing Grating removed
△ 2-7-79 Drainage Grates and Traffic Bearing Grating deleted

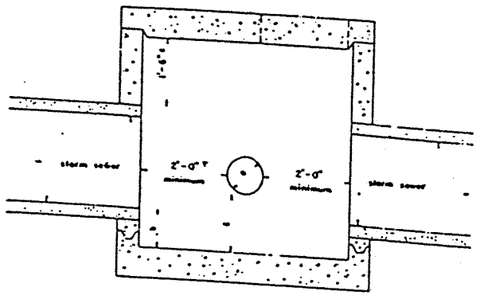
PUBLIC WORKS DEPARTMENT
CITY OF TAMPA, FLORIDA

MODIFIED GRATE INLETS
TYPES "C", "E" & "H" AND
TRAFFIC BEARING MANHOLE
FRAME & COVER

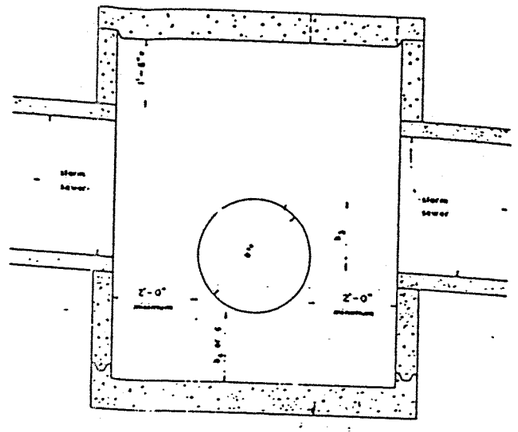
B.S.C. 9-6-78

DRAINAGE
STANDARD DRAWING

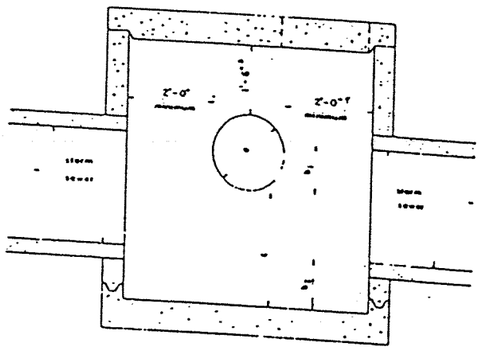
DPW D-8



$b = a$; $c = 1'-6"$ minimum
(use the greater of the two)



$b_3 = b_4$; $c = 1'-6"$ minimum
(use the greater of the two)



$b_1 = b_2$; $c = 1'-6"$ minimum
(use the greater of the two)

* Unless specified otherwise or restricted by field conditions.

** Outside diameter of the other utility line or sleeve.

T 2'-0" or ½(a) whichever is greater (unless specified otherwise or restricted by field conditions.)

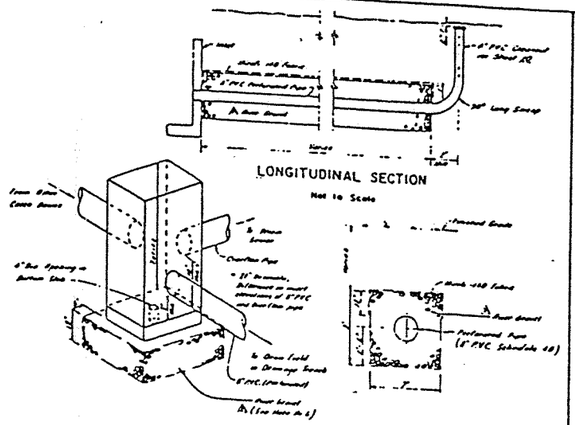
NOTES

1. For conflicting pipe sizes of 36" diameter & over, the conflict manhole drawing shall be submitted to D.P.W. for prior approval.
2. For more than one conflict, each case would be evaluated separately.
3. The structural design shall be as per D.P.W./DOT. standards as applicable and as approved by D.P.W.

PUBLIC WORKS DEPARTMENT
CITY OF TAMPA, FLORIDA

GUIDELINES FOR CONFLICT MANHOLES

DRAINAGE STANDARD DRAWING | DPW D-10



LONGITUDINAL SECTION

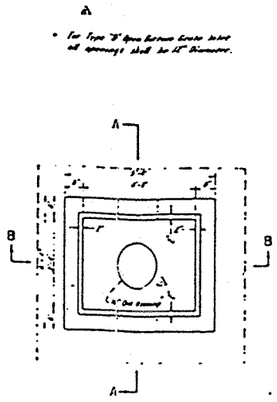
Not to Scale

INLET WITH DRAINAGE TRENCH

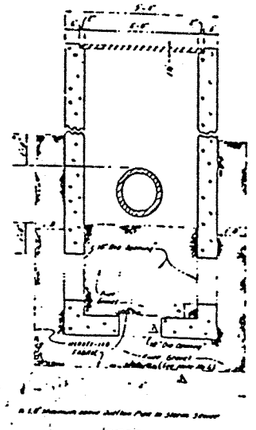
Not to Scale

DRAINAGE TRENCH CROSS-SECTION

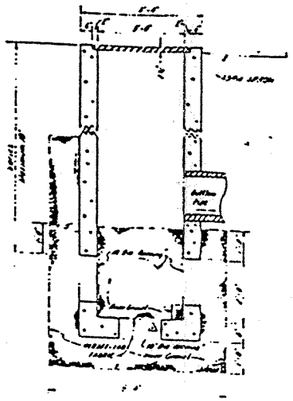
Not to Scale



PLAN



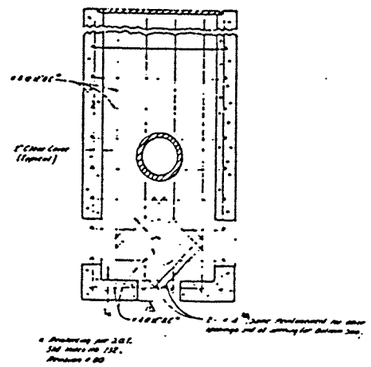
SECTION B-B



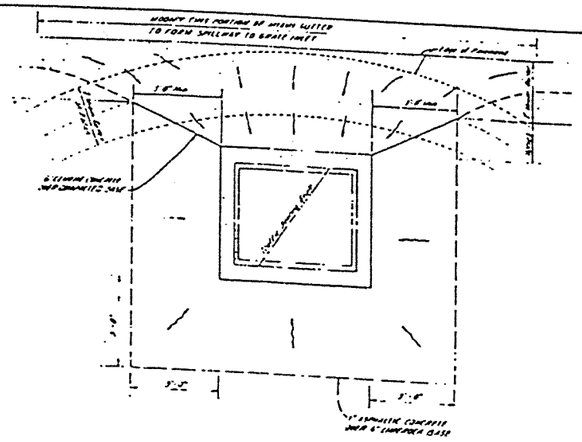
SECTION A-A

OPEN BOTTOM INLET – TYPE "E"

Not to Scale

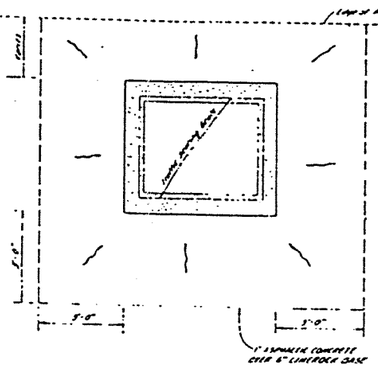


TYPICAL WALL REINFORCEMENT



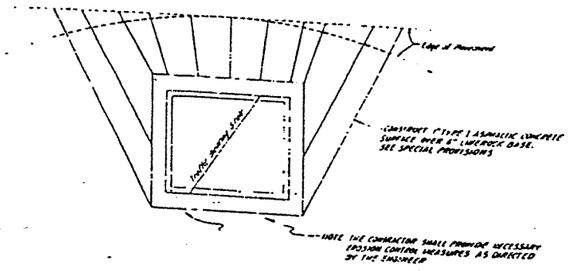
APRON DETAIL FOR GRATE INLET AT MIAMI GUTTER

Not to Scale



ASPHALT APRON

Not to Scale



ASPHALT APRON – ALTERNATE

Not to Scale

TYPICAL APRON DETAILS FOR GRATE INLETS

NOTES:

1. FOR GRATE SPECIFICATIONS SEE DPW STANDARD DRAWING NO DPW D-8
2. THE ABOVE OPEN-BOTTOM SUBSTRUCTURE MAY ALSO BE USED IN CONJUNCTION WITH CITY OF TAMPA CURB TYPE OPEN BOTTOM INLETS.
3. APRONS FOR INLETS SHALL BE CONSTRUCTED AS DIRECTED BY THE ENGINEER.
4. ANY CONCRETE POURED ON GROUND SURFACE SHALL HAVE MINIMUM OF 3" CLEARANCE TO REINFORCING.
5. THIS INLET IS DESIGNED FOR OFF TRAFFIC LOCATIONS. IF IN TRAFFIC, ADDITIONAL REINFORCING SHALL BE PROVIDED.
6. RIPER GRAVEL SHALL BE CLEAN AND CONFORM TO D.O.T SPECIFICATIONS UNDER SECTION 901-2 AND SHALL MEET ASTM SIZE NO. 4 GRADATION (1½" TO ¾" SIZE).
7. ALL EXPOSED CONCRETE CORNERS AND EDGES TO BE CHAMFERED ¾".

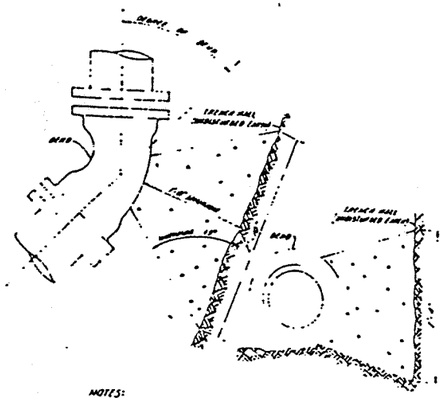
Scale ½" = 1'-0"

PUBLIC WORKS DEPARTMENT
CITY OF TAMPA, FLORIDA

INLET WITH DRAINAGE TRENCH, GRATE INLET APRONS, AND OPEN-BOTTOM TYPE INLET

DRAINAGE STANDARD DRAWING

DPW D-11

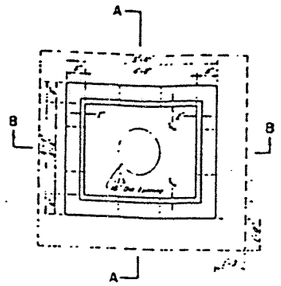


NOTES:

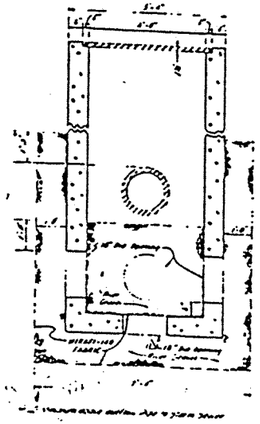
1. CONCRETE SHALL BE KEPT AT SUFFICIENT DISTANCE FROM JOINTS FOR REMOVAL OF ALL JOINT ACCESSORIES INCLUDING BOLTS
2. ALL BEARING SURFACES TO BE CARRIED TO UNDISTURBED SOIL
3. POOR SOIL (MUCK SOILS, CLAY, SAND OR PEAT) WILL REQUIRE LARGER THRUST BLOCKS

DETAIL

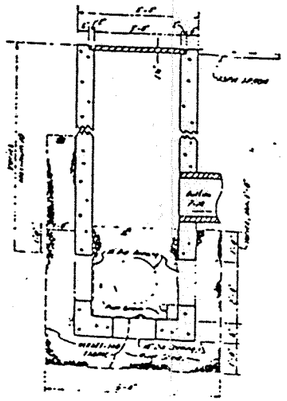
THRUST BLOCK



PLAN

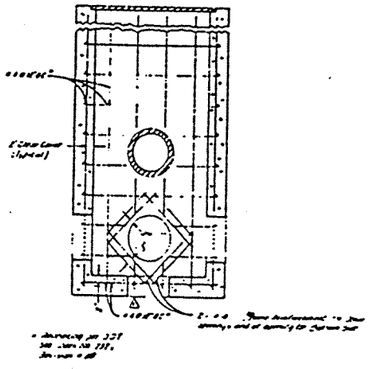


SECTION B-B



SECTION A-A

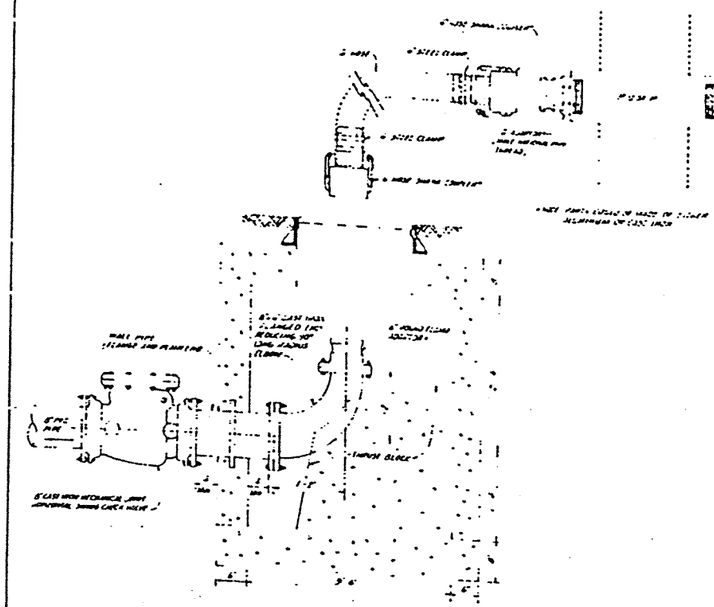
TYPE "E" (OPEN BOTTOM) GRATE INLET



TYPICAL WALL REINFORCEMENT

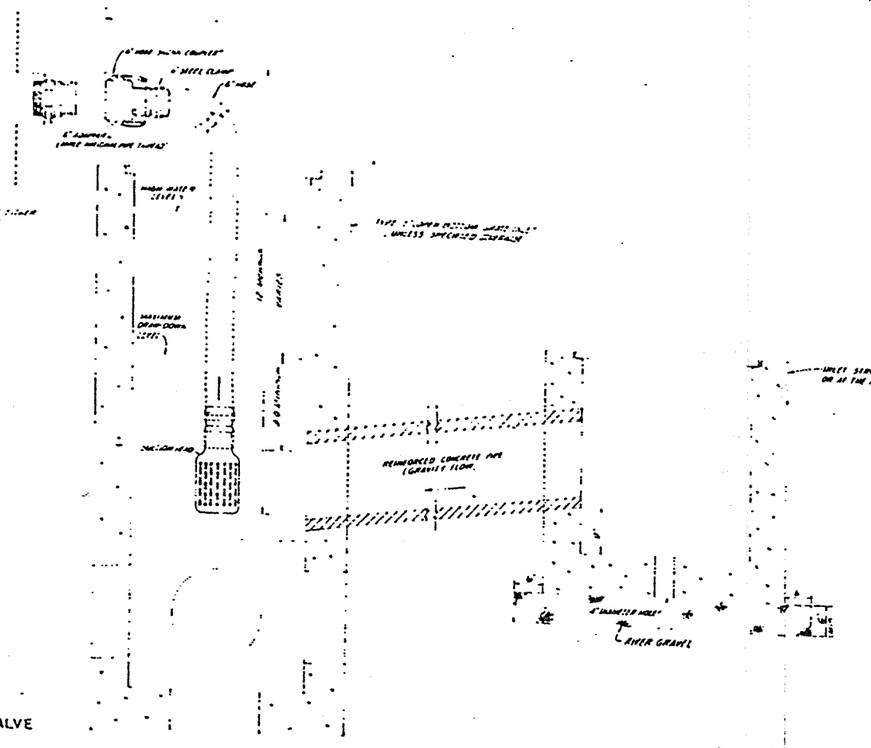
GENERAL NOTES:

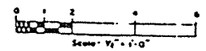
1. ALL COVER ON REINFORCEMENT SHALL BE A MINIMUM OF 2" UNLESS OTHERWISE SHOWN.
2. FOR GRATE SPECIFICATIONS SEE DPW STANDARD DRAWING NO. DPW D-8
3. THE GRAVEL SHALL CONFORM TO D.O.T. SPECIFICATION SECTION 901-2 AND SHALL CONFORM TO ASEM. SIZE NUMBER 4 GRADATION.



DETAIL

MANHOLE TYPE P-7T (3.5' dia.)
AND
8" C.I.M.J. HORIZONTAL SWING CHECK VALVE



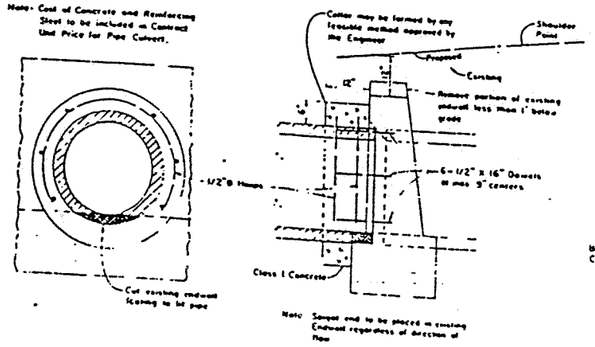


PUBLIC WORKS DEPARTMENT
CITY OF TAMPA, FLORIDA

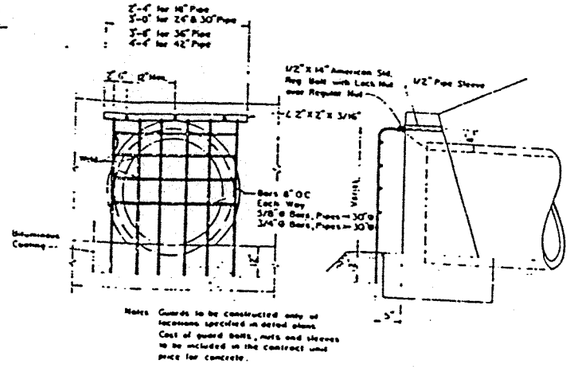
TEMPORARY FORCE MAIN
AND PUMPING STANDARDS

DRAINAGE STANDARD DRAWING

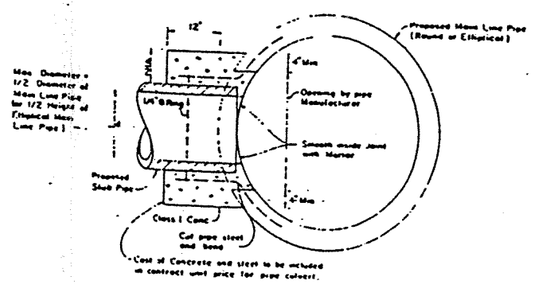
DPW D-12



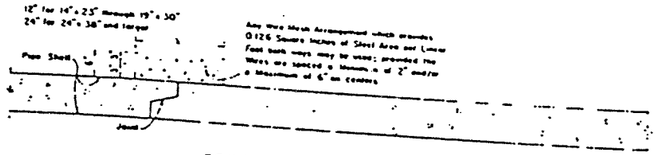
CONCRETE COLLAR FOR EXTENSION OF EXISTING PIPE CULVERTS



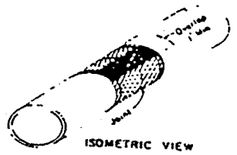
GUARD AT PIPE ENDS

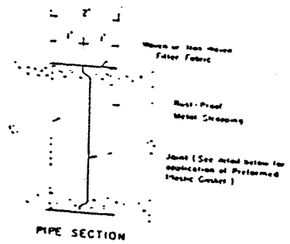


CONCRETE COLLAR FOR JOINING MAINLINE PIPE AND STUB PIPE



CONCRETE JACKET

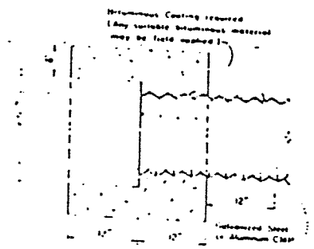




NOTES
1. Only one, either fabric or concrete jacket shall be provided at any single joint.
2. Concrete jacket shall be provided at least at last two joints before the outlet end of the pipe is not secured by an endwall. Engineer may specify concrete jacket at other points if so necessary.
3. Cost of concrete jacket and fabric jacket to be included in cost of adjacent pipe culverts.

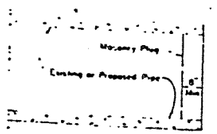
FILTER FABRIC JACKET

ELLIPTICAL CONCRETE PIPE JOINTS



CONCRETE JACKET FOR CONNECTING DISSIMILAR TYPES OF PIPE / OR PIPES WITHOUT HEADWALLS / ENDWALLS

Note: Cost of concrete and bituminous coating to be included in contract unit price for new pipe



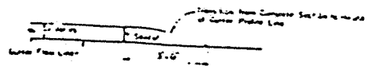
PIPE PLUG

Note: Cost of Masonry Plug Construction and or Removal to be included in Contract Unit Price for New Pipe

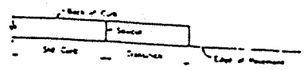
COUNTY WORKS DEPARTMENT

MISCELLANEOUS DRAINAGE DETAILS

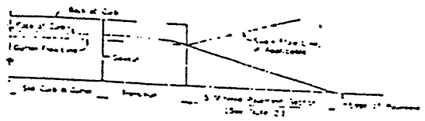
DRAINAGE STANDARD DRAWING | DPW D-13



ELEVATION

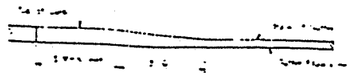


CURB PLAN

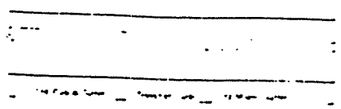


CURB AND GUTTER PLAN

STANDARD END OF CURB AND CURB AND GUTTER



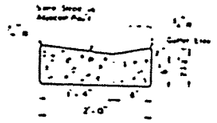
ELEVATION



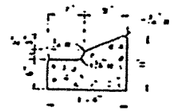
PLAN

MIAMI GUTTER TO STANDARD CURB AND GUTTER TRANSITION

STANDARD



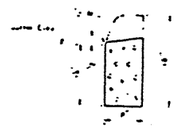
STANDARD DROP



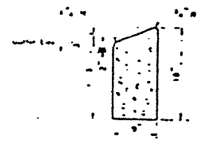
TYPE "A" CURB

CONCRETE CURBS AND GUTTERS

TYPE "C" CURB

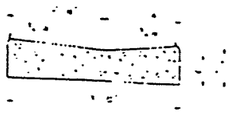


TYPE "D" DROP CURB

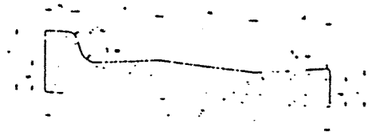


TYPE "B" CURB

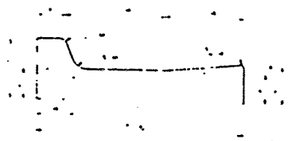
CONCRETE CURBS



SECTION A-A



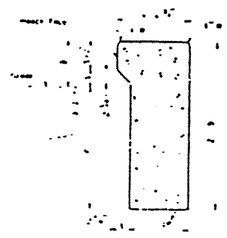
SECTION B-B



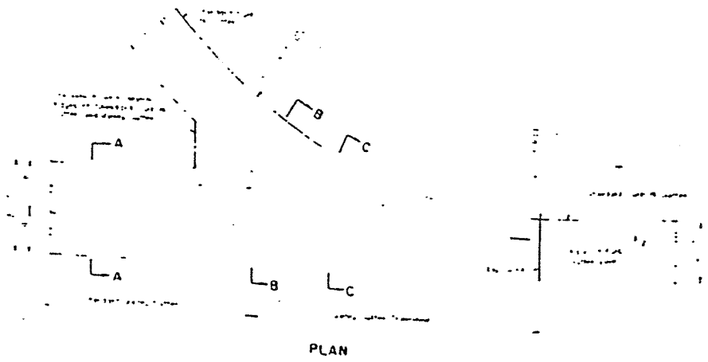
SECTION C-C

MIAMI GUTTER

ASPHALT CURB

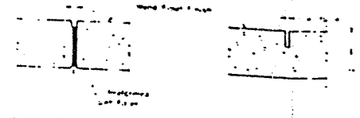


BARRIER CURB



PLAN

STANDARD VALLEY GUTTER DETAILS
FOR USE AT INTERSECTING STREETS



EXPANSION JOINT

CONTRACTION JOINT

JOINT DETAILS

CURBS-GUTTERS
JOINT DETAILS

PAVING
STANDARD DRAWING

DPW P-3

TOPOGRAPHY – NATURAL FEATURES

- SALT WATER MARSH
- FRESH WATER MARSH
- EXISTING SHORELINE (Waterline)
- HIGH WATER LINE
- LARGE DITCH OR RETENTION BASIN
- SMALL DITCH OR SWALE
- DRAINAGE FLOW DIRECTION
- LIMIT OF WOODED, SHRUB, OR GROVE AREA
- HEDGES
- SHRUBS
- CONIFER TREES
- PALM TREES
- MISCELLANEOUS TREES (Identified)
- CONTOUR LINES
- ELEVATIONS

PROFILE LINES & ELEVATIONS

- EXISTING SURVEY LINE
- PROFILE GRADE @ 2.00% — PROPOSED SURVEY OR CENTERLINE GRADE
- PROPOSED ELEVATIONS

TOPOGRAPHY – MAN MADE FEATURES

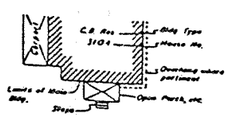
EXISTING	PROPOSED	TYPE
		POWER POLE (Electric)
		TELEPHONE POLE
		COMBINATION POLE (Power & Telephone)
		STREET LIGHT ON POST
		TRAFFIC LIGHT ON POST
		POLICE CALL BOX
		STREET SIGN (Marker) ON POST
		POWER (Electric) TOWER
		TELEPHONE TOWER
		COMMUNICATIONS (Radio) TOWER
		TELEVISION TOWER
		OVERHEAD POWER (Electric)
		OVERHEAD TELEPHONE

OCCUPIED ROADWAYS

EXISTING	PROPOSED	TYPE
		PAVED, NO CURB OR GUTTER
		PAVED, VERTICAL CURB ONLY (No integral gutter)
		PAVED, CURB AND GUTTER
		PAVED, VALLEY GUTTER
		UNPAVED

TOPOGRAPHY – MAN MADE FEATURES

- GUY POLE & WIRES
- GUY WIRE & ANCHOR
- COMBINATION POLE OR POST (Misc. usage identified)
- FIRE HYDRANT
- GASOLINE PUMP ISLAND
- CHANNEL BEACON
- CHANNEL MARKER
- RAILROAD CROSSING LIGHT
- RAILROAD CROSSING SIGN
- RAILROAD MILEPOST
- RAILROAD SWITCHBOX
- RAILROAD TRACKS (Large scale)
- RAILROAD TRACKS (Small scale)
- FENCE (Type identified)
- GATE
- WALL (Type identified)
- (Small) (Large) MISCELLANEOUS SIGNS
- STRUCTURES: Building Limits & Identification



PUBLIC WORKS DEPARTMENT
CITY OF TAMPA, FLORIDA

D.P.W. DRAFTING STANDARDS

FILE No. D-16-34 — SHEET 1 of 3

SURVEY & PROPERTY REFERENCES

- BENCH MARK (Control)
- CONCRETE MONUMENT
- CROSS IN CONCRETE
- IRON PIPE
- IRON ROD
- MISC. MARKER (Identified)
- NAIL & CAP
- STAKE (Hub)
- CHANGE IN ALIGNMENT
- SPECIAL REFERENCE MONUMENT

TESTING LOCATIONS

- TEST PIT
- PROBE SOUNDING
- BORINGS

PROFILE - PROPERTY LINE ELEVATIONS

- LEFT OF ℄
- RIGHT OF ℄

SURVEY, LAND, PROPERTY & EASEMENT LINES

- CONTROLLING LINE (Primary)
- AUXILLARY LINE (Secondary)
- COMBINED WITH SURVEY LINE
- CONSTRUCTION BASE LINE (Other Than ℄)
- MIDSECTION LINE
- SECTION LINE
- TOWNSHIP LINE
- RANGE LINE
- LIMITED ACCESS LINE (Expressways, etc.)
- SUBDIVISION BOUNDARY (Other Than Midsection Or Section Line)
- PROPERTY LINE PER PLAT
- PROPERTY LINE PER OCCUPATION (If Different Than Plat)
- PROPOSED R/W LINE and/or PROPOSED EASEMENT LINE (Additional R/W Required)
- EXISTING EASEMENT LIMIT (Boundary)

UNDERGROUND FACILITIES

UTILITIES

EXISTING Up to 15"	EXISTING 15" & Over	PROPOSED Up to 15"	PROPOSED 15" & Over	TYPE
				STORM SEWER
				SANITARY SEWER
				WATER
				GAS

UTILITIES, CONT'D.

EXISTING	PROPOSED	TYPE
		POWER (Electric)
2"E	2"E	POWER (Electric) - Special
		TELEPHONE
F	F	FIRE ALARM CABLE
WU	WU	WESTERN UNION
CTV	CTV	CABLE TELEVISION
		ROOF DRAIN (Identified)
		WYE AT PROPERTY LINE (San. Sewer House Conn.)
		TEE AT PROPERTY LINE (San. Sewer House Conn.)

UNDERGROUND STRUCTURES - INLETS** △

EXISTING	PROPOSED	TYPE
		TYPE 1 STD. CURB INLET
		TYPE 2 STD. CURB INLET
		TYPE 3 STD. CURB INLET
		TYPE "D" GRATING INLET
		TYPE "E" GRATING INLET
		TYPE "H" GRATING INLET
		TYPE B-S-1 STD. CURB INLET
		TYPE B-V-1 STD. CURB INLET
		TYPE 5 STD. CURB INLET
		TYPE 6 STD. CURB INLET

** Special shaped inlet structures are drawn per Standard Details if not shown here.

UNDERGROUND FACILITIES, CONT'D.

UNDERGROUND STRUCTURES - MANHOLES

EXISTING	PROPOSED	TYPE
		STORM SEWER MANHOLE
		SANITARY SEWER MANHOLE
		OTHER (Type Identified)

UNDERGROUND STRUCTURES - MISCELLANEOUS

EXISTING	PROPOSED	TYPE
		EJECTOR STATION
		PUMPING STATION
		VALVE BOX
		METER
		GAS DRIP
		HANDHOLE OR PULL-BOX
		VALVE
		SANITARY SEWER CLEANOUT
G	G	GASOLINE TANK
F	F	FUEL OIL TANK
W	W	WATER TANK
P	P	OTHER (Type Identified)

NOTE:

For CONSTRUCTION DRAWINGS, items listed under "PROPOSED" are items To Be Constructed.

PUBLIC WORKS DEPARTMENT
CITY OF TAMPA, FLORIDA

D.P.W. DRAFTING STANDARDS

FILE No. D-15-34 SHEET 2 of 3

15

CYPRESS
ST.
T29S-R18E.
(Center North Arrow middle of working area when possible)
Bench Mark Notes should be kept in upper right hand column directly over Title Block. Use upper and lower case 1/8" Lettering.
STA. 73+50
STA. 78+00
SECTION 17
SECTION 20
74
75
76
77
Survey ℄ - 1/8" Lettering
Survey ℄ drawn with No 2 Mars Pen
Construction Lines drawn with No 1 Mars Pen
Match Line drawn with No 2 Mars Pen
MATCH LINE
MATCH LINE
WARD
Survey Line Profile - Upper and lower case 1/8" lettering
PROFILE GRADE LINE - Upper Case 1/8" Lettering
No. 000 Mars Pen
115 LEROY Template No 2 Mars Pen Inclined
175 LEROY Template No. 2 Mars Pen Vertical
12
10
8
6
4
2
0
73+50
74+00
75+00
76+00
77+00
78+00
PUBLIC WORKS DEPARTMENT
CITY OF TAMPA, FLORIDA
D.P.W. DRAFTING STANDARDS
SAMPLE DRAWING
FILE No. 0-15-34
SHEET 3 of 3

CITY OF TAMPA
DRAINAGE IMPROVEMENTS

RIVER VIEW AVENUE DRAINAGE IMPROVEMENTS
St. Marco St. to Buffalo Ave.

FILE No. D-7-48 JOB No. 5615

STORMWATER MANAGEMENT DIVISION
DEPARTMENT OF PUBLIC WORKS
CITY OF TAMPA, FLORIDA

SAMPLE COVER SHEET

NOTE

THIS SAMPLE SET OF DRAWINGS IS FURNISHED TO BETTER CLARIFY OUR DRAWING SHEET LAYOUT AND DRAWING SET ARRANGEMENT. IT IS NOT TO BE USED AS AN EXAMPLE FOR DESIGN. YOU MAY NOTE THAT ALTHOUGH ALL DRAFTING STANDARDS ARE NOT FOLLOWED EXACTLY, A GENERAL UNIFORMITY IS APPARENT THROUGHOUT THE SET. THREE SHEETS OF [illegible] DRAFTING STANDARDS ARE INCLUDED. SHEETS ONE AND TWO SHOW THE SYMBOLS TO BE USED. SHEET THREE SHOWS THE PRINCIPLES FOR LINES AND SHEET ARRANGEMENT FOR PLAN AND PROFILE DRAWINGS. ALL PROPOSED DRAINAGE LINES AND STRUCTURES SHOULD BE DRAWN TO SCALE.

VICINITY MAP

INDEX OF SHEETS

Sheet No.	Description
1	Cover Sheet and Vicinity Map
2	Legend, Summary of Quantities, General Notes and Drainage Area Map
3	Details and Typical Sections
4-7	Plan and Profile
8-13	Cross Sections

APPLICABLE CITY STANDARD DRAWINGS

DPW D-2 Standard Inlets Type 1,2,3,"D","E" & "H"
DPW D-10 Guideline for Conflict Manholes
DPW P-3 Curbs-Gutters & Joint Details

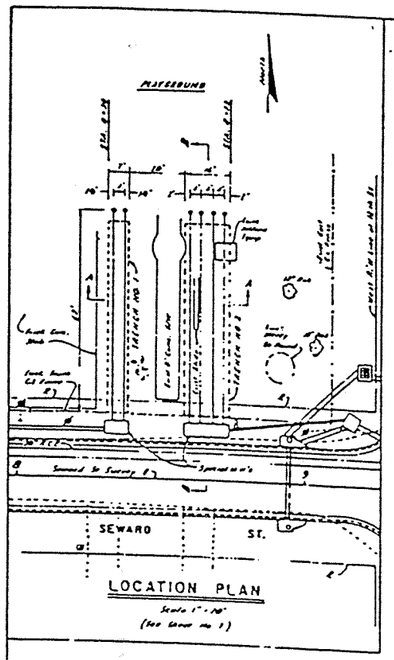
APPLICABLE D.O.T. STANDARD DRAWINGS

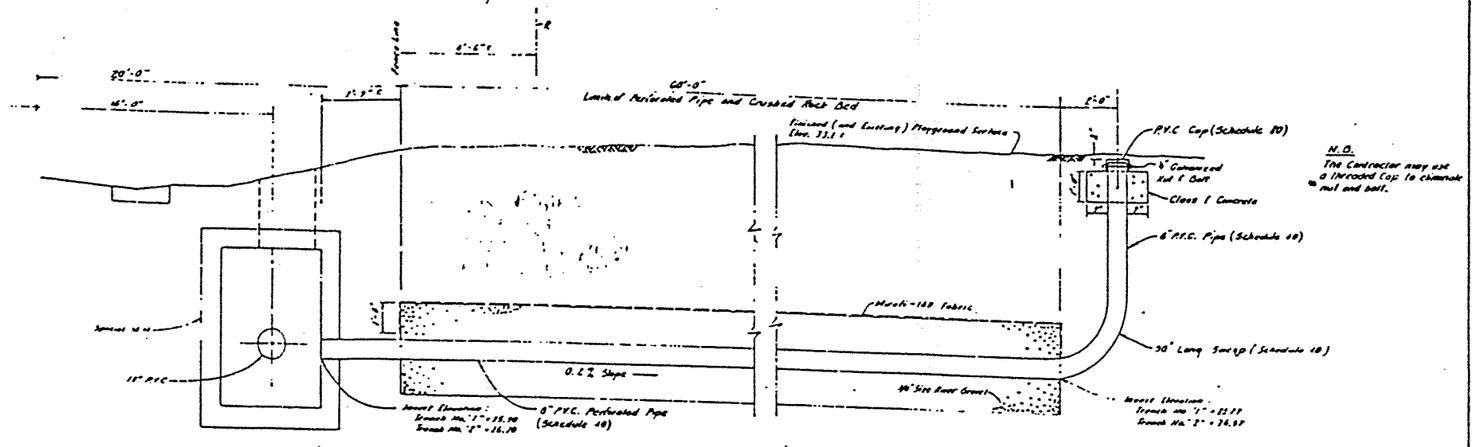
DOT 200 Structure Bottoms Types "J" and "P"
DOT 261 U-Type Concrete Endwalls Baffles and Grate Optional

CONSULTANT

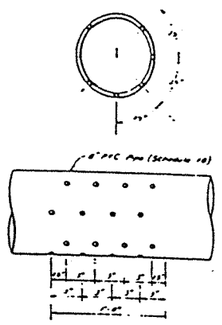
STORMWATER MANAGEMENT DIVISION
DEPARTMENT OF PUBLIC WORKS
CITY OF TAMPA

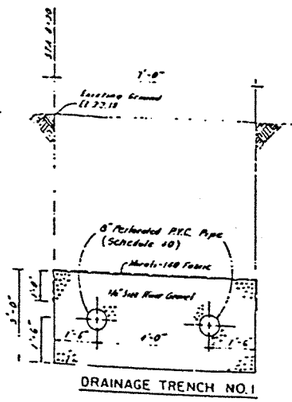
Sheet to Inclusive, Certified By:

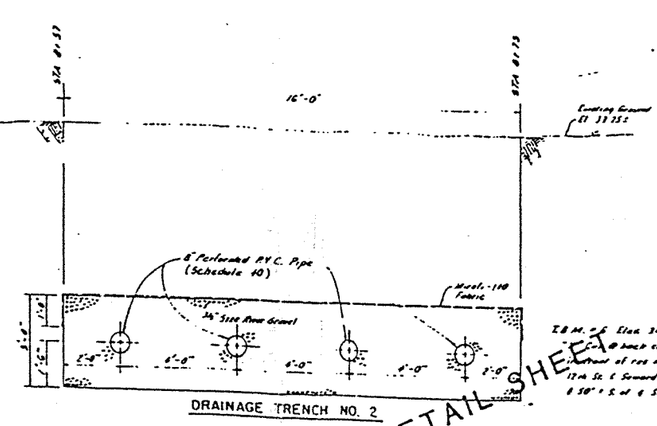




SECTION B-B
Scale: 1/8"=1'-0"







SECTION A-A
Scale: 1/8"=1'-0"

NOTES

1. All R.C.C. Pipe & Fittings Shall be Schedule 40, Except Where Shown Differently.
2. 6" Perforated R.C.C. Pipe Shall Have 28 Perforations of 3/8" Diameter Each Per Foot Length of the Pipe.
3. Aggregate (River Gravel) Shall be 3/4" Size (Uniform Size)
4. The Grading and Top Finish Elevations of the Trenches (& the Playground Area) Shall be as Per Sheet No. A-3 of the Plans for North Tampa Playground, Project No. 6168, O.E.M. File No. B-6-68, and as Directed by the Engineer. The Top Elevations Indicated Here are only Approximate.

T.B.M. #5 Elev. 30.28
Nail & washer conc. S'ly'st ass W. side 12th St.
Ground at pole # 9516 12th St. ass S.W. cor.
12th St. & Seward St., 15'± W. of ℄ 12th St.
& 50'± S. of ℄ Seward St.

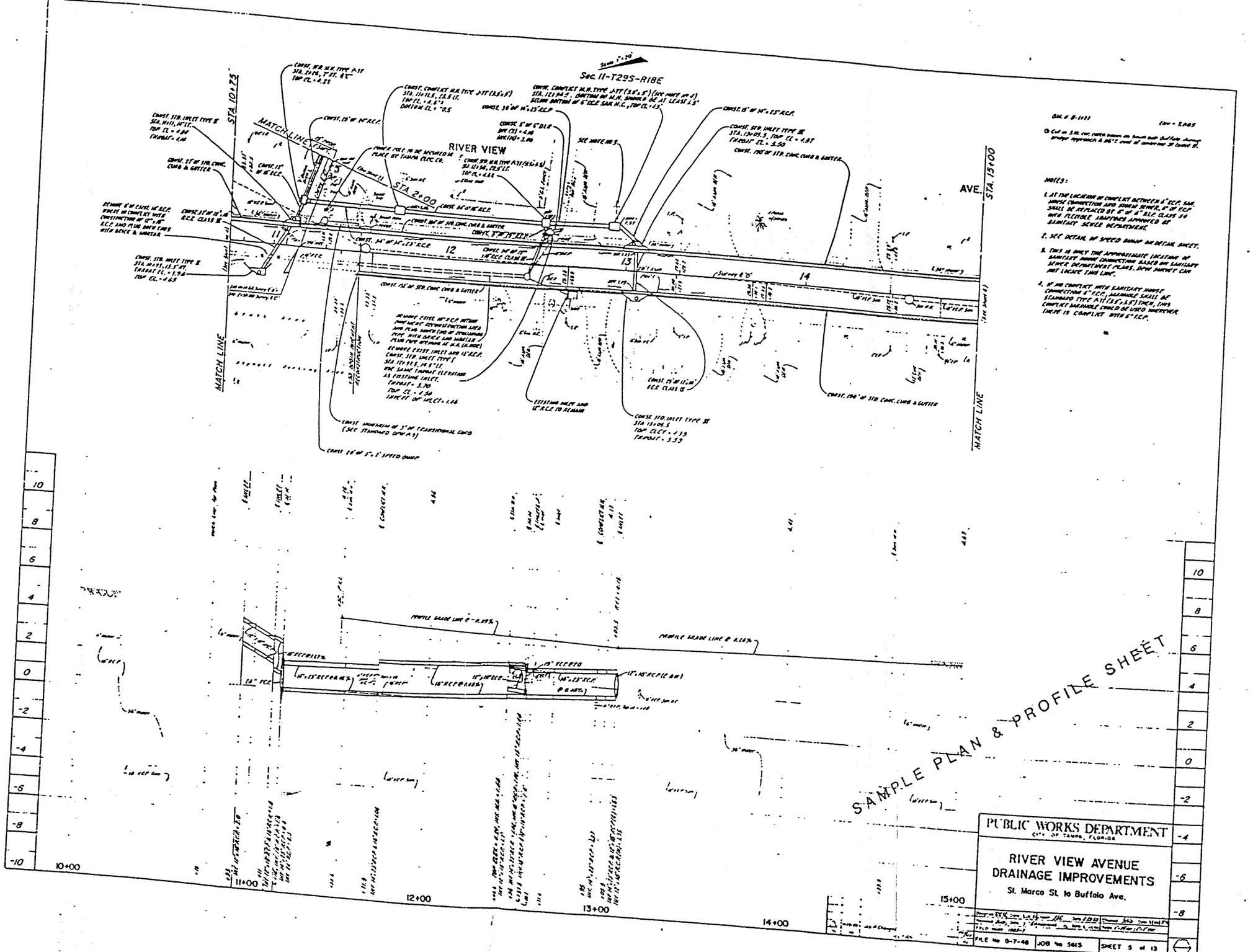
SAMPLE DRAIN FIELD DETAIL SHEET

DRAIN FIELD DETAILS

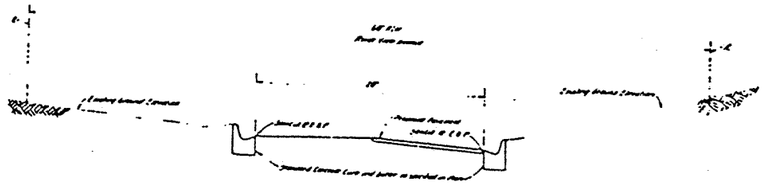
PUBLIC WORKS DEPARTMENT
CITY OF TAMPA, FLORIDA

EXTENSION OF
9th ST. STORM SEWER

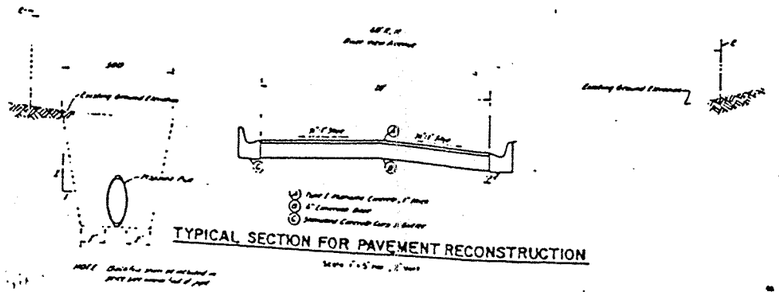
FILE No. A-3-4 | JOB no. 5367 | SHEET 20 of 66



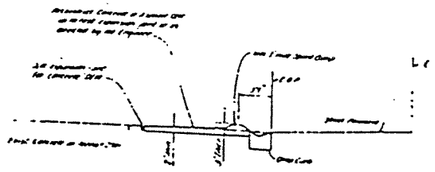
Sec. 11-T29S-R18E
RIVER VIEW
AVE.
STA. 10+75
STA. 15+00
STA. 2+00
MATCH LINE
MATCH LINE
MATCH LINE
11
12
13
14
10+00
11+00
12+00
13+00
14+00
15+00
SAMPLE PLAN & PROFILE SHEET
PUBLIC WORKS DEPARTMENT
CITY OF TAMPA, FLORIDA
RIVER VIEW AVENUE
DRAINAGE IMPROVEMENTS
St. Marco St. to Buffalo Ave.
FILE No 0-7-48
JOB No 5615
SHEET 5 of 13



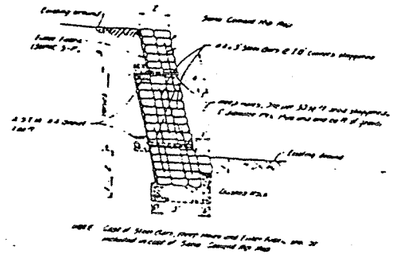
TYPICAL SECTION FOR CONSTRUCTION
OF CURB AND GUTTER



TYPICAL SECTION FOR PAVEMENT RECONSTRUCTION



DETAIL OF SPEED BUMP AND
RECONSTRUCTION OF CONCRETE OR ASPHALT D/W



TYPICAL CROSS SECTION OF SAND-CEMENT RIP-RAP

SAMPLE DETAILS & TYPICAL SECTIONS SHEET

DETAILS & TYPICAL SECTIONS

PUBLIC WORKS DEPARTMENT
CITY OF TAMPA, FLORIDA

RIVER VIEW AVENUE
DRAINAGE IMPROVEMENTS
St. Marco St. to Buffalo Ave.

FILE No. D-7-48 | JOB No. 5615 | SHEET 3 of 13

LEGEND

EXISTING Up to 15"	EXISTING 15" & Over	PROPOSED Up to 15"	PROPOSED 15" & Over	TYPE
				STORM SEWER
				SANITARY SEWER
				WATER
				GAS
				POWER (Electric)
				TELEPHONE
				FIRE ALARM CABLE
				ROOF DRAIN
				WYE AT PROPERTY LINE (Storm Sewer House Conn.)
				TEE AT PROPERTY LINE (Storm Sewer House Conn.)
				STORM SEWER MH
				SANITARY SEWER MH
				OTHER (Type Identified)
				VALVE BOX
				METER
				GAS DRIP
				HANDHOLE OR PULL-BOX
				VALVE
				SANITARY SEWER CLEANOUT
				FIRE HYDRANT
				POWER POLE (Electric)
				TELEPHONE POLE
				COMBINATION POLE (Power & Telephone)
				STREET LIGHT ON POST
				TRAFFIC LIGHT ON POST
				POLICE CALL BOX
				STREET SIGN ON POST (Marker)
				GUY POLE & WIRES
				GUY WIRE
				SHRUBS
				CONIFER TREES
				PALM TREES
				MISC. TREES (Identified)

NOTES:

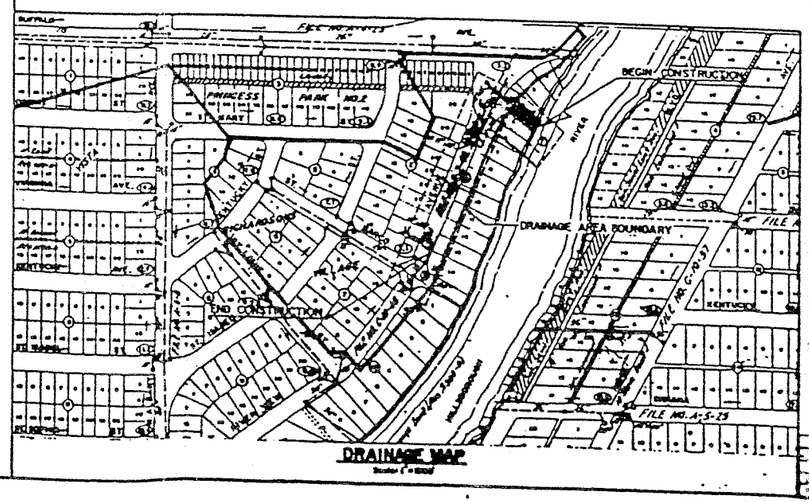
1. For construction drawings, items listed under PROPOSED are items to be constructed.
2. All pipes and conduits to be drawn to scale in profile.

SUMMARY OF QUANTITIES

Item No.	Item	Unit	Approx. Quantities
120-1	REGULAR EXCAVATION	CY	213
121-1	SELECT BEDDING MATERIAL	CY	27
200-1-1	LIMEROCK BASE, (12") 2 COURSE	SY	1899
285-1*	SHELL FOR DRIVEWAYS	TON	4
334-1-1	TYPE I ASPHALTIC CONCRETE, 1" THICK INCLUDING		
	RETURNING MATERIAL FOR PRIME/TACK COAT	SY	1090
400-1-1	CLASS I CONCRETE	CY	3.7
400-1-2	CLASS I CONCRETE INCLUDING STEEL REINFORCEMENT	CY	3.8
425-1-1	STANDARD INLET TYPE I	EA	1
425-1-2	STANDARD INLET TYPE II	EA	4
425-1-3	STANDARD INLET TYPE III	EA	2
425-2-2	COMPLETE MANHOLE TYPE J-72	EA	2
425-2-3	STANDARD MANHOLE TYPE P-72	EA	2
430-1-1	CONCRETE PIPE CULVERT 15" RCP	LF	5
430-1-2	CONCRETE PIPE CULVERT 18" RCP	LF	98
430-1-3	CONCRETE PIPE CULVERT 24" RCP	LF	164
430-1-38	CONCRETE PIPE CULVERT 19"x29" RCP	LF	169
430-1-72	CONCRETE PIPE CULVERT 12"x18" CLASS IV	LF	109
520-1-1	STANDARD 2" CONCRETE CURB & GUTTER	LF	1190
520-4	CONCRETE MEDIAN GUTTER (2' WIDE)	LF	72
522-2	CONCRETE SIDEWALK (6" THICK) FOR DRIVEWAY	SY	9.4
570-9	WATER FOR GRASSING & DUST CONTROL	1000-GAL	18
575-1-4	SOLID SOD (ST. AUGUSTINE)	SY	1073
580-1*	FURNISHING & PLANTING LIVE OAK (6"-8")	EA	1
SP-4	6" DIP	LF	6
			9
	* CONTINGENT ITEMS		

GENERAL NOTES

1. ALL ELEVATIONS ARE REFERRED TO THE MEAN SEA LEVEL DATUM OF THE U.S.C. AND G.S. (M.S.L.)
2. PROVIDE AT LEAST 48 HOURS NOTICE TO THE VARIOUS UTILITY COMPANIES IN ORDER TO PERMIT THE RELOCATIONS OF EXISTING UNDERGROUND UTILITIES IN ADVANCE OF CONSTRUCTION, BY CALLING SUNSHINE 1-800-282-8811.
3. STATIONS GIVEN ARE TO THE CENTERLINE OF THE INLETS AND MANHOLES.
4. 6" SELECT BEDDING MATERIAL SHALL BE PROVIDED UNDER ALL PIPES AND STRUCTURES UNLESS DIRECTED OTHERWISE BY THE ENGINEER OR SHOWN ON THE PLANS.
5. LAWN, LANDSCAPING, SPRINKLER SYSTEMS TO BE DISTURBED DURING THE CONSTRUCTION SHALL BE RESTORED.
6. CURB CHANNEL SHALL CONFORM TO THE STANDARDS AS SHOWN ON CITY OF TAMPA STANDARD DRAWING NO. P-3. CURB CHANNEL SHALL BE PROVIDED ON BOTH SIDES OF CURB INLET IF CURB IS NOT SPECIFIED ON THE PLANS.
7. DRIVEWAYS SHALL BE RECONSTRUCTED IN ACCORDANCE WITH CHAPTER 45, ARTICLE IIII OF THE CITY CODE, AS AMENDED BY ORDINANCE NO. 7882-A ADOPTED MARCH 17, 1983. DEVIATION FROM THE ESTABLISHED STANDARDS SHALL BE APPROVED BY THE CITY TRAFFIC ENGINEER.
8. TEMPORARY SHEETING AND SHORING SHALL BE USED WHERE NOTED ON PLANS OR AS DIRECTED BY THE ENGINEER. COST OF SHEETING AND SHORING SHALL BE INCLUDED IN THE PRICE PER LINEAR FOOT OF PIPE; NO SEPARATE PAYMENT SHALL BE MADE.
9. ALL EXISTING 4" PVC, CMP, AND OTHER PIPES THAT DRAIN RUNOFF FROM THE ADJACENT PROPERTIES TO THE DITCHES SHALL BE ADJUSTED IN A MANNER TO DRAIN FREELY, AS DIRECTED BY THE ENGINEER DURING THE CONSTRUCTION OF THE STORM SEWER.
10. 36" WATER MAIN LOCATED ALONG EAST SIDE OF RIVER VIEW AVENUE SHALL BE CAREFULLY PROTECTED DURING THE ENTIRE PROJECT.



DRAINAGE MAP

SAMPLE LEGEND, SUMMARY OF QUANTITIES, GENERAL NOTES & DRAINAGE MAP SHEET

LEGEND, SUMMARY OF QUANTITIES, GENERAL NOTES & DRAINAGE MAP

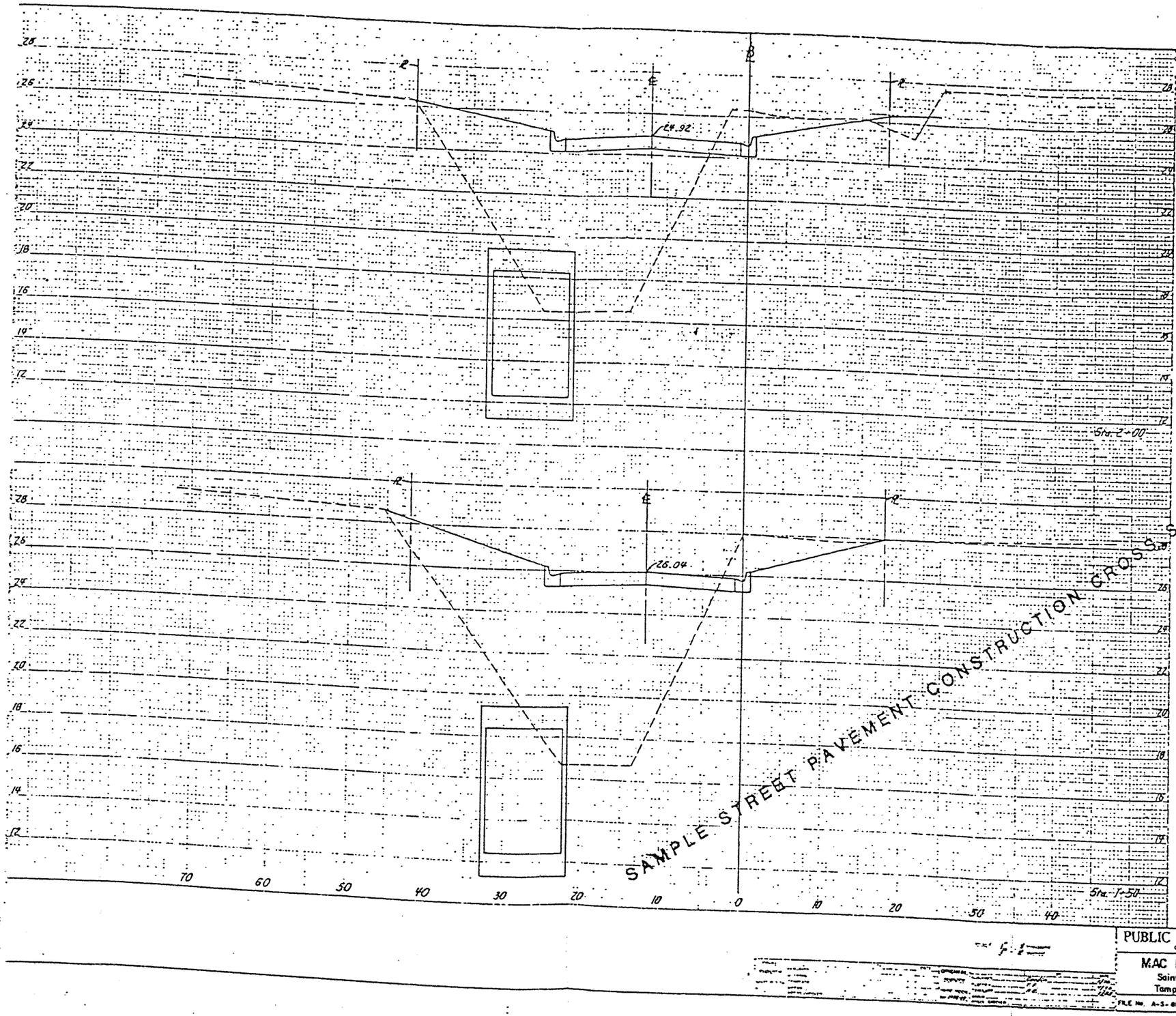
PUBLIC WORKS DEPARTMENT
CITY OF TAMPA, FLORIDA

RIVER VIEW AVENUE
DRAINAGE IMPROVEMENTS
St Marco St to Buffalo Ave.

Designed	Drawn	Checked	Approved
S.E.V.	V.A.A.		
Recommended for Approval	Date	Approved	Date
FIELD WORK			

No.	REVISIONS	Date	Approved
1	Add of Channel	11-28-88	

FILE No. 0-7-46 | JOB No. 5849 | SHEET 2 of 13



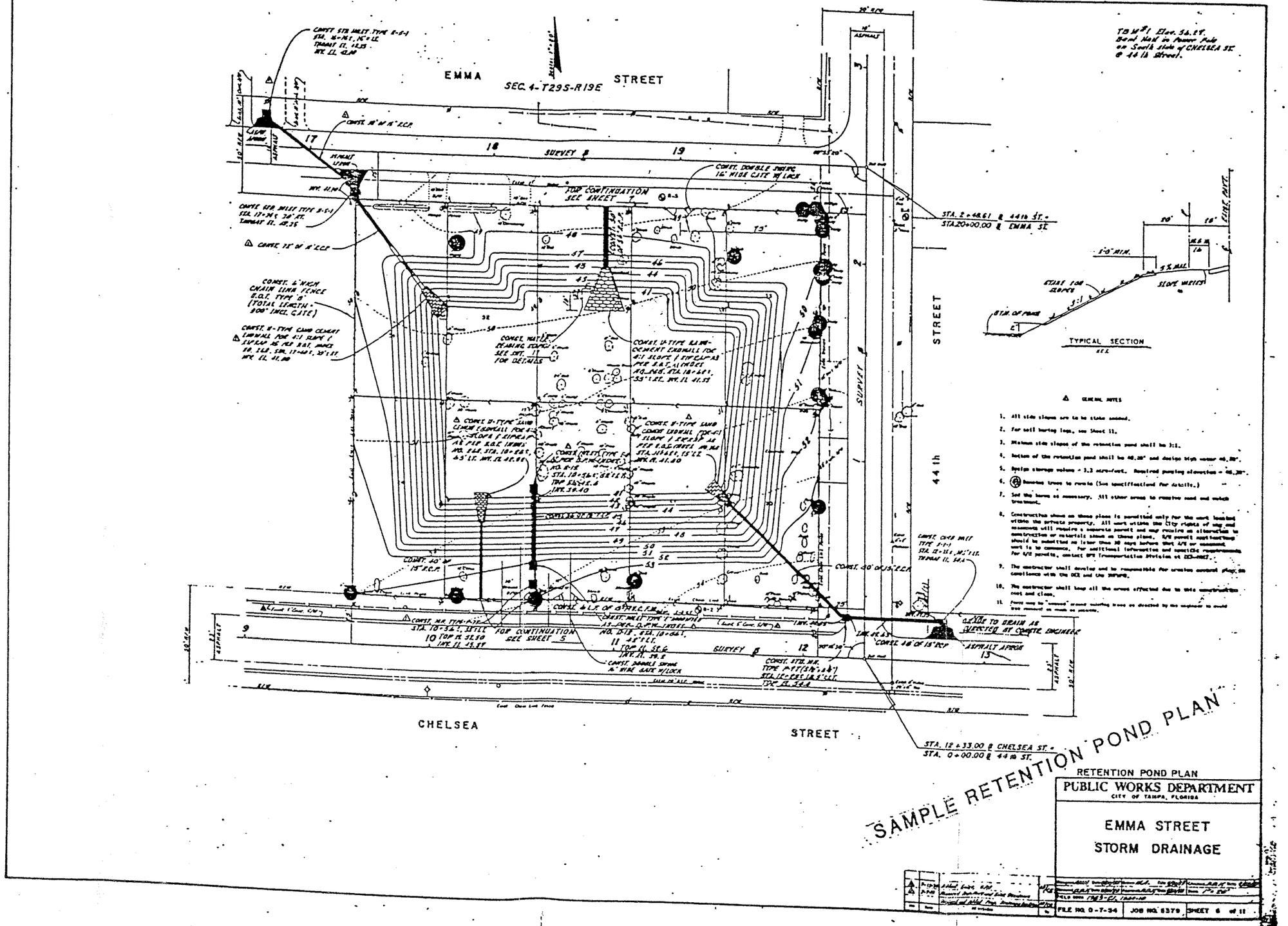
END AREA		VOLUME	
Sq. Ft.		Cu. Yds.	
Cut	Fill	Cut	Fill
		42	277
28	205		
		44	206
28	235		

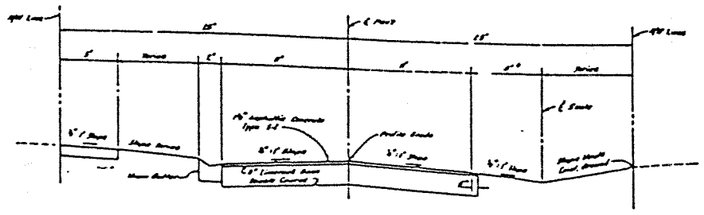
SAMPLE STREET PAVEMENT CONSTRUCTION CROSS SECTIONS SHEET

PUBLIC WORKS DEPARTMENT
CITY OF TAMPA, FLORIDA

MAC DILL AVE. OUTFALL
Saint Louis St. Ditch Closure
Tampania Ave. to Armenia Ave.

FILE No. A-S-61 | JOB No. 3566 | SHEET 13 of 21


EMMA STREET
SEC. 4-T29S-R19E
SURVEY ℄
FOR CONTINUATION SEE SHEET 7
FOR CONTINUATION SEE SHEET 5
44th STREET
CHELSEA STREET
STA. 2+48.61 ℄ 44th ST. = STA. 20+00.00 ℄ EMMA ST.
STA. 12+33.00 ℄ CHELSEA ST. = STA. 0+00.00 ℄ 44th ST.
TYPICAL SECTION
GENERAL NOTES
1. All side slopes are to be stake seeded.
2. For soil boring logs, see Sheet 11.
3. Minimum side slopes of the retention pond shall be 3:1.
4. Bottom of the retention pond shall be 40.20' and design high water 46.20'.
5. Design storage volume = 3.3 acre-feet. Required pumping elevation = 46.20'.
6. Remove trees to remain (See specifications for details.)
7. Sod the berms as necessary. All other areas to receive sand and mulch treatment.
8. Construction shown on these plans is permitted only for the work located within the private property. All work within the City rights of way and easements will require a separate permit and may require an alteration to construction or materials shown on these plans. R/W permit applications should be submitted no later than 30 days before that R/W or easement work is to commence. For additional information and specific requirements for R/W permits, contact DPW Transportation Division at [illegible].
9. The contractor shall develop and be responsible for erosion control plan in compliance with the DER and the SWFWMD.
10. The contractor shall keep all the areas affected due to this construction neat and clean.
11. Fence may be "wound" around existing trees as directed by the engineer to avoid tree removal as much as possible.
SAMPLE RETENTION POND PLAN
RETENTION POND PLAN
PUBLIC WORKS DEPARTMENT
CITY OF TAMPA, FLORIDA
EMMA STREET
STORM DRAINAGE
FILE NO. 0-7-34
JOB NO. 6379
SHEET 6 of 11

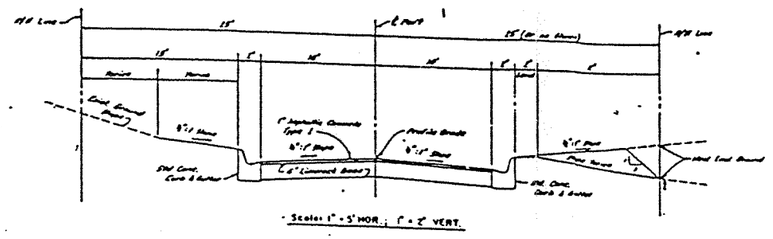


Scale: 1" = 5' HOR.; 1" = 2' VERT.

12th ST. - STA. 7+00 TO ℄ FAIRBANKS ST. (Miami Gutter - West Side Only).

12th ST. - SEWARD ST. (STA. 9+49.26) TO END OF CONTRACT (STA. 22+56)
Miami Gutter - West Side Only
Std. Conc. Curb & Gutter - East Side (Sta. 17+88 to Sta. Equation: 19+50.84 Bk = 19+99.6 Ahd)

12th ST. - FAIRBANKS ST. (STA. 10+50.20 TO STA. 15+00)
No Std. Conc. Curb & Gutter or Miami Gutter

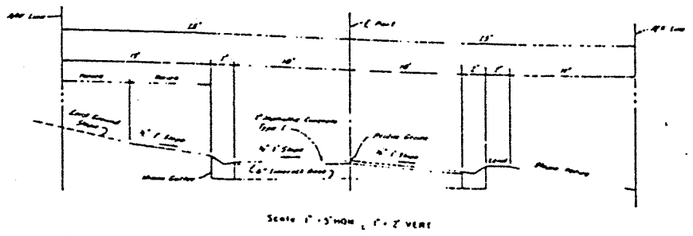


Scale: 1" = 5' HOR.; 1" = 2' VERT.

FAIRBANKS ST. - STA. 0+50 TO STA. 10+50.2

ALASKA ST. - NORTH OF FAIRBANKS (STA. 0+30 TO STA. 4+40)

ALASKA ST. - SOUTH OF FAIRBANKS (STA. 0+30 TO STA. 1+80)

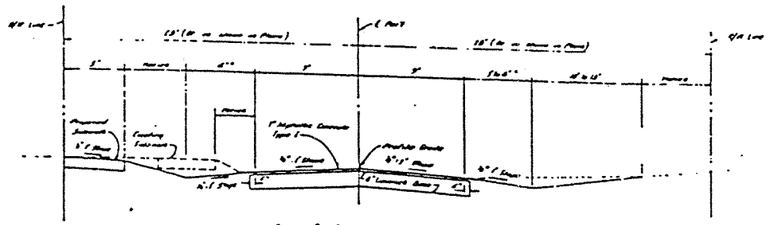


Scale: 1" = 5' HOR.; 1" = 2' VERT.

SEWARD ST. - EAST OF ALASKA (STA. 5+00 TO STA. 9+23.26)

11th ST. - NORTH OF FAIRBANKS (STA. 0+30 TO STA. 2+00)
Miami Gutter - West Side and Sta 0+30 to Sta. 1+12 - East Side

11th ST. - SOUTH OF FAIRBANKS (STA. 0+30 TO STA. 1+20)



Scale: 1" = 5' HOR.; 1" = 2' VERT.

YUKON ST. - EAST OF 12th ST. (STA. 0+60 TO STA. 8+40)

BROOKS ST. - NORTH OF YUKON ST. (STA. 0+30 TO STA. 0+80)

BROOKS ST. - SOUTH OF YUKON ST. (STA. 10+00 TO STA. 8+15)

13th ST. - NORTH OF YUKON ST. (STA. 0+47 TO STA. 2+00)
Exist Conc. Sidewalk on West Side

11th ST. - SOUTH OF SEWARD ST. (STA. 3+60 TO STA. 4+20)

NOTE:
* Check with Street Plan and Cross-Section

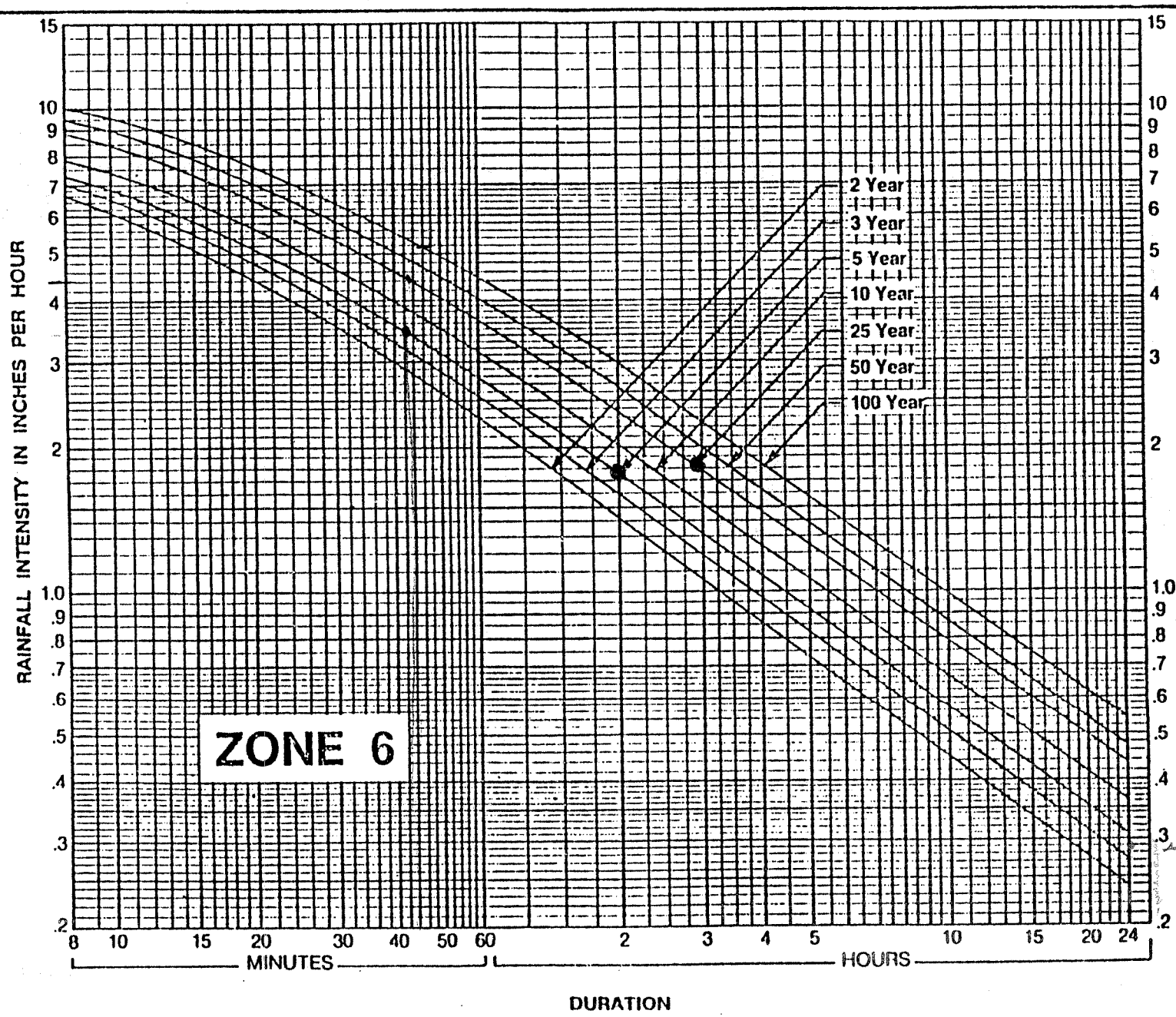
SAMPLE TYPICAL SECTION SHEET

TYPICAL SECTIONS

PUBLIC WORKS DEPARTMENT
CITY OF TAMPA, FLORIDA

EXTENSION OF
9th ST. STORM SEWER

FILE No. A-3-4 | JOB No. 5367 | SHEET 23 of 66



Rainfall Intensity-Duration-Frequency Curves for Zone 6

Table 5-2
DEPARTMENT INTENSITY-DURATION-FREQUENCY (IDF)
REGRESSION EQUATION CONSTANTS AND COEFFICIENTS

Rainfall Zone	Storm Frequency in Years	Polynomial Coefficients for a Third-Degree Polynomial A	B	C	D
1	2	11.09830	-2.47240	0.00711	0.01886
1	3	11.97845	-2.67930	0.02444	0.01812
1	5	11.82413	-2.28931	-0.07735	0.02535
1	10	12.01819	-1.91394	-0.20146	0.03519
1	25	13.48736	-1.84775	-0.32753	0.04818
1	50	13.12334	-1.04283	-0.52846	0.06176
2	2	10.57745	-2.10106	-0.08181	0.02557
2	3	10.89437	-1.83103	-0.19244	0.03537
2	5	10.85901	-1.50267	-0.27902	0.04121
2	10	12.30743	-1.94991	-0.22855	0.03903
2	25	12.81040	-1.40033	-0.43207	0.05602
2	50	14.17099	-1.56750	-0.47317	0.06168
3	2	11.87566	-2.78202	0.02345	0.02058
3	3	11.40436	-2.01001	-0.18000	0.03550
3	5	11.42451	-1.65788	-0.29070	0.04438
3	10	11.51866	-1.25713	-0.41757	0.05430
3	25	11.30909	-0.30052	-0.70475	0.07704
3	50	12.16856	-0.12834	-0.82217	0.08822
4	2	12.75884	-3.55763	0.21171	0.00678
4	3	12.36825	-2.82718	0.00820	0.02248
4	5	11.81456	-2.18321	-0.14397	0.03283
4	10	12.54028	-2.13586	-0.20440	0.03866
4	25	12.76532	-1.45996	-0.42819	0.05666
4	50	14.56743	-2.19263	-0.30685	0.04897
5	2	12.89666	-3.55805	0.21227	0.00619
5	3	12.49905	-2.90429	0.04609	0.01794
5	5	12.28117	-2.34803	-0.11099	0.02995
5	10	13.68290	-2.93192	-0.00385	0.02241
5	25	12.69696	-1.22300	-0.49561	0.06173
5	50	13.36862	-0.83912	-0.66880	0.07724
6	2	14.09519	-4.17207	0.31773	0.00029
6	3	14.98331	-4.44963	0.35683	-0.00224
6	5	14.54762	-3.89935	0.22564	0.00674
6	10	14.35386	-3.10140	-0.01003	0.02525
6	25	16.15961	-3.48135	-0.00160	0.02677
6	50	15.67671	-2.52635	-0.26055	0.04609

Table 5-2
(continued)

Rainfall Zone	Storm Frequency in Years	Polynomial Coefficients for a Third-Degree Polynomial A	B	C	D
7	2	12.10821	-2.79255	0.02002	0.02053
7	3	12.43560	-2.56458	-0.06903	0.02787
7	5	12.51872	-2.17764	-0.19805	0.03849
7	10	12.49556	-1.67116	-0.34901	0.05017
7	25	12.92209	-1.11084	-0.55019	0.06666
7	50	13.29550	-0.70432	-0.70152	0.07933
8	2	11.51282	-2.10568	-0.16578	0.03515
8	3	11.13440	-1.44999	-0.34027	0.04808
8	5	11.41155	-1.34465	-0.38409	0.05149
8	10	11.54908	-0.89694	-0.53000	0.06319
8	25	10.92111	0.51710	-0.93480	0.09473
8	50	11.58787	0.73605	-1.04111	0.10384
9	2	11.08062	-1.66022	-0.28464	0.04453
9	3	11.54667	-1.49353	-0.35960	0.05071
9	5	11.76664	-1.38391	-0.39880	0.05352
9	10	12.08400	-1.00328	-0.53661	0.06491
9	25	12.38592	-0.27352	-0.77532	0.08370
9	50	14.16172	-0.73486	-0.75377	0.08518
10	2	11.33384	-1.86569	-0.22813	0.04005
10	3	11.32916	-1.38557	-0.36672	0.05012
10	5	11.19083	-0.93165	-0.48526	0.05836
10	10	10.84265	-0.18976	-0.69575	0.07495
10	25	11.83969	0.09353	-0.84451	0.08783
10	50	11.59208	1.00204	-1.10384	0.10762
11	2	10.09256	-2.25031	0.01661	0.01544
11	3	09.30810	-1.21537	-0.25504	0.03590
11	5	09.02699	-0.47796	-0.46784	0.05263
11	10	10.23814	-1.23242	-0.27724	0.03685
11	25	11.68811	-1.61200	-0.25239	0.03706
11	50	09.94772	0.31312	-0.73271	0.07222

$I = A + BX + CX^2 + DX^3$ X = ln (time in minutes)

These equations were derived from the rainfall curves and are not exact representations thereof. Appropriate values for X are 8 to 180 minutes.

Table 5-3
EXAMPLE APPLICATION OF DEPARTMENT IDF REGRESSION EQUATIONS

EXAMPLE

ZONE 6 - 50 YEARS

$I = A + AX + CX^2 + DX^3$ $\quad X = \ln$ (time in minutes)

$I = 15.67671 - 2.52635X - 0.26055X^2 + 0.04609X^3$

Time	I (curve)	I (calculated)
8 min	9.4	9.7
10 min	8.9	9.0
20 min	7.2	7.0
30 min	5.9	5.9
40 min	5.1	5.1
50 min	4.5	4.6
60 min	4.1	4.1
2 hr	2.67	2.67
3 hr	2.02	1.99
4 hr	1.65	1.59*
5 hr	1.40	1.34*
10 hr	.87	0.92*
15 hr	.65	0.94*
20 hr	.54	1.09*
24 hr	.47	1.25*

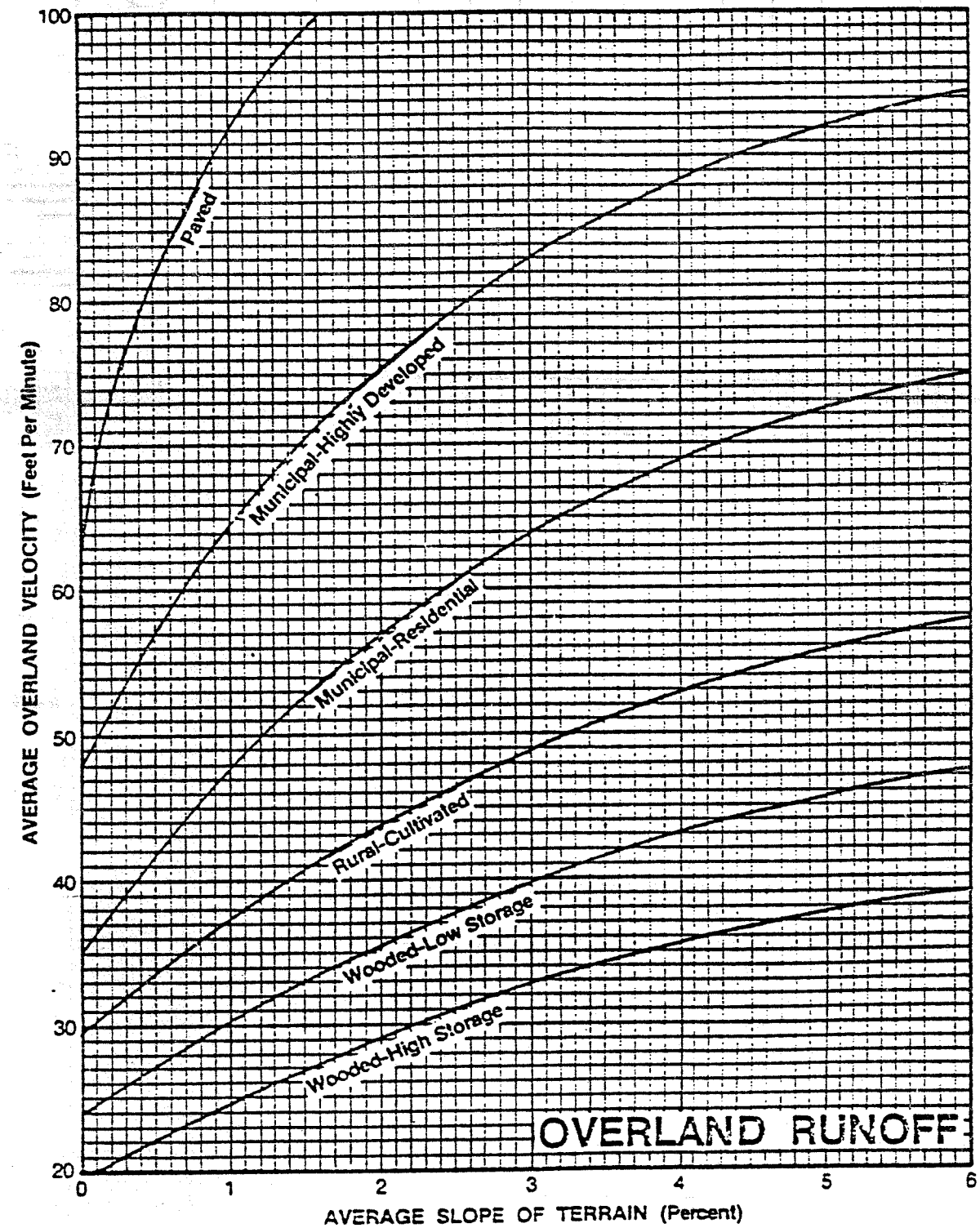
*These values are provided for comparison purposes only, since the regression equations are not valid beyond a 3-hour period.

HAINFALL CURVE

DEPT. OF PUBLIC WORKS — CITY O[illegible] TAMPA, FLORIDA
TABULATION OF STORM SEWER [illegible]SIGN DATA

PROJECT ______ DRAINAGE AREA ______ BY ______ DATE ______ SHEET ___ OF ___

SUB AREA NO.	LOCATION OF SECTION	FROM	TO	LENGTH OF SECTION IN FT	DRAINAGE AREA (ACRES) C= C= C= INCREMENT	SUB TOTAL	SUB-TOTAL (CA)	TIME OF CONCENTRATION MIN.	TIME OF FLOW IN SECTION MIN	INTENSITY	TOTAL (CA)	Q Q TOTAL RUNOFF (CFS)	MANHOLE OR INLET ELEV (FEET)	ELEV OF H G / CROWN EL / FLOW LINE FL: UPPER END	LOWER END	FALL (IN FEET)	DIAMETER (IN.)	SLOPE (%)	VELOCITY (FPS)	CAPACITY (CFS)	NOTES / REMARKS



Overland Flow Velocities for Various Land Use Types

K JOB DESCRIP PROJ NO

TIME OF CONCENTRATION HOURS	MIN.	RAINFALL INTENSITY INCHES/HOURS	TOTAL TIME HOURS	ACCUM. RAINFALL INCHES	INFLOW AC. FT.	OUTFLOW THRU PERC.	OUTFLOW THRU PIPE	OUTFLOW COMB. PER.-PIPE	DIFF.
25 YEAR FREQUENCY. ZONE VI - TAMP									
0	01	13.17	0.02	.22					
0	02	12.01	0.03	.40					
0	03	11.00	0.05	.55					
0	04	10.19	0.07	.68					
0	05	9.60	0.08	.80					
0	06	9.20	0.10	.92					
0	07	8.91	0.12	1.04					
0	08	8.60	0.13	1.17					
0	09	8.60	0.15	1.29					
0	10	8.40	0.17	1.40					
0	11	8.20	0.18	1.50					
0	12	8.00	0.20	1.60					
0	13	7.75	0.22	1.68					
0	14	7.50	0.23	1.75					
0	15	7.30	0.25	1.83					
0	30	5.40	0.50	2.70					
1	0	3.70	1.00	3.70					
1	30	2.90	1.50	4.35					
2	0	2.40	2.00	4.80					
3	0	1.80	3.00	5.40					
4	0	1.50	4.00	6.00					
6	0	1.12	6.00	6.72					
8	0	0.93	8.00	7.44					
12	0	0.70	12.00	8.40					
16	0	0.57	16.00	9.12					
20	0	0.50	20.00	10.00					
24	0	0.44	24.00	10.56					

WATERSHED DATA	
C" WEIGHTED COEFFICIENT=	
AX" DRAINAGE AREA =	
CA" EFFECTIVE RUNOFF =	

SAMPLE CALCULATIONS FOR INFLOW CURVE

$Qx = \frac{AxCI}{12}$

Qx = TOTAL INFLOW IN ACRE FEET OVER TIME PERIOD INDICATED.

Ax = DRAINAGE AREA IN ACRES.

I = ACCUMULATIVE RAINFALL IN INCHES OVER TIME PERIOD INDICATED.

C = WEIGHTED COEFFICIENT FOR ENTIRE WATERSHED

Qx =

CHECK | JOB DESCRIPTION | PROJECT NO.

TIME OF CONCENTRATION HOURS	MIN.	RAINFALL INTENSITY INCHES/HOURS	TOTAL TIME HOURS	ACCUM. RAINFALL INCHES	INFLOW AC. FT.	OUTFLOW THRU PERC.	OUTFLOW THRU PIPE	OUTFLOW COMB. PER.-PIPE	DIFF.
50 YEAR FREQUENCY, ZONE VI - TAMPA									
0	15	7.95	0.25	1.99					
0	30	5.90	0.50	2.95					
1	0	4.10	1.00	4.10					
1	30	3.20	1.50	4.80					
2	0	2.67	2.00	5.31					
3	0	2.00	3.00	6.00					
4	0	1.64	4.00	6.56					
6	0	1.24	6.00	7.44					
8	0	1.02	8.00	8.16					
12	0	0.76	12.00	9.12					
16	0	0.63	16.00	10.08					
20	0	0.54	20.00	10.80					
24	0	0.47	24.00	11.28					

WATERSHED DATA
C" WEIGHTED COEFFICIENT=
AX" DRAINAGE AREA =
CA" EFFECTIVE RUNOFF =

SAMPLE CALCULATIONS FOR INFLOW CURVE
$Qx = \frac{AxCI}{12}$
Qx = TOTAL INFLOW IN ACRE FEET OVER TIME PERIOD INDICATED.
Ax = DRAINAGE AREA IN ACRES.
I = ACCUMULATIVE RAINFALL IN INCHES OVER TIME PERIOD INDICATED.
C = WEIGHTED COEFFICIENT FOR ENTIRE WATERSHED
Qx =
Qx = _____ ACRE - FT.