

CITY OF TAMPA

STORMWATER

TECHNICAL STANDARDS MANUAL



Originally adopted December 5th, 1996
Revised June 2022

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Stormwater Division Standard Details can be obtained under the following link:

<https://www.tampa.gov/document/stormwater-standard-details-25946>

City of Tampa Stormwater Technical Standards Manual

SECTION I - INTRODUCTION

I.A. Stormwater Management in Tampa

The City of Tampa manages stormwater runoff in compliance with the Federal Clean Water Act as reauthorized in 1987 and the [State of Florida's Chapter 62-40 F.A.C.](#), the State Water Policy. Both of these documents give authority to, and require local governments to, lessen the impact of excess runoff on flooding and pollution caused by the stormwater management system.

The State Water Policy states that the City must adopt a Stormwater Management Plan, which lays out the methodology for managing stormwater. Currently, this Stormwater Management Plan is the Stormwater Element of the City of Tampa Comprehensive Plan. The Stormwater Element contains goals, objectives, and policies which set out the City's approach to controlling the effect of stormwater runoff quantity and quality on the citizens of Tampa.

Tampa Code gives the official (the mayor or their designee) authority to establish/publish technical standards and adopts them by reference. They have, therefore, the force and effect of law. The Stormwater Technical Standards Manual sets forth standards that fulfill the goals, objectives, and policies of the Comprehensive Plan, which affect the development and redevelopment, and construction of stormwater improvements. Our overriding goal in regulating new and redevelopment is to ensure the project has no negative offsite impacts and does not worsen a flooding or pollution problem.

In consultation with the citizens of Tampa, the City of Tampa, the development community, and the engineering community have established these minimum standards, guidelines, criteria, and design aids to control stormwater runoff. This manual aims to provide individuals with the guidance, minimum standards, and procedures associated with the design of drainage facilities on private land and City rights-of-way and easements.

I.B. Organization

The manual is arranged to provide the necessary information in as helpful a format as possible, given the amount and complexity of the material. It is divided into four sections: Introduction and Glossary, Basis of Review, General Development Requirements, and Design Standards.

- I. Introduction and Glossary** - Describes the rationale and authority of the manual as well as provides definitions for use in the manual.
- II. Basis of Review** - Classifies general development activities and references the location of standards for each.
- III. General Development Requirements** - Describes requirements for all new and redevelopment projects.
- IV. Design Standards** - Technical standards for Residential, Commercial, and Public Easement and ROW Activities

I.C. Glossary:

The following definitions are to clarify the intentions of the language used in this manual except where specific definitions are used within specific sections. For the purpose of such sections, the following terms, phrases, words, and their derivation shall have the meaning given herein and not be inconsistent with the text. For example, words used in the present tense include the future tense, words used in the plural number include the singular number, and words in the singular number include the plural number.

Adverse Impacts. Any modifications, alterations, or effects on a feature or characteristic of water bodies or flood-prone lands, including their quality, quantity, hydrodynamics, surface area, species composition, living resources, aesthetics, or usefulness for human or natural uses, which are or potentially may be harmful or injurious to human health, welfare, safety or property, biological productivity, diversity or stability, or which reasonably interfere with the enjoyment of life or property including outdoor recreation or cause damage to adjacent property owners`. The term includes secondary and cumulative as well as direct impacts.

Area of New Construction. The area disturbed by the construction of a redevelopment project. This area will include, but is not limited to, building expansions, parking lot construction or reconstruction (excluding resurfacing only), and ponds.

Artificial Turf or Grass. This is an artificial turf surface made out of synthetic fibers to look like natural grass. It is commonly vinyl or high strength “poly” based and may be permeable or impermeable depending on the surface material and the installed base materials. Permeability of each supplier’s artificial turf will be approved by the Stormwater Engineering Division following review of review of testing results and installation specifications.

Attenuation. To limit stormwater flow to reduce downstream impacts. (See also "Detention").

Base Flood Elevation (BFE) The elevation of surface water resulting from a flood that has a 1% chance (100-year storm) of equaling or exceeding that level in any given year. The BFE is shown on the Flood Insurance Rate Maps (FIRM) for zones AE, AH, A1–A30, AR, AR/A, AR/AE, AR/A1– A30, AR/AH, AR/AO, V1–V30, and VE. In case of a question, the City of Tampa Building Official should be consulted for assistance in determination.

Best Management Practices (BMPs). Means whereby pollutant loading to downstream elements are reduced. BMPs can be either structural (see Stormwater Treatment Facility) or non-structural practices. Non-structural practices include, but are not limited to, inlet cleaning, street sweeping, and detention pond maintenance.

Borrow Pits. An excavated area where material has been removed for use as fill at another location.

Capacity Analysis. A determination of a Stormwater Management facility's ability to provide a given Flood Protection Level of Service (FPLOS).

Channel. A natural or artificial watercourse of perceptible extent, with a definite bed and banks to confine and convey continuously or periodically flowing water. Channel flow thus is the water which is flowing within the limits of the defined channel.

Closed Drainage Basin. A drainage basin with no structural outfall. The discharge from a closed drainage basin is limited to percolation (and other groundwater flow), evaporation, and evapotranspiration.

Commercial Development. Any development consisting of more than one (1) single family residence.

Community Redevelopment Area (CRA). As defined by [Chapter 163, Part II, Florida Statutes](#), as amended.

Construction. The act of altering land or vegetation in preparation for development, or any action or activity which results in an alteration of either land, vegetation, or existing structures or the building of new structures.

Conveyance. Transport of stormwater via pipe and/or open channel system(s).

Design Capacity. The amount of flow a storm sewer system is designed to manage, usually expressed in cubic feet per second for flow and cubic feet or acre feet for storage.

Detention or To Detain. To temporarily store stormwater in such a way as to limit its flow, either to limit downstream impacts or provide treatment for water quality.

Detention Basin. A stormwater facility designed to capture and limit stormwater flow (by releasing it at a reduced rate) to reduce downstream impacts or improve its quality.

Developer. Any person who acts in their own behalf or as the agent of an owner of property and engages in alteration of land or vegetation in preparation for construction activity, development, or any action or construction activity which results in an alteration of either land, vegetation, or existing structures.

Ditch. An open stormwater conveyance facility with side slopes steeper than three units horizontally to one unit vertically (3:1).

Drainage. A general term applied to the removal of surface or subsurface water from a given area either by gravity or by pumping, commonly applied herein to surface water.

Drainage Basin. Any land area from which the runoff collects at a common point or receiving water.

Drainage System. The surface and subsurface system for the removal of water from or control of water on the land, including both the natural elements of streams, marshes, swales, and ponds, whether of an intermittent or continuous nature, and man-made elements which include culverts, ditches, channels, piping, and storage facilities. The storm sewer system may be referred to as a stormwater management facility, conveyance system, etc.

Elevation. Height in feet above mean sea level referenced to the North American Vertical Datum of 1988 (NAVD) or other nationally recognized standard.

Engineer of Record. An individual licensed by the State of Florida as a Professional Engineer. Further, the individual must be registered to perform engineering assignments in the specific technical field of Civil Engineering and such engineering practice must not conflict with [Chapter 471 Florida Statutes](#) and the rules and regulations of the Florida Board of Professional Engineers.

Erosion. The general process whereby soils are moved by flowing surface water, wind, or mechanical action.

Erosion Control Plan. A plan to control on-site soil that may ordinarily be moved by flowing surface water, wind, or movement of vehicles. The erosion control plan may consist of a separate and distinct plan or details and notes on the site plan as appropriate for the location and proposed activity.

Excavation. The action or process of creating a depression or hole in the ground greater than two (2) feet in depth by moving and/or removing the soil.

Exfiltration Trench. A sub-surface facility designed to convey stormwater into the underlying soil, providing treatment through filtration and volume reduction.

Fence. A structure having openings no larger than six (6) inches wide and constructed to prevent accidental or unauthorized entry to an area.

Filling. The action or process of raising the elevation of the property by bringing in soil from off-site or by reconfiguring the soil on-site.

Flood. A temporary rise in the level of water in rivers, streams, watercourses, lakes, drainage systems, depressions, etc., which results in inundation of areas not ordinarily covered by water.

Floodplain. Land which has been or may be covered by water because of a storm event, including but not limited to the 100-year flood.

Flood Prone Lands. Lands which are subject to periodic inundation by water; the flood plain associated with the 100-year flood; those lands frequently subjected to inundation; and those lands identified on the 'Stormwater Advisory List' by the Stormwater Engineering Division due to frequent localized flooding problems.

Flood Protection Level of Service (FPLOS). A degree of stormwater facility or system function or ability to protect from flooding. Typical rating systems use a comparison Classification such as A, B, C, D, or F to describe the level of protection related to a specific storm event.

Flowpath. The direction or course which stormwater would move or flow due to natural or modified land surface elevations.

Grading. The action or process of changing the elevation contours of a specified site.

Grading Plan. A plan to accurately show the proposed change in elevations of a specific site.

Impervious Surface. Land surfaces which do not allow (or minimally allow) the penetration of water. It includes surfaces such as concrete, asphalt and most conventionally surfaced areas such as streets, roofs, sidewalks, parking lots, and other similar structures constructed of similar materials. In addition, a surface such as compacted clay or limerock could be considered impervious.

Inlet. A structure which allows stormwater to flow into a conveyance system.

Internally Drained. The surface water runoff from a parcel does not discharge into an off-site area.

Lot. A platted portion of land identified as a single unit in a subdivision and intended for lease, transfer of ownership, use or improvements, or a combination thereof. The term lot includes the terms "plot," "parcel," or "tract."

Manhole. A structure which allows access to a stormwater management facility but is not designed to allow the input of stormwater directly from the surface.

Master Basin Plan or Study. An in-depth investigation into the drainage needs of a particular drainage basin. Usually limited to large basins where the expected improvements will entail large expenditures and phasing.

Mine. A pit or excavation in the earth from which minerals or earthen products are taken for use elsewhere.

Models. Computer software assisted approximations of the hydraulics and hydrology of a drainage basin or basins based upon mathematical derivations of quantifiable relationships between various factors. These factors usually include, but are not limited to, area, slope, drainage system characteristics, rainfall, and land use.

New Development. The development of a parcel in pre-developed conditions i.e. in a previous condition or natural state.

Normally Supervised. Customarily watched over and controlled by a person designated by the permittee, who will be at the site during the times that children may be in the general area and can hear and observe all activity on the site.

Obstruction. Any dam, wall, wharf, embankment, levee, dike, pile, abutment, projection, excavation, channel rectification, bridge, conduit, culvert, building, wire, fence, rock, gravel, refuse, fill, structure, or matter in, along, across, or projecting into any channel, watercourse, flow path or flood plain area which may impede, retard, or change the direction of the flow of water, either by itself or by catching or collecting debris carried by such water, or that is placed where the flow might carry the same downstream to the damage of life or property.

Official. The Mayor of the City of Tampa or his or her designee.

Outfall. Location where stormwater flows out of a given system. The ultimate outfall of a system is usually a "receiving water."

Owner, Tenant, Occupant. Shall include the executors, administrators, successors, and assigns of the person referred to; and the covenants and agreements contained in any contract between the department and its consumers should be binding upon and inure to the benefit of the successors, heirs, executors, administrators, or assigns of the respective persons thereto.

Peak Flow Rate. The maximum flow rate occurring from a drainage area for a designated design storm event.

Percolation. The ability of water to pass through a porous medium, in most cases, the soil.

Permit. Regulatory document issued by the City which is needed before any development operations can be made (including clearing, grubbing, grading, filling, excavation, or any other construction operations).

Pervious. An area which is, under standard conditions, permeable to stormwater runoff and surface water.

Positive Outfall. A direct connection to the City stormwater system, a City street meeting the requirements of IV.C.6, or a receiving water.

Public Drainage System. Drainage systems located on or draining water from public rights-of-way or easements.

Pre-Developed Conditions. For new development, raw land in a previous condition or natural state before alteration (i.e., runoff coefficient approximately .20). For redevelopment projects "pre-developed conditions" include permanent impervious surfaces (not shell or clay) on the site.

Receiving Water. Any water bodies or watercourses into which surface waters ultimately flow either naturally, in man-made ditches, or in a closed conduit system. Specifically: The Hillsborough River, Old Tampa Bay; Hillsborough Bay; McKay Bay.

Redevelopment. The development of a parcel with existing improvements on the site. Existing improvements include those on the site on or before October 1, 1984.

Resiliency. The ability of an entity to quickly recover from stressors. In the context of this manual, it pertains to adaptive capacity for dealing with climate change and increased flood risks through various design policies and techniques.

Retention or To Retain. To store stormwater to prevent its discharge into receiving waters or to provide a storage facility for stormwater where no outfall is available.

Retention Basin. A stormwater facility which has no structural outfall and the discharge from which is limited to percolation, evaporation, and evapo-transpiration.

Right-of-Way. Land dedicated, deeded, used or to be used for a street, walkway, boulevard, drainage facility, access of ingress and egress, or other purpose by the public, certain designated individuals, or governing bodies.

Sediment. Fine particulate material, whether mineral or organic, that is in suspension or has settled in a water body or has been deposited by flowing water, wind, or other sources.

Semi-Impervious. Surfaces which partially restrict the penetration of water, such as porous concrete and asphalt pavements, gravel, lime rock, artificial turf pavers, and certain compacted soils.

Service Area. The corporate limits of the City of Tampa.

Sheet Flow – Shallow overland stormwater runoff flow that is not concentrated flow. Concentrated flows are flows such as gutter flow, swale flow, ditch flow and pipe flow.

Sinkhole. A depression in karst terrain caused by the collapse of the underlying rock and soil. May be dry or wet, depending on the elevation of the surrounding aquifer in relation to the bottom of the sink. A common feature of closed drainage basins.

Site. The property limits of a development or redevelopment. Included in the definition of a site are parking and other areas used by the site even if not contiguous.

Stockpile. The storage of soil or earthen products during construction activities or at a specific site in accordance with a site earthwork and drainage plan.

Stockpile, Temporary. The short-term storage of soil or earthen products during construction activities at a specific site in accordance with a site earthwork and drainage plan.

Stormwater. Flow of water which results from, and which occurs immediately after a rainfall event.

Stormwater Advisory List (SAL). Those properties which experience or may be reasonably expected to experience frequent localized flooding problems, or which may have other problems associated with stormwater management.

Stormwater Management System. See Drainage System.

Stormwater Retention/Detention Pond. Any excavation or contour of earth designated or intended for the retention or detention of stormwater or any natural contour, which retains or detains stormwater.

Stormwater Treatment Facility. A structural "Best Management Practice" (BMP) designed to reduce pollutant loading to a receiving water by either reducing the volume of flow; allowing the biological uptake of pollutants or by allowing pollutants to settle out of stormwater flow. Structural BMPs include, but are not limited to, detention basins, retention basins, open bottom inlets, undercut ditches, exfiltration trenches, and swales.

Street. Any access way such as a road, lane, highway, avenue, boulevard, parkway, viaduct, circle, court, terrace, place, or cul-de-sac and also includes all of the land lying between the right-of-way lines as delineated on a plat showing such streets, whether improved or in rights-of-way intended solely for limited utility purposes, such as for electric power lines, gas lines, telephone lines, water lines, drainage and sanitary sewers, and easements or rights-of-way of ingress or egress. The functional classification of streets such as arterial collector, etc., shall be per the Mobility Department - Transportation Division.

Subdivide. The division of lands into three (3) or more lots, blocks, tracts, or other portions, however designated, to provide for or necessarily require the establishment or extension of streets, alleys, or other rights-of-way.

Surcharge. Flow out of a stormwater facility at a point upstream from the outfall resulting from inflow into the system in excess of its designed capacity.

Sustainability: A holistic approach referring to the ability to maintain or support the function of ecological, social, and economic systems over time.

Swale. An open stormwater conveyance facility with side slopes equal to or shallower than three units horizontally to one unit vertically. (Generally, very shallow.)

SWFWMD. Southwest Florida Water Management District. One of five water management districts organized by the state to oversee the management of surface and subsurface water resources in the State of Florida. SWFWMD is the local district for the City of Tampa.

Time of Concentration. The time required for water to flow from the most distant point of a drainage basin to the measurement or collection point.

Volume Sensitive Basin. Volume sensitive areas have been identified on the Stormwater Advisory List (SAL). Volume sensitive criteria is necessary to protect those drainage basins which are internally drained (lacking a positive outfall to one of the four receiving waters) although those area may or may not have extensive system coverage. These can be fully or partially closed basins.

Watercourse. Any natural or artificial channel, ditch, canal, stream, river, creek, waterway, or wetland through which water flows in a definite direction, either continuously or intermittently, and which has a definite channel, bed, banks, or other discernible boundary.

Watershed. A drainage area or drainage basin contributing to the flow of water to a common point ultimately, in this area, a receiving water or sinkhole.

Wetland. Land that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

I.D. Outside Agency Review

Activities regulated by this manual may also be subject to other regulations and/or permit requirements from other agencies. An approved permit from the City does not constitute permission from any other agency to construct those improvements. Property owners are responsible for obtaining all appropriate approvals or permits prior to construction.

I.E. Review and Update

To keep the manual current, the City will review policies, procedures and criteria from time to time with revisions being produced as required.

I.F. Warning and Disclaimer of Liability

The degree of protection obtained by use of regulations presented in this manual is considered to provide a reasonable level of flood protection and is based on sound and accepted engineering practice. Flooding may occur or flood heights may be increased by man-made or natural causes. This manual does not imply or guarantee that areas or properties permitted will be free from flooding or flood damages. This manual shall not create liability on the part of the City of Tampa or any officer or employee thereof for any flood damages that result from reliance on this manual, or any administrative decision lawfully made thereunder.

I.G. Repeal of Conflicting Policy, Procedures, and Criteria

The policies, procedures, and criteria presented in this manual supersede all previously distributed material and constitute the most current stormwater regulatory standards available.

I.H. Violation and Enforcement

In any instance in which any land is, or is proposed to be, used in violation of this manual, the City Attorney may, in addition to other remedies provided by law, institute injunction, abatement or any appropriate action or actions to prevent, enjoin, or abate unlawful use. In addition, upon a finding that any provision of this manual or ordinances has been violated, all development and building permits issued to the violator will be suspended or held in abeyance until the violation has been corrected to the satisfaction of the Stormwater Engineering Division.

I.I. Effective Date

The manual shall be in full force and effect from and after its adoption by City Council. Updated editions of this manual as approved by the City shall supersede all previous editions.

I.J. Deviations from Standards

The standards in this manual were developed to protect the lives and property of the citizens of Tampa. Deviations from these standards may only be permitted if approved by the official or his designee in cases where such a deviation will not appreciably alter the project's impact on the basin.

I.K. Abandonment of Existing Stormwater Management Facilities

Existing stormwater management facilities cannot be abandoned or diminished in capacity without replacing the treatment and attenuation capacity onsite or at an approved alternate location.

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SECTION II - BASIS OF REVIEW

For purposes of this manual, projects will be subject to requirements and standards as follows:

II.A. Residential

1. One (1) Detached Single Family Dwelling - General Development Requirements only.
2. One Single Family with impervious surfaces (not including the water surface of pools) greater than 50% of entire site - General Development Requirements and Minimum Retention/Detention Standards.
3. One Duplex - General Development Requirements only.
4. More than One (1) Residential Dwelling or Duplex - General Development Requirements and Standard Commercial requirements.
5. Small Affordable Subdivisions (Less than 10 lots) - General Development Requirements and Small Subdivision Requirements (IV.B.3.)
6. Large Subdivisions (>10 lots) - Subject to the requirements of City of Tampa [Stormwater Division Standard Details](#)

II.B. Commercial Redevelopment Projects

1. Redevelopment Projects <3000 Square feet of New Construction - General Development Requirements only. No retention/detention requirements.
2. Redevelopment Projects >3000 Square Feet of New Construction - General Development Requirements and Standard Redevelopment Requirements.

II.C. New Commercial Development Projects

1. New Commercial Development <10,000 s.f. - General Development Requirements and Minimum Retention/Detention Requirements. No attenuation requirements.
2. New Commercial Development >10,000 s.f. - General Development Requirements and Standard Commercial Requirements.

II.D. Activities and Projects in City Easements and City Right-of-Way

All activities in a City easement or City right-of-way, whether as part of a private development project, or a public works, utilities or transportation project, shall fall under the minimum standards and guidelines outlined in this manual.

II.E. Exceptions/Exemptions

1. Projects in Basins with Adequate Stormwater Management Facilities - General Development Requirements only. No City stormwater retention/detention requirements.

2. Projects in Ybor City, Channel District, or Downtown CRA - General Development Requirements only. No City stormwater retention/detention requirements.
3. Developments with Outfalls Directly to Receiving Waters - General Development Requirements and Minimum Retention/Detention Standards. No City stormwater detention requirements.

SECTION III - GENERAL DEVELOPMENT REQUIREMENTS

All development or redevelopment projects are subject to the provisions of the requirements of this section, as applicable.

III.A. Documentation Requirements

The developer is required to provide sufficient documentation to the permitting department to ensure the standards of this manual are being met. Documentation requirements for projects may vary due to differences in their complexity, potential offsite impacts, and other factors.

III.B. Finished Floor Elevation Requirements

Finished floor elevations (living and non-living space) shall be a minimum of 6 inches above any recorded flood elevation.

All living space must be a minimum of 1.5 feet above the crown of the street adjacent to the respective property, with all other floor elevations being 1.0 foot above the crown. Waivers to these requirements may be granted when the condition and/or topography of the site is such that no practical purpose would be served by their enforcement.

A request for a waiver from these requirements may be submitted on appropriately executed forms. Waivers will be approved provided the authorized official agrees the risks are minimal with respect to the flooding potential of surrounding buildings and the land in question.

Exceptions to the formal waiver procedure may be granted if all of the following conditions are met:

1. The proposed project is an addition less than 500 square feet; and
2. The proposed slab is no lower than the existing floor; and
3. Conditions and/or topography of the site indicate the risk of flooding is minimal

III.C. Grading and Excavation Requirements

III.C.1. Grading

Chapter 21 of the City of Tampa Code stipulates an appropriate permit for any action which changes the existing and/or natural contours of a site.

Sites must be graded such that all stormwater runoff drains to the nearest public right-of-way or drainage facility without crossing or causing detrimental impact to adjacent property. Minor exceptions to this grading policy may be granted when the site topography is such that there is no practical way to divert all runoff to the street. However, portions which may be allowed to continue to drain according to natural patterns will be restricted to pervious areas left in a natural configuration and the runoff patterns are clearly indicated by pre-construction elevations. This exception is not applicable for side slopes of filled areas.

The proposed work must comply with the following requirements:

- a. Side Slope - Unless restrained by an approved retaining wall (Section III.O), terracing or other accepted stabilizing method, the maximum side slope for any fill shall be two (2) feet horizontal to one (1) foot vertical.
- b. Erosion Control - All sites must have an erosion control plan addressing waterborne erosion, windblown erosion, and sediment deposited by vehicles entering or leaving the site. The erosion control plan may consist of, but is not limited to, either a temporary system installed by the applicant or a twenty (20) foot wide buffer of undisturbed vegetation. In all instances, the plan must remain in effect until the site is permanently vegetated.

III.C.2. Excavation Requirements

Proposed excavation must comply with the following requirements. Standards for mines and borrow pits are located in IV.C.14.

- a. Setback - The minimum horizontal setback from any property line to the top of bank is four (4) feet. The minimum horizontal separation from any sidewalk, normal pedestrian area, slab or grade type patio, vehicle driving or parking area or leisure activity area to the top of bank for any excavation is four (4) feet unless separated from the excavation by a fence. Maximum slope within a setback area is one (1) foot vertical to six (6) feet horizontal.
- b. Depth - Depressions less than or equal to two (2) feet shall be considered a function of grading.
- c. Side Slope - Side slopes shall not promote erosion, shall be easily maintainable, and shall be appropriate for the soil conditions. The maximum allowable side slope for an excavation without a fence is two (2) feet horizontal to one (1) foot vertical. There is no maximum side slope for fenced excavations.
- d. Fencing - All proposed excavations greater than two (2) feet in depth with an overall side slope steeper than two (2) feet horizontal to one (1) foot vertical (2:1) shall be fenced, whether the excavation is ongoing or complete. The minimum fence height shall be forty-two (42) inches on normally supervised sites and shall be six (6) feet in all other instances. Vertical walls less than two (2.0') deep do not require fences.
- e. Maintenance - A written maintenance plan is required for all excavations, said plan providing for access to all areas within the excavation and providing for the maintenance thereof.
- f. Erosion Control and Stabilization - All sites must have an erosion control plan addressing waterborne erosion, windblown erosion, and sediment deposited by vehicles entering or leaving the site. The plan must remain in effect until the site is permanently vegetated.
- g. Erosion protection – Erosion protection shall continuously extend from two (2) feet beyond both the top of the bank and the toe of the bank for dry ponds. For wet ponds protection shall extend from two (2) feet beyond the top of the bank to two (2) feet below the design low water elevation.
- h. Solid sod – Solid sod is permissible on side slopes of two (2) feet horizontal to one (1) foot vertical (2:1) or less. On all other slopes, fabric, terracing, paving, retaining walls, or other approved durable protection systems must be utilized.

III.D. Development Within Flood Prone and Restricted Areas

III.D.1. Development on Stormwater Advisory List (SAL) Properties

The City of Tampa maintains a listing of [“Stormwater Advisory List \(SAL\) Properties”](#). This list is periodically updated and is available from the Stormwater Engineering Division. This property may be restricted because of the need to acquire an easement for an existing or proposed drainage facility, illegal fill, and/or any area subject to periodic flooding. In addition, lands subject to periodic flooding may be determined using Federal Flood Insurance Rate Maps (FIRM), USGS studies, City records, or other reliable sources. Special considerations may be imposed upon the planned development of this property during the permitting procedure.

To protect and advise the current and any future owners of the property, the City may require the owner to execute a Hold Harmless Agreement. This agreement will be required for properties red lined because of flooding potential. The Hold Harmless Agreement will be on a form prepared by City Staff and signed, notarized, and executed by the owner in accordance with established procedure, and recorded in the Public Records of Hillsborough County prior to the issuance of the Building Permit. Under a Hold Harmless Agreement, a development is not excluded from any City requirements normally imposed upon development. Applicability of using the Hold Harmless Agreement will be determined on a case-by-case basis.

III.D.2. Special Allowances for Designated Drainage Basins

Throughout the City of Tampa are drainage basins which are subject to special drainage requirements and allowances based on City Master Drainage Plans and improvement projects or special studies. Information as to whether a site is within such an area may be obtained from the Stormwater Engineering Division. If a site is within such an area, the City will issue any special drainage considerations upon request.

III.D.3. Development in Existing Low Lots

A request or an application for a building permit for construction in a lot which is lower than the street will require the following:

If the lot is lower than the street and receiving runoff from the road due to a low point in the road located along the front area of the lot in question, a building permit may be issued.

However, no fill will be permitted, except as follows: Within the foundation limits, sufficient fill may be allowed to raise the building floor elevation to meet the minimum floor elevation requirements. The yard will not be permitted fill except if a raised drain field is required by the Health Department or if there will be no adverse offsite impacts. In these cases, detailed evaluation of off-site impacts will be required. If the project proposes fill and has no positive discharge for drainage, equivalent storage will be required.

If the lot is lower than the street but located at the top of a hill or between two street intersections where the grade in the road continues (no low point between intersections exists), then the yard may be filled provided neighboring property will not be adversely affected.

III.D.4. Equivalent Storage Within Flood Prone Areas

The City of Tampa maintains records of some properties that have experienced severe stormwater flooding. The limits of the flooding are shown in the Tampa Flood Zone Building Map and/or the

City of Tampa Localized Flood Atlas. The storage capacity of the floodplain must be preserved, or the result will be to relocate the flooding problem and usually to make it more severe.

To ensure that any proposed development will not decrease the floodplain storage capacity, all development will be evaluated for compliance with the following:

- a. No earth fill may be placed within a flood hazard area unless an equal amount of flood storage volume is created by excavation below the base flood elevation and above the seasonal high groundwater table elevation.
- b. No portion of any structure which reduces the storage capacity of the flood hazard area may be constructed within the limits of the flood hazard area unless equal replacement storage volume is provided by acceptable engineering techniques.
- c. A flood hazard area is defined as an area that has experienced flooding in 1979 or later and is recorded in either the City of Tampa Localized Flood Atlas or the City Flood Zone Building Map.

III.E. Drainage Patterns not to be Changed to the Detriment of Neighboring Properties

Notwithstanding the issuance of a permit by the City and compliance with the requirements of Chapter 21, the act(s) of stockpiling material, grading, excavating, and other act(s) affecting drainage shall not change the surface drainage patterns to the detriment of neighboring properties or public rights-of-way.

By common law, an upstream property owner has an easement over lands of a lower owner for surface waters to flow or escape from his land by natural ways and routes. An upper property owner may not, without liability, change the point of discharge of surface waters, nor concentrate them in ditches, nor divert in one direction waters which would have escaped in another direction, nor discharge them at a higher velocity, nor add to their pollution and cause a downstream property adverse impact. Likewise, the lower owner may not, without liability, obstruct natural flow of surface waters onto his land, either by excluding it or causing backwater on his neighbor. In disputes between private property owners, it is the right of the injured private party to seek an injunction because of a private nuisance created when the drainage was altered.

III.F. Erosion and Sedimentation Control

Proposed temporary and permanent erosion and sediment control plans shall be submitted with each application for a development permit. These plans shall specify in detail the erosion and sedimentation control measures to be used during all phases of clearing, grading, filling, construction, and permanent development, and accurately describe their proposed operation. In addition, these plans shall be in accordance with the latest applicable specifications and recommendations.

No clearing, grading, excavating, filling, or other disturbing of the natural terrain will be permitted until approved City erosion and sediment control measures have been installed, except those operations needed to implement these measures. All erosion and sediment control measures shall be continuously maintained during the construction phase of the development.

These erosion and sediment control measures shall apply to all features of the construction site, including street and utility installations as well as to the protection of individual lots.

III.G. Functional Stormwater System During Construction

During all phases of construction, all stormwater entering, leaving, or flowing through construction sites shall be controlled in a manner consistent with the approved stormwater plan and shall not adversely affect the drainage of the adjacent properties.

III.H. Certificate of Occupancy

Except as may be established by alternative City policy or procedure, no certificate of occupancy (C.O.) shall be issued unless and until all site work indicated on the approved plan, along with appropriate auxiliary requirements has been completed and satisfactorily verified. These items may include but are not limited to; engineer of record certification, certified record drawings of completed construction, properly permitted, and inspected work within public rights-of-way or easement, delivery of easements and/or other agreements. Phased development must have the improvements complete for the phase of the development for which certificates are being sought.

III.I. Permits for Work in Public Right-of-way

Any work within existing or proposed public rights-of-way or easements will require a right-of-way permit. Some examples of drainage improvements that would require a permit are:

1. Connection of a private stormwater system to the City's storm sewer or ditch system both within and without an easement or right-of-way.
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.

Work within City easements or right-of-way must be performed to meet the minimum standards and guidelines given in Section IV.D of this manual.

III.J. Review of Off-site Improvements Associated with Commercial Development

In the event that drainage improvements are necessary in the Public Right-of-Way and are to be constructed by private development concerns, notification must be provided to the City.

All public improvements shall require conformance to design standards for public improvements which are described in Section IV.D of this manual.

Four sets of plans should be submitted to the City per III.J and include the following:

1. Plan and profile of the existing and proposed storm sewers or ditch (including affected drainage structure sizes - such as manholes, inlets, etc.) showing all existing utilities at scale of: H 1" = 20'; V 1" = 2'. Alternative scales may be accepted but must be approved by the Stormwater Engineering Division, prior to submittal.
2. Letters of "No Conflict" for all utilities.
3. Construction notes for restoring right-of-way (shoulder, sidewalk, pavement, etc.) after the hook-up.
4. Erosion Control Plan
5. For further criteria to be used for improvements in the public rights-of-way, refer to the [Stormwater Division Standard Details](#).
6. Upon completion of work, one set of reproducible and one set of blueprints of the "As-Built" plans or record drawings, signed and sealed by a Professional Engineer licensed in the State of Florida, shall be submitted to the Stormwater Engineering Division.

NOTE: All stormwater work in City easements or right-of-way shall be inspected by the City.

III.K. Protection of City Stormwater Management Systems

III.K.1. Structures in Drainage Easements

No permanent structures such as concrete foundations, pools, walls, or buildings may be constructed in any City drainage easement or right-of-way.

III.K.2. 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 or other public system, the City 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 City Guidelines for easement requirements are found in Section III.N.

III.K.3. Retaining/Decorative Walls and Structures on Ditch Banks

Retaining or decorative walls, fences, or any other structure to be built along any City ditch shall be constructed a minimum of four (4) feet from the ditch top of bank.

III.L. Discharge to Sinkholes

No new discharges will be permitted into active sinkholes without water quality treatment and approval from the appropriate regulatory agencies.

III.M. Maintenance of Private Drainage Facilities

Any portion of a drainage system, including on-site and off-site facilities, that is constructed for development will be continuously maintained by the owner(s) or an entity identified by the

developer such as a homeowner's association unless it is officially accepted by the City for maintenance.

In addition, where vegetation, debris or sediment has accumulated in such a manner as to interfere with the free flow of water or adequate functioning of drainage facilities, the City shall require the owner of such properties to clear and remove the debris or obstruction to permit the drainage system to function as permitted. Enforcement shall be as in City Code Chapters 1 and 21.

After notice and reasonably diligent efforts to have the owner of the property remove the debris or obstruction, City forces may be authorized to enter upon such drainage ways and clear or remove the debris or obstructions. The cost thereof shall be charged to the owner of the property where the debris and/or obstruction was generated.

III.N. Easement Requirements

Easements may be required over private property to ensure continued City access to public stormwater management systems. The minimum acceptable width for a public drainage easement is fifteen (15) feet.

1. For pipe or box systems the minimum easement width may be calculated as follows: Easement Width = (2 X Trench Depth) + Width of structure
2. For Ditch Systems Smaller than 15' Wide (Access to one bank only): Easement Width = 4 X Ditch Depth + Bottom Width + 20'
3. For Ditch Systems Greater than 15' Wide (Access to both banks): Easement Width = 4 X Ditch Depth + Bottom Width + 40'

All calculated widths should be rounded to the next highest five (5) foot increment.

III.O. Retaining Wall Construction

For Commercial Development, any retaining wall adjacent to private property and/or public rights-of-way shall be constructed of a permanent material; specifically, either a cast-in-place concrete wall or a reinforced masonry block wall. The wall plans shall be designed, signed and sealed by an engineer and shall be comprised of a footing, reinforcement, concrete, grout, etc. as required.

For Residential Development, any retaining wall adjacent to private property and/or public rights-of-way which is taller or deeper than three (3) feet shall be constructed of a permanent material as above. Low retaining walls (3 feet and under) may be constructed of pressure treated wood. All wood members/posts must be set to a minimum depth into the ground equal to the height of the wall. Wooden retaining walls must adhere to [City of Tampa Standards](#).

For All Development, retaining walls not adjacent to rights-of-way or other private property may be built of pressure treated wood, concrete, or masonry. In addition, terracing may be allowed if properly designed and constructed.

In areas where there is a suspected high-water table, soil information will need to be provided. An adequate drainage system of rock and perforated drainpipe will be necessary to allow for the

drainage of any water in the soil. Any soil drainage must be channeled to an approved drainage system and not to neighboring property.

All lumber utilized shall be pressure treated with CCA (chromated copper arsenate) wood preservative chemicals. A certification of treatment from the mill shall be necessary prior to construction approval. The minimum retention of treatment for use in direct contact with the ground is 0.40 pound per cubic foot. The minimum retention for lumber used when it will be exposed to periodic wetting of fresh water is 0.60 pound per cubic foot and 2.50 pounds per cubic foot for salt water.

SECTION IV - DESIGN STANDARDS

This section defines the technical requirements for specific classes of development within the City of Tampa. **Figure 1 Stormwater Ponds Attenuation Criteria** and **Figure 2 Stormwater Retention/Detention Standards** are provided for additional clarification of City Standards.

IV.A. Exemptions / Exceptions

The following projects are exempt from City Stormwater attenuation and treatment requirements. All projects must still comply with pertinent Southwest Florida Water Management District (SWFWMD) stormwater rules. All other City stormwater criteria such as erosion and sedimentation controls, provisions for flow through water, control of discharge from roof downspouts, offsite drainage, etc. shall apply.

IV.A.1. Single Family Residential and Single Duplex Exemption (IV.B.1 below)

IV.A.2. Waiver of On-Site Drainage Requirements for Ybor City and Central Business District Community Redevelopment Areas.

New Development and redevelopment projects within the Ybor City and Central Business District Community Redevelopment Areas, except Harbour Island, as defined by Chapter 163, Part III Florida Statutes, as amended, are exempt from City stormwater quantity and quality requirements.

IV.A.3. Discharges to Basins with Adequate Stormwater Management Facilities

Projects which discharge to stormwater management systems constructed to accommodate the proposed project's intensity of development and 5-year discharge and which have water quality treatment for same are exempt from City retention/detention requirements. For information on this exemption contact the Stormwater Engineering Division.

IV.A.4. Minimum Retention / Detention Requirement Projects

The following projects are allowed a deviation from the standards located in IV.C. In lieu of the standard requirements the following will be applied:

The minimum retention/detention requirement is the retention of a volume equal to one-half inch (½") over the entire site. Those projects eligible for the minimum requirements are:

a. Small Commercial Projects:

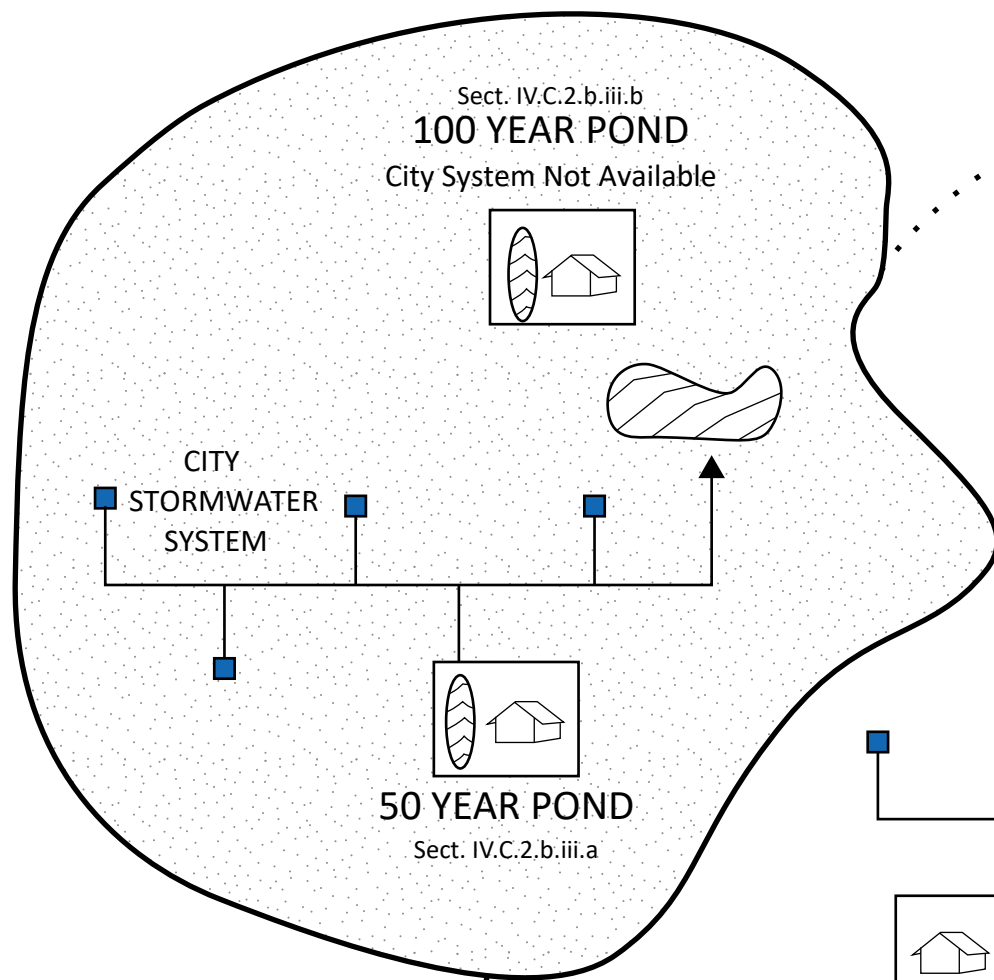
New development of a parcel less than or equal to 10,000 s.f. which is not part of any larger development or redevelopment. Subsequent additions to the site will not be approved unless the entire site is brought into compliance with current standards found in IV.C.

b. New Developments with Outfalls Directly to Receiving Waters.

Attenuation is not required for projects which have their own outfalls to the Hillsborough River, McKay, Hillsborough, or Old Tampa Bays. Projects with discharges in close proximity to a City outfall may qualify for the Capacity Adjustment.

VOLUME SENSITIVE BASIN

DRAINS INTERNALLY



RECEIVING WATERS BASIN

DRAINS TO RECEIVING WATERS

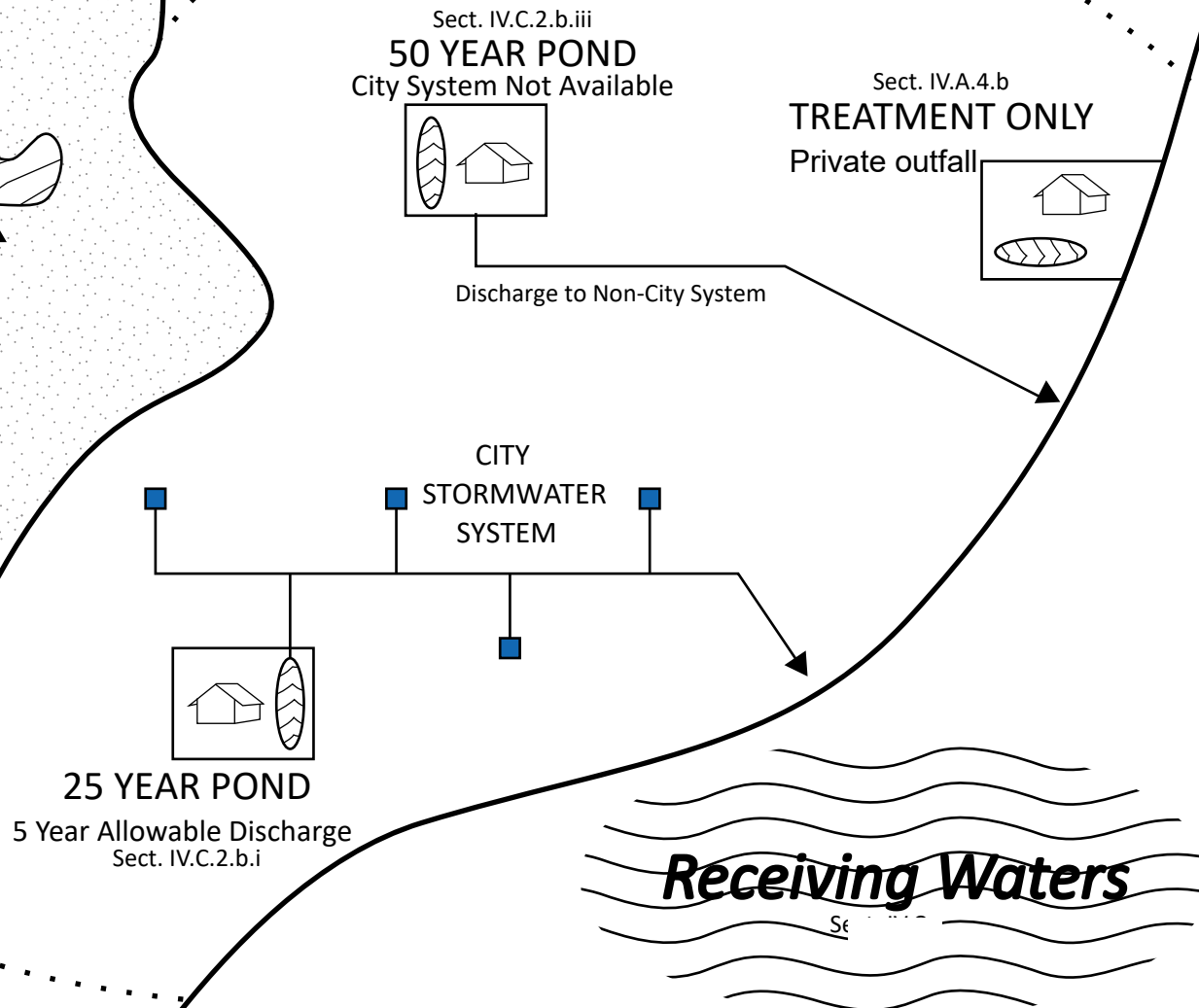
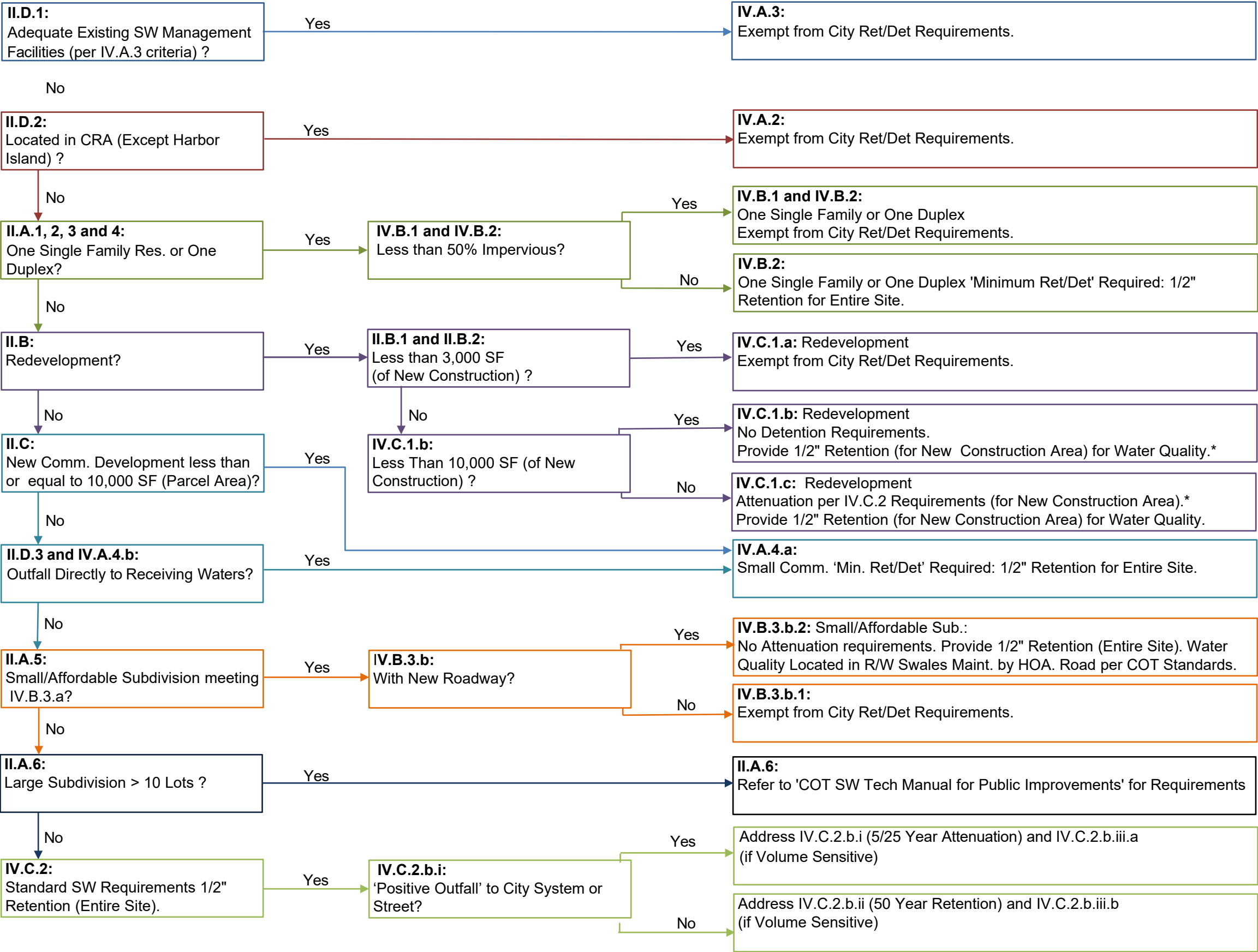


Figure 1 Stormwater Ponds Attenuation Criteria

Figure 2

City of Tampa Stormwater Retention/Detention Standards

General Development (Sect. III)
and Design Standards (Sect. IV.3
through Sect. IV.14)
requirements apply in addition to
any requirements listed here.



Foot Notes

* With Credit for Existing Impervious
(IV.C.1 'Notes')

IV.A.5. Capacity Adjustment

Stormwater attenuation and discharge rates may be adjusted based on a drainage capacity analysis performed by a licensed engineer. At the request of the project engineer, capacity analysis of the specific drainage systems will be reviewed by the City. Such analysis will conform to standard engineering practice and must prove the proposed discharge will have no negative offsite impacts to the receiving system.

IV.B. RESIDENTIAL STANDARDS**IV.B.1. Single Family Residential and Single Duplex Exemption**

The construction of, or additions to, one detached single-family residence or duplex is exempt from City stormwater treatment and attenuation requirements except as stipulated in IV.B.2.

IV.B.2. Residential Projects Exceeding 50% Impervious

Residential projects with impervious areas (not including the water surface of pools) greater than 50% of the total site exceed the design capacity of the City stormwater management system. To reduce this excess flow, the project must retain the first 1/2" of rainfall onsite. Subsequent additions to a site will not be approved unless the site is brought into compliance with this standard.

IV.B.3. Small Subdivision Standards

Subdivisions (greater than or equal to 10 lots) are subject to the Commercial Standards found in Section IV.C. and Section V of this manual. Exceptions for the attenuation requirements may be made for small residential subdivisions which have been certified by the City for affordable housing. Small affordable subdivisions may also be exempted from having a stormwater retention/detention facility located within a common area and establishing a Homeowners Association.

a. Definition of Applicable Developments:

1. Subdivision certified by the City of Tampa as an Affordable Housing Project and so noted on the final plat and,
2. Subdivision must be comprised of less than 10 detached single-family platted lots and,
3. Subdivision is not:
 - a. Located in a Stormwater Engineering Division 'Stormwater Advisory List (SAL)' area or,
 - b. Located in a volume sensitive basin or Flood Hazard Area or,
 - c. Contributory to an identified flooding problem.

b. Requirements:

1. For subdivisions located on an existing paved roadway - no stormwater attenuation or retention requirements.
2. If subdivision includes new roadway:

- a. Water quality treatment for entire subdivision.
- b. Roadway to meet all City standards and be dedicated to the City.
- c. Water quality treatment to be provided in swales in the right-of-way - City will assume responsibility for hydraulic maintenance, normal maintenance (mowing, trash removal etc.) will be responsibility of individual homeowners.

IV.C. COMMERCIAL STANDARDS

IV.C.1. Drainage Review for Redevelopment

Redevelopment projects are required to limit the impact of the area of new construction that exceeds the existing impervious surfaces of a site. Specific requirements are:

If Area of New Construction is:

a. Less than or Equal to 3000 Square Feet

Project is exempt from City stormwater retention and detention requirements.

b. Greater than 3000 Square Feet but Less Than or Equal to 10,000 Square Feet

Project has no detention requirements. Must retain 1/2" of rainfall for the area of new construction to satisfy water quality requirements.

c. Greater than 10,000 Square Feet

Project must retain 1/2" of rainfall and provide detention per Section IV.C.2. for the area of new construction only.

NOTE:

Credit is granted for existing impervious surfaces as follows:

1. Water Quality Calculations - Credit for areas of like or less intense use than proposed.
2. Detention -Credit for all existing permanent impervious surfaces.
3. Treatment and attenuation areas need not be the actual area of new construction. Areas of equivalent size and use intensity on the site may be substituted.

IV.C.2. Discharge / Detention/Retention / Water Quality Requirements

a. Discharge Requirements - Allowable Discharge

The maximum allowable discharge into a City system utilized in the design of private systems to serve new developments and redevelopments shall be limited to the peak discharge based on the 5-year FDOT Zone VI storm and the predeveloped condition. The time of concentration shall be determined utilizing the FDOT velocity of runoff chart or other methods approved by the Stormwater Engineering Division.

b. On-Site Detention/Retention Requirements

On-site attenuation will be required for those project sites which exceed 10,000 square feet in area. Design criteria to be adhered to is outlined below for several City system outfall scenarios. Please

note the Stormwater Engineering Division may impose restrictive requirements based on the best available drainage studies and data.

i. Drainage Systems Designed with a Positive Outfall

If adequate drainage facilities are available to allow for the design of a detention system with a positive outfall into the City drainage system or gutter flow, the following criteria apply. A positive outfall is described as a direct pipe connection to the City stormwater system or direct discharge to a City street which meets the requirements of IV.C.6.

- a. Detention requirements shall be based on the difference between the allowable and the calculated post-development peak discharge rate.
- b. Allowable peak discharge rate is based on a 5-year DOT Zone VI storm and pre-developed conditions.
- c. Post-development peak discharge rate is calculated for a 25-year, 24-hour, Zone VI storm and proposed impervious conditions.
- d. If the appropriate data is supplied, percolation can be used to decrease the detention requirements.
- e. The stored water shall be drawn down by a system within a 72-hour period.
- f. Volumes for water quality requirements shall be retained below the 5-year discharge weir. Water quality volumes to be set by the SWFWMD and IV.C.2.c.

ii. Drainage Systems Designed Without a Positive Outfall

If adequate drainage facilities are not available, a retention system must be designed to provide for the storage of the stormwater runoff volume. The following criteria applies:

- a. Retention systems shall be sized to store the difference in runoff (volume) generated from the post- versus the pre-developed condition based on a 50-year, 24-hour, Zone VI storm.
- b. After the above volume has been retained, discharge will be allowed at no greater than the pre-developed 5-year rate for the remainder of the 50-year storm.
- c. A design percolation rate, as determined in accordance with the Percolation and Soils Investigation Criteria Section IV.C.11, shall be used to draw down the stored water within a 72-hour period.

iii. Drainage Systems Designed in Volume Sensitive Basins

Known volume sensitive areas in the City have been identified on the [Stormwater Advisory List](#) (SAL). Volume sensitive criteria is necessary to protect those drainage basins which are internally drained (lacking a positive outfall to one of the four receiving waters) although those areas may or may not have extensive system coverage.

a) Drainage System Designed with a Positive Outfall in a Volume Sensitive Area

- i. Detention requirements shall be based on the difference between the pre-development allowable discharge and the calculated post-development runoff.
- ii. Retention of the difference in volume between the pre-developed 50-year, 24-hour runoff and the post-developed 50-year, 24-hour runoff will be required prior to an allowable discharge from the site.
- iii. After the above volume has been retained, discharge will be allowed at no greater than the pre-developed 5-year rate for the remainder of the 50-year storm.
- iv. If appropriate data is supplied, percolation can be used to decrease retention/detention requirements.
- v. The stored water shall be drawn down within a 72-hour period.

b) Drainage Systems Designed Without a Positive Outfall in a Volume Sensitive Area

- i. Retention of the post-development runoff (volume) of a 100-year, 24-hour, Zone VI storm will be required.
- ii. A design percolation rate, determined in accordance with the Percolation and Soils Investigation Criteria Section, shall be used to draw down the stored water within a 72-hour period.

c. Water Quality Requirements

Private development will provide treatment in accordance with the SWFWMD regulations; however, a minimum water quality treatment will be required by the City of Tampa per the guidelines below.

1. New Development - Retention of 1/2 inch of runoff from the entire site. As an option, the permittee may provide retention of the runoff from the first 1" inch of rainfall.
2. Redevelopment - Retention of 1/2 inch of runoff from the area of new construction with credit for existing impervious areas based on like or less intense use.

Baffles or other appropriate devices for control of floating material must be provided.

IV.C.3. Culverts

a. Minimum Pipe Size

The minimum size of pipes to be used for culvert installations within the public right-of-way shall be 15" circular or 12" x 18" oval or elliptical.

b. Lengths of Structures

The minimum length of culverts without an appropriate vehicular barrier shall be the proposed width of driveway plus eight (8) feet for safety shoulder (four feet each side) The maximum slope within the shoulder area is six (6) feet horizontal to one (1) foot vertical. The maximum length of culverts without access shall be as follows:

15" - 36" pipe	350 feet
42" and larger and all box culverts	500 feet

Inlets will be required as necessary to allow inflow into the system. For subdivisions, inlet spacing will be designed per [Stormwater Division Standard Details](#). Street encroachment in excess of those standards in IV.C.6 will not be permitted.

c. Design Tailwater

All culvert installations will take into consideration the tailwater of the receiving facility or body of water or outfall. For discharge into retention/detention ponds with known discharge curves and submerged outfalls, the HGL may begin at the one half ($\frac{1}{2}$) the difference in elevation between the normal water level and design high water. For ponds designed for treatment only the tailwater shall be the weir crest elevation plus the flow depth at peak flow.

d. End Treatment

Headwalls or mitered end sections 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 permissible 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.

e. Acceptable Materials

Reinforced concrete pipes and precast or poured in place concrete boxes constructed in accordance with the specifications of the FDOT are allowable as culvert materials in the City of Tampa.

Double wall, smooth invert, plastic pipe suitable for H20 and E80 loading will also be accepted for residential culverts and may be considered for areas of non-vehicular traffic. Aluminum pipes may be used if the following requirements are met:

A culvert larger than forty-eight (48) inches is required.

1. The culvert is located outside the pavement and appropriate shoulder width.
2. The City has no immediate plans (within 5 years) to close the ditch.
3. Pipe shall have smooth or paved inverts.

All culverts, regardless of material, must be installed in strict accordance with the manufacturer's recommendations.

IV.C.4. Stormwater System Criteria and Design

a. Flow Generation

The Stormwater Engineering Division requires the Rational Method to be used for all sites less than ten (10) acres in size. For sites larger than ten acres, other methods may be used with prior approval of the Stormwater Engineering Division.

b. Rainfall Curves

Design storms are to be obtained from the Florida Department of Transportation Zone VI Rainfall Intensity Curves.

c. Runoff Coefficients

Concrete Paved Areas	1.00
Water Areas at Design High Water	1.00
Roof Areas	0.95
Asphalt Paved Areas	0.95
Turf-Block Areas	0.70
Grassed and Landscaped Areas	0.20

IV.C.5. Outfall Pipes

Outfall pipes are to be no smaller than necessary to flow the allowable capacity at the Design High Water (DHW) level.

The maximum velocity of discharge into the City system for any outfall (including roof drains) is eight (8) feet per second.

Roof drains from buildings greater than ten (10) stories must be vented to avoid introducing pressurized air into the City system.

All utilities in the right-of-way which may potentially conflict with the outfall pipe shall be shown with the elevations. A right-of-way permit will not be required before building or site permit approval, but any apparent conflicts must be resolved, and a Right-of-Way permit obtained prior to work performed in the right-of-way.

IV.C.6. Discharge to Public Streets

A positive outfall can be claimed if gutter flow does not intrude onto other private property or encroach into the areas listed below:

The minimum street width to be unobstructed by stormwater shall be as follows:

<u>Street Classification</u>	<u>Minimum Width in Either Direction</u>
Arterial or Collector	10 feet in the outside lane
Local (All RS, RM, and RO zoning)	Half of the 6.5 feet design vehicle width
Local (All other zoning)	Half of the 8.5 feet design vehicle width

Should the developer desire to discharge into the street, his engineer must:

- a. Provide a survey profile of the path of the gutter flow in 50-foot increments and provide cross sections at every change in the typical section and every 50 feet to the point of inlet into the City system.
- b. Provide calculations (suggest a modified storm sewer tabulation form) to document the quantity of stormwater runoff entering the road from the last point of inlet to the system (or the basin boundary.) The quantities will be calculated at the time of concentration corresponding to the maximum rate of discharge from the proposed project reaching that specific point.

- c. For each location identified above provide a stormwater spread calculation using the latest [Florida Department of Transportation's \(FDOT's\) latest Stormwater Manual, Drainage Design Guide or other FDOT Guidance](#).
- d. Verify that the street width less the width of stormwater spread calculated is greater than or equal to the "minimum width to be unobstructed by stormwater" as stated earlier.

Freeboard, percolation, and all other applicable design criteria and code requirements will also be required.

IV.C.7. Retention / Detention Basin Standards

a. Design High Water of Basin

Design high water elevation (DHW) shall be established in consideration of adjacent properties and facilities, but normally one foot below the ground surface adjacent to the facility. If necessary, a minimum of one-half foot at the basin may be combined with the remaining half-foot elsewhere on the property for sites with positive outfalls.

b. Storage Volume

The net storage volume required will be in addition to the storage volume developed for satisfaction of water quality criteria less that part which is dewatered during the first 36 hours for wet ponds and 72 hours for dry ponds. Use of a detention/retention basin or drain field shall require that an inflow/outflow curve be submitted together with the drainage calculations. The elevation of the pond volume in relation to the wet season (Aug.-Sept.) high groundwater table (Seasonal High Water-SHW) at the exit point from the pond shall be shown. All storage shall be above this groundwater level or, if a new SHW is to be established, above the new SHW as accepted by the SWFWMD. For dry ponds, the minimum difference between the SHW and the pond bottom is one (1) foot.

c. Drainage Systems for Water Quality Treatment

1. Volumes for water quality requirements shall be retained below the 5-year discharge weir for systems designed with a positive outfall.
2. Storage volumes shall be drawn down within a 72-hour period by natural percolation through the soil. The distance between the pond bottom and the seasonal high groundwater table shall be at least 1 foot.
3. Detention facilities whose water quality storage volumes cannot be drawn down within a 72-hour period due to an insufficient percolation rate and/or a highwater table will be required to stack the required attenuation volume over the water quality volume.
4. Underdrains are not normally approved due to system clogging and failure. However, underdrain systems designed for continued functionality and ease of maintenance will be considered in cases where percolation is limited.

IV.C.8. Maintenance and Screening for Retention/Detention Ponds, Vaults, and Drain Fields Maintenance

The maintenance of any privately owned drainage system included as part of development shall be the responsibility of the owner. This includes, but is not limited to, any scarifying or sediment

removal in percolation ponds which is necessary to continue the specified infiltration rates and storage volume. Every project must provide a plan which shall include:

- a. A program for proper maintenance of the bottom and sides of the retention basin to preclude silting up of the basin which would reduce its capacity or reduce the rate of percolation, and to prevent the basin from becoming a nuisance. Ponds with vegetation plans must have a maintenance element to those plans.
- b. A program for proper maintenance of the interior of the vault or drain field to preclude reducing its capacity or the rate of percolation, and to prevent the facility from becoming a nuisance.
- c. A statement designating the entity which will be responsible for the operation and maintenance of the stormwater management system. Attached to the statement should be a defined maintenance program to ensure said system will function for the purpose for which it was intended. If the entity responsible for the operation and maintenance is not the entity for whom the engineering plans, specifications, and design analysis were submitted, then a letter should also be attached stating who the entity will be and its agreement to conform to the defined maintenance program.

Screening of Normally Wet Ponds

- d. When a normally wet pond abuts a residentially zoned district, the method of shielding shall consist of solid masonry walls at least 6 feet in height along the boundary of the normally wet pond and the entire residential district.
- e. Exemption from these criteria may be granted if the pond is established as an amenity to the development as indicated by a separate landscape plan to include:
 - i. Siting the pond near the interior of the development and/or;
 - ii. Features a minimum 15-foot maintenance berm; and
 - iii. Side slopes have a maximum steepness of 4:1 from the maintenance berm to the toe of the bank or a point six (6) feet below the normal water level; and
 - iv. Feature littoral zone plantings.

IV.C.9. Vault Access

For maintenance of covered vaults to be realistic, a minimum vertical clearance of 4.0 feet at all points inside the vault must be provided. At least one access point shall be required for the first 250 square feet in the area; additional access points shall be provided for each additional 1000 square feet, or part thereof. Spacing locations should be designed for effective cleaning, ventilation, maintenance, and inspection. All access points shall be adequate for adult ingress and egress.

IV.C.10. Trench Drain Standards

Underground trench drains employing filter gravel or rock bed and perforated pipe shall be designed according to the following general design criteria:

- a. Thirty percent (30%) of the rock bed measured from the bottom of the rock to the design high water (DHW) elevation may be used for storage.
- b. Forty percent (40%) of an expanded shale rock bed may be used for storage as above provided appropriate test documentation is provided by a reputable test lab.

- c. The entire inside pipe area shall be allowed for storage if the crown is below the DHW.
- d. The top and side surfaces of the rock bed shall be covered with a suitable membrane filter material in order to prevent silting of the voids in the rock bed.
- e. The discharge of the required volume by percolation through the trench drains or other means shall be completed in a maximum of 72 hours after the end of the storm event.
- f. Design high water elevation shall be established in consideration of adjacent properties and facilities, but normally one foot below the ground surface adjacent to the facility. If necessary, a minimum of one-half foot at the basin may be combined with the remaining half-foot elsewhere on the property for sites with positive outfalls.
- g. Inlets shall be a sumped open bottom design to trap sediment before it can enter the trench drain.
- h. The distance between the trench bottom and the seasonal high groundwater table shall be at least 1 foot.
- i. Aggregate for exfiltration trench shall comply with current FDOT Standard Specifications for Road and Bridge Construction for coarse aggregate size number 5 (1 to 1/2"), except that no limestone, dolomites, or sandstones shall be used.

IV.C.11. Percolation and Soils Investigations

- a. Results of all percolation and soils investigations shall be certified by a Florida Licensed Professional Engineer.
- b. Sufficient test borings shall be made by a certified testing firm to a minimum depth of ten (10) feet below the bottom elevation of the basin or bottom of drain field in order to determine the groundwater table and soil classifications.
- c. Percolation rates at the bottom elevation of the basin or bottom of a drain field shall be determined based on a Double-Ring Infiltrometer test (DRI), per current ASTM Designation D3385, or other engineered test procedure approved by the Stormwater Engineering Division. Percolation tests shall not be made in filled ground unless the soil has been thoroughly and mechanically compacted or allowed to settle for a period of six months or more.
- d. For the DRI test, the adjusted field rate may be used on the bottom of the pond or drain field and 50% on the horizontal component of the sides up to the design high water.
- e. The percolation rate in either case shall be reduced by ten percent (10%) for each foot the water table rises above the elevation ten feet below the bottom of the basin or bottom of drain field. The maximum allowable percolation rate after adjustment for water table elevation is 1.5 feet/hour.
- f. 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 locations. If multiple ponds are used, one soil boring and infiltration test will be required per pond regardless of the size. In addition, multiple borings, or tests immediately adjacent to each other will not be accepted.

- g. Where percolation from a pond bottom is to be considered, the final six (6) inches of grading shall not be completed until the development has been constructed. This procedure shall be included in the drainage plan.

IV.C.12. Erosion and Sedimentation Control Plans

The submitted plans shall contain a systematic and comprehensive erosion and sedimentation control plan for both the construction phase and the completed project. The erosion and sedimentation plan shall consist of, but not be limited to:

- a. Internal grading to route all stormwater runoff through the designed drainage system.
- b. Temporary (hay bales, sedimentation fences, silt screens, etc.) controls shall be placed along the perimeter of the property to filter the flow of runoff.
- c. The final grading of any retention or detention basin shall not be completed until the development has been completed.
- d. Provisions at the construction site to minimize the tracking of soil, mud, concrete, etc., onto the public streets shall be provided.

IV.C.13. Stockpiles

Permanent stockpiles are considered earthwork and outside storage and must be permitted. All stockpiles of earth, soil, or other earth products, whether temporary or permanent, shall comply with the following requirements:

- a. Setback - No stockpile shall be placed within four (4) feet of an adjacent property line unless written authority is granted by the affected adjacent property owner, or the stockpile is contained with an approved concrete or masonry wall.
- b. Erosion Control - All sites shall have an erosion control plan in effect until such time as the stockpile is removed and the site is permanently vegetated. The erosion control devices may be an approved temporary system installed by the applicant or a twenty (20) foot wide buffer of undisturbed vegetation.

IV.C.14. Excavation of Mines and Borrow Pits

A permit must be obtained prior to the excavation of any mine or borrow pit. In addition to the articles in III.C, the following criteria will apply:

- a. A detailed development plan including scheduling, length of activity, reconstruction, and reclamation plans must be submitted with the application.
- b. Reclamation plans will include littoral zones and aquatic plantings to establish a viable lake-based ecosystem. Side slopes will be consistent with long term stability.
- c. Bond(s) or other surety must be posted to assure completion of the development plan. Bond amounts will be based on 125% of the City's and engineer's estimates (including contingency amounts) of the cost of the development plan.

- d. Impacts of the development on the adjacent transportation network must be recognized and accommodated. Permission from the City Stormwater Engineering Division must be obtained.
- e. Dewatering activities may be considered the same as site drainage and both will be regulated based on outfall conditions. Site plans must show pump locations, attenuation facilities, environmental protection facilities, and flow routes.
- f. The reviewer may impose additional requirements as may be deemed necessary to ensure compliance with III.C. These requirements may include reports and/or studies and on-site inspection and control by specialized consultants during the permitted activities.
- g. The permit will be valid for six (6) months.

IV.D. CITY EASEMENTS AND RIGHT-OF-WAY STANDARDS

IV.D.1. General

The purpose of this section is to provide design standard guidance related to work in the City's public owned easements and right-of-way performed as part of a private development project, or as a public works, utilities, or transportation project. Adhering to these requirements does not relieve the permittee of the requirements of other departments or agencies. It is the responsibility of the applicant to verify the most current and applicable requirements and procedures as necessary for specific projects.

IV.D.2. 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 City 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 City. Guidelines for easement requirements are found in Section III.N.

IV.D.3. Use of Grate Inlets

As standard operational policy, the City 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 Stormwater Engineering Division.

IV.D.4. Acceptance of Storm Sewer Systems for Future Maintenance

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 meet the public right-of-way standards in this document. 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.

IV.D.5. Acceptable Materials

Only reinforced concrete pipes are acceptable for use as storm sewers within City 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 City and must be wrapped with white indicator tape for marking.

IV.D.6. 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 Mobility Department, Florida Department of Transportation (FDOT), the Florida Department of Environmental Protection (FDEP) and any other environmental agencies which may have jurisdiction on the improvements.

IV.D.7. 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 City Stormwater Engineering Division.

IV.D.8. 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 because 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 City requirements will be enforced:

All items will be the responsibility of the respective utility or their assigns, including any costs incurred because 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 Engineering Division, Mobility Department 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 of construction must (unless specific written instructions from the Stormwater Engineering Division 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 Engineering Division. In addition, all construction shall be inspected and accepted by the Stormwater Engineering 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.

a. Conflicts

Any utility, or their assigns, desiring to construct facilities in conflict with existing drainage facilities should immediately notify the Stormwater Engineering Division of such intent. It shall be the respective utilities' responsibility to obtain approval from the Stormwater Engineering Division of the design of the conflict structures and to certify all conflict structures on construction is completed.

b. Relocations

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

IV.D.9. Public Drainage Facility Information

Drainage structures within City easements and rights-of-way may have "as-built" or "record" drawings on file at the Stormwater Engineering Division. Such as-built information, and other recorded information is available to the public.

IV.D.10. Design Criteria and Engineering Guidelines for Work in Public Easements and Right-of-Way

The following section outlines the general criteria governing the design of all public storm sewer systems constructed within the City of Tampa. These criteria are 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 City must be received prior to plan submission.

a. Flow Generation and Hydraulic Design

i. 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.

ii. 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 Stormwater Engineering Division. Where a proposed drainage system discharges into a stream or ditch the flow conditions of this stream or ditch shall be investigated by the Engineer of Record. 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 City should be estimated by the consultant for review and approval by the City.

At tidal outfalls a mean high tide of 2.0 feet above MSL should be used as the beginning HGL elevation. The City reserves the right to make revisions to these tidal tailwater elevation requirements as updated data becomes available from regional and national sources.

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 City.

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](#).

iii. Storm Sewer Tabulations

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

iv. 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.

v. Minimum Sizes

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

vi. 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 City, 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 the City Utilities Department and the Mobility Department.

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 Natural Resources Division.

vii. Minimum Material Standards

Reinforced Concrete Pipe shall be used for concrete culvert, storm drains and stormwater structures.

b. 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.

i. 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 Driveways-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 "saddle" 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 from the City.

ii. Minimum Pipe Clearances

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, the use of a conflict manhole must be approved by the Stormwater Engineering Division.

c. Inlets.

i. Locations and Spacing

Inlets shall be 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 the point 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 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 percent 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 in 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 stormwaters shall be removed prior to pedestrian crossing or bicycle facilities. Inlets shall be placed at all points where the cross slope on a roadway reverse 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.

ii. 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:

- a. Type-1
- b. Type-2
- c. Type-3
- d. B-r-1
- e. B-R-2

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

- a. Type-5
- b. Type-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.

iii. Inlet 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 City Approval Only*

d. Manholes

i. Locations 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. All manholes shall be FDOT traffic bearing manholes.

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 or Box	500 Feet

ii. Standards

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

e. Culverts

i. Minimum Pipe Size

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

ii. Length of Structures

The minimum length of culvert shall be 24'. The maximum length of culverts without access shall be as allowed in Section IV.D.10.a.ii.

iii. 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 IV.D.10.b.

iv. End Treatment

Headwalls shall be provided at all inlet or outlet pipes. The headwalls shall be bagged sand cement, riprap, 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 permissible 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.

v. Allowable Materials

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

f. Ditches**i. 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.

ii. Side Slope

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 horizontals to 1 vertical (4:1) shall be utilized. All open channels should have a minimum bottom width two (2) feet wider than the culvert or storm system for which it serves as an outfall.

iii. Channel Curvature

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

iv. 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 line, whichever is lower.

v. .Maximum Allowable Velocities for Unlined Open Channels

<u>Soil Type</u>	<u>Allowable Velocity (f.p.s.)</u>
Silt or Fine Sand	1.50
Sandy Loam	1.75
Silt Loam	2.00
Finn Loam	2.50
Hardpans	6.00

Maximum Allowable Velocities for Lined Open Channels

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

vi. Ditch Erosion Protection

Ditches shall be provided with permanent erosion protection. Such protection may be sod, sand/cement, rip-rap or ap- proved 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 stormwater 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 City.

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

vii. Utility Crossing

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

a) 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.

b) 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 City.

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

g. Detention / Retention Facilities

i. 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.

ii. 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. 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 and for a rainfall of 24 hours duration.

iii. Basin Analysis

Basin Analysis 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 City for review and approval.

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

iv. 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.

v. 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 groundwater 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.

vi. 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.

Percolation - Percolation rates must be submitted by a qualified Geotechnical Engineer. For retention facilities dependent entirely on percolation of volume recovery, the minimum depth to the seasonal high groundwater shall be two feet.

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.

The use of other manmade filtration systems.

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

vii. 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 groundwater 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 aesthetic 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.

viii. 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.

ix. 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 ensure stabilization.

x. Off-Site Overland Flow

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

xi. 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. The water level control structure shall not be a pipe riser and shall not be adjustable unless previously reviewed and approved by the City. The water level control structure shall be an end wall 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 end wall or ditch bottom inlet will not enable the basin to function as shown on the Basin Analysis. In the event an end wall or ditch bottom inlet will not enable the basin to function as shown on the Basin Analysis, the water level control structure shall be a weir or other method approved by the City.

In the event the water level control structure is an end wall, the design low water elevation of the detention basin shall be the end wall 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.

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.

xii. Underdrains/Exfiltration Systems

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

a) Piping

Pipes shall be of sufficient size to effectively transmit the design flow. Pipes may be corrugated aluminum, polyvinyl chloride (PVC), corrugated polyethylene or other material approved by the City. All underdrains 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.

b) Aggregate 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 Specification](#) for coarse aggregate size number 4, except that no limestone, dolomites or sandstones shall be used.

c) Aggregate for Underdrain Systems

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

d) 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 City. 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.

e) Application of Exfiltration Systems

The clearance between the exfiltration trench bottom and the seasonal high groundwater shall be at least 1 foot unless specifically approved by the City. 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.

f) 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. Lime rock will not be accepted as exfiltration aggregate.

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 trenches 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:

- i. 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.
- ii. Where two or more laterals or lines of drainpipe are required, a distribution box shall be provided between the inlet and drain field.
- iii. Boxes shall be of reinforced concrete, of adequate structural strength and of sufficient size to accommodate the required number of drainpipe and provide for proper maintenance.
- iv. Each drain field line shall connect individually to box.
- v. Invert to box shall be at least one inch above invert of outlets and invert of outlets level.
- vi. In lieu of required distribution box, a header pipe may be used when approved by the Stormwater Engineering Division and installed with sufficient cleanouts to allow proper maintenance.

g) Percolation and Soils Investigations

Results of all percolation and soils investigations shall be certified by a Florida Licensed 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 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. A Florida Licensed Engineer shall estimate 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 period 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 drain field 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 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.

h. Erosion and Sediment Control**i. General**

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 City 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 DOT Standard Specifications for Road and Bridge Construction and Road Design Standards relative to construction sequences, limitations of exposed erodible 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 interim measures to preclude off-site flooding, erosion, sedimentation or pollution to receiving waters or on abutting properties during the construction periods. The City may waive the requirement 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 Stormwater Engineering Division 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, erodible 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 assure such incremental

plans are compatible with proper stormwater management until the entire project is completed.

ii. 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 City. 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 control 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 City 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:

- i. Diversion berms and interceptor
- ii. Ditches Temporary seeding and mulching.
- iii. Sediment barriers-straw bales, gravel, weirs, etc.
- iv. Sediment basin (3 acre or greater development).
- v. Sodding
- vi. 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:

iii. 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.

iv. 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.

v. 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.

vi. 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.

vii. 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.

viii. 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.

ix. Temporary Re-grassing

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.

x. 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.

xi. Permanent Erosion Control

The erosion control facilities of the project should be designed to minimize the impact on off-site facilities. All storm- water 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.

xii. 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 400-600 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.

xiii. 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.

xiv. 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.

xv. Strip Sodding

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

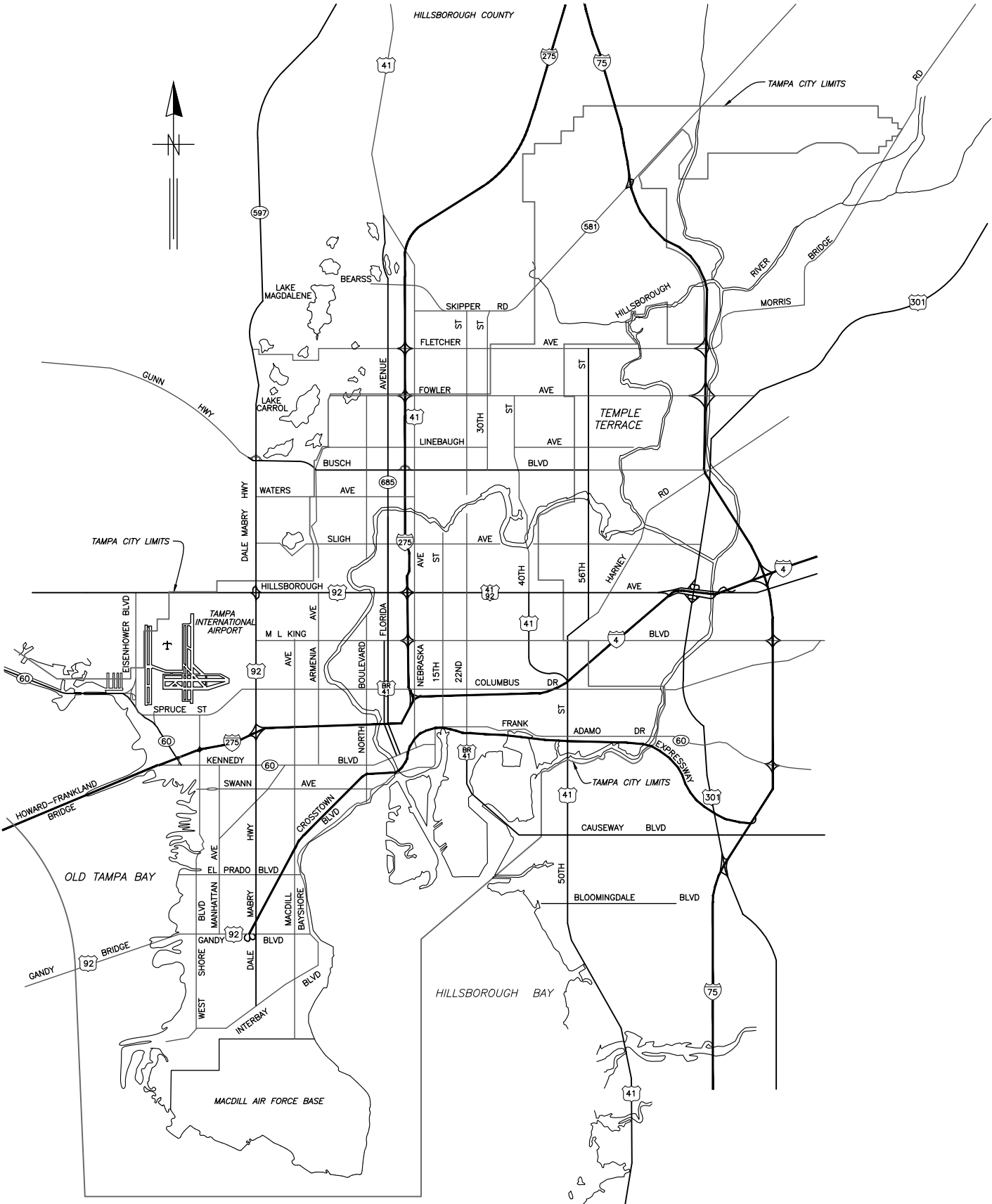
xvi. Re-grassing

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 regressed.

CITY of TAMPA



STORMWATER DIVISION
STANDARD DETAILS



REVISIONS			REVISIONS			DES: STORM DRN: STORM CKD: DATE:	CITY of TAMPA Mobility Department Stormwater Engineering Division	COVER SHEET	SHEET 1 OF 40
No.	DATE		No.	DATE					
3			6						
2			5						
1			4						

STORMWATER DEPARTMENT
ETAILS GENERAL NOTES

SW

ANHOLES, INLETS, OUTFALL STRUCTURES AND OTHERS)
PACTED #57 AGGREGATE FOUNDATION, WRAPPED COMPLETELY
OT STANDARD SPECIFICATIONS 441-2.3

PTICAL AND BOX CULVERTS) SHALL BE WRAPPED COMPLETELY
OT STANDARD SPECIFICATIONS 441-2.3. FABRIC SHALL
PIPE SECTION (JOINT) AND SHALL OVERLAP A MINIMUM OF
ABRIC SHALL BE HELD IN PLACE WITH RUST-PROOF METAL

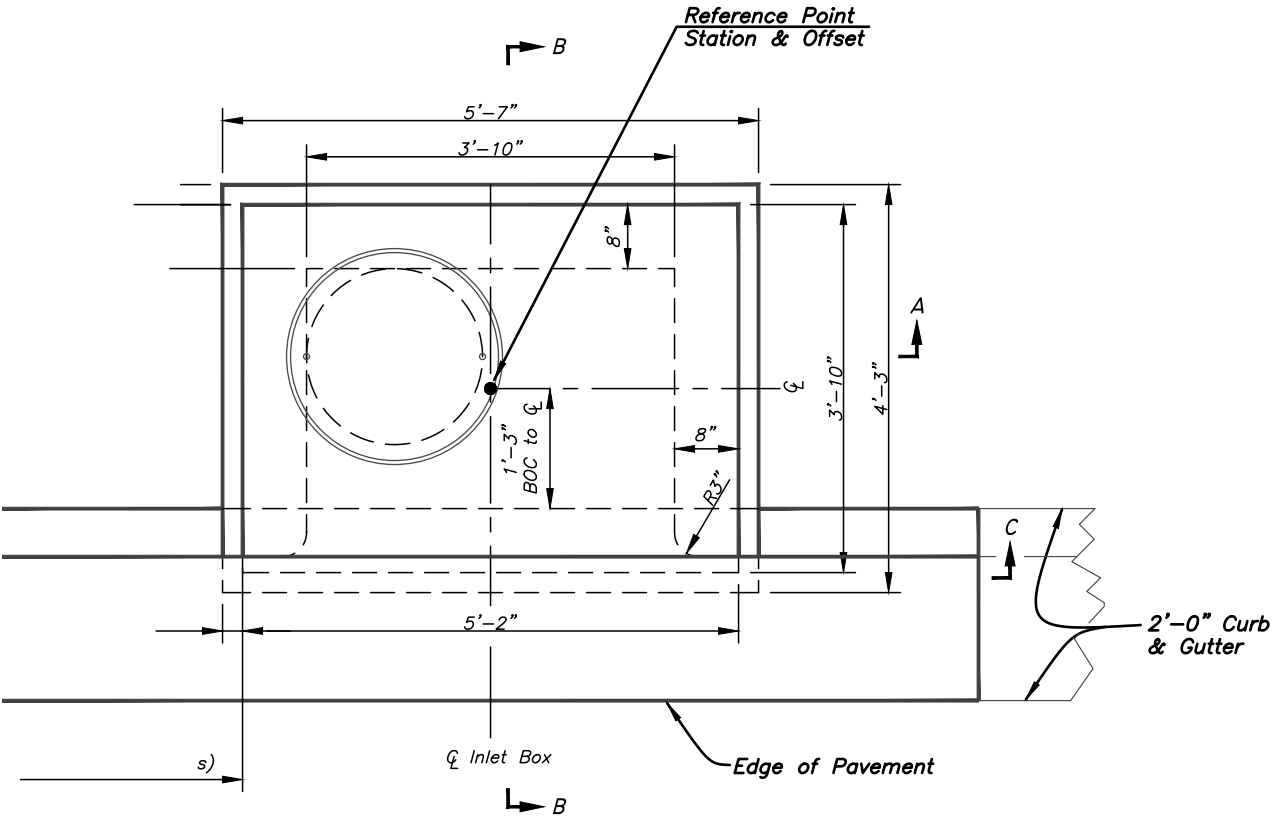
LL BE CONSISTENT WITH FDOT INDEX 200 AND AS APPROVED

INDEX

Sheet No.	Description
1	Cover
2	Index & General Notes
3 – 4	Type 1 Inlet
5 – 7	Type 2 Inlet
8 – 10	Type 3 Inlet
11	Type 1 Inlet Modified
12 – 13	Type BS-1 Curb Inlet
14 – 15	Type BV-1 Curb Inlet
16 – 19	Type BR-1 Curb Inlet
20 – 23	Type BR-2 Curb Inlet
24-25	Grate Inlet Details
26-27	Manhole & INLET Covers
28	Guidelines For Conflict Manholes
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30	Temproary Force Main & Pumping Standards
31	Pipe Bedding Details
32	Payment limits & Jacked Crossing Details
33-35	Miscellaneous Details
36-40	Residential Driveway Details

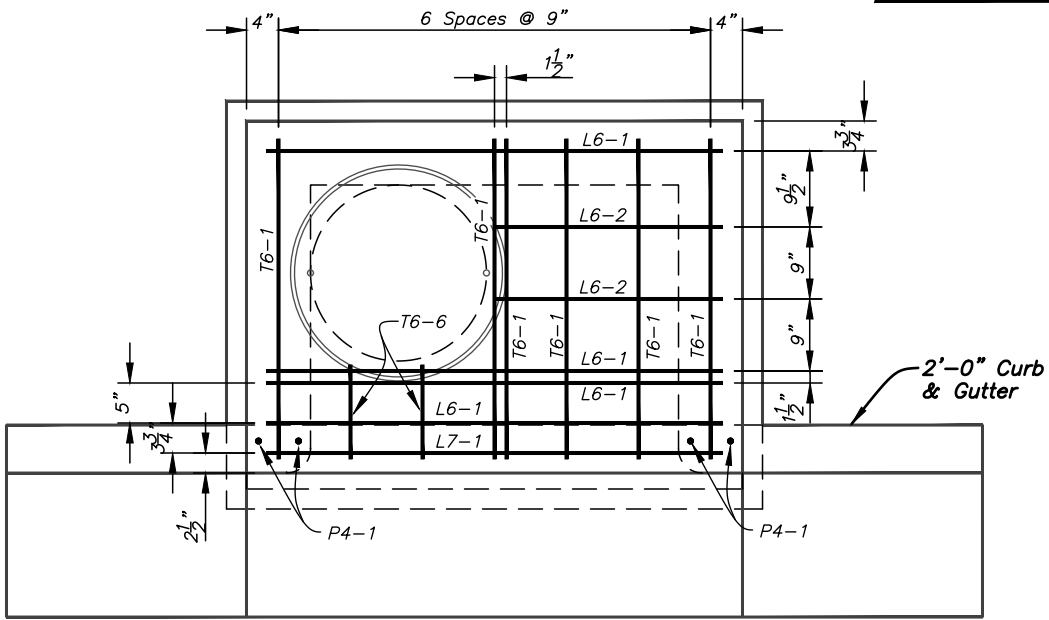
D DETAILS	
r)	USF 1190 (85 lb.)
g)	USF 1190
)	USF Type -0 (160 lb.)
Ring)	USF 575
Ring)	USF 1175
	USF 6289
s	USF 6286
s	USF 6288
	USF 7100
bove or equal.	
City Of Tampa ROW or easements shall <u>not</u> include	
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include the text "Stormwater" as shown in the	

SW

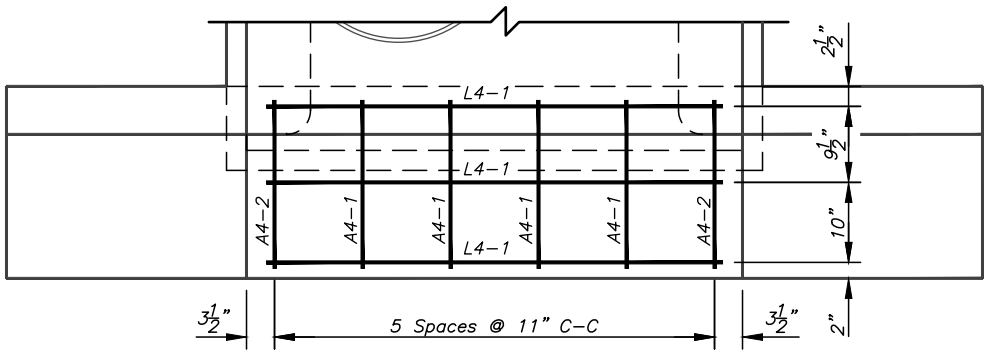


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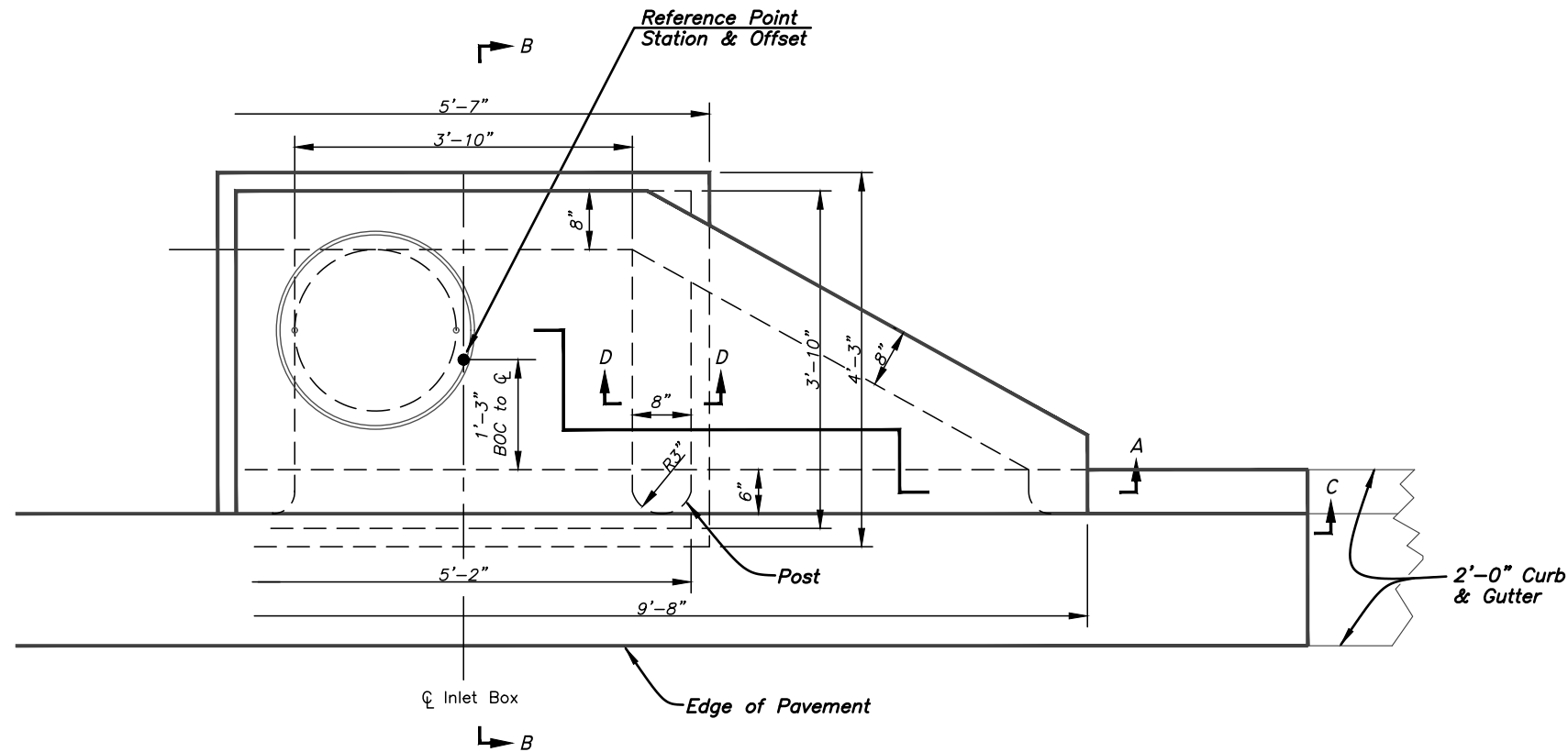
SCHEDULE OF REINFORCING STEEL B-RS (FOR INLET TOP -ND -PRON ONLY)					
M-RK	SIZE	COUNT	LENGTH	WT E-CH	TOT-L WT
T6-1	No 6	6	3' 5"	5.132	30.794
T6-6	No 6	2	1' 1"	1.627	3.253
L4-1	No 4	3	4' 11"	3.285	9.854
L6-1	No 6	4	4' 11"	7.385	29.541
L6-2	No 6	2	2' 5 1/2"	3.692	7.384
L7-1	No 7	1	4' 11"	10.050	10.050
-4-1	No 4	4	1' 9"	1.169	4.676
-4-2	No 4	2	2' 9 1/4"	1.851	3.702
P4-1	No 4	4	1' 1 1/2"	0.752	3.006
TOT-L WEIGHT IN POUNDS					102.261



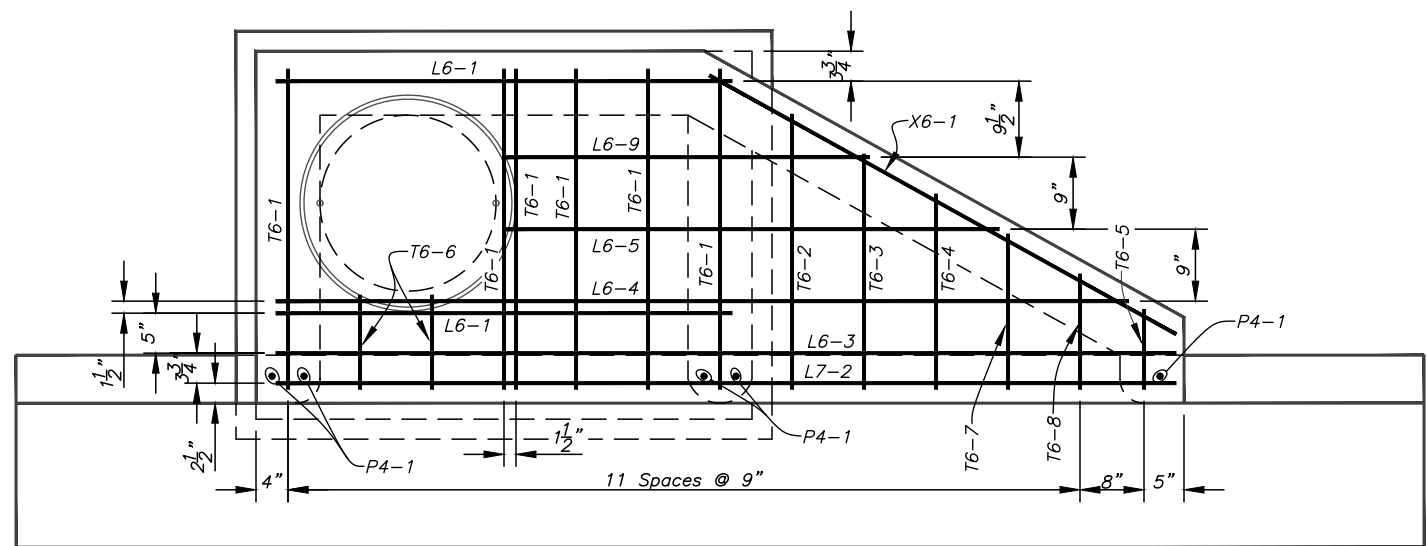
PLAN - TOP SLAB REINFORCEMENT
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PLAN - APRON REINFORCEMENT
Scale: 1/2" = 1'-0"

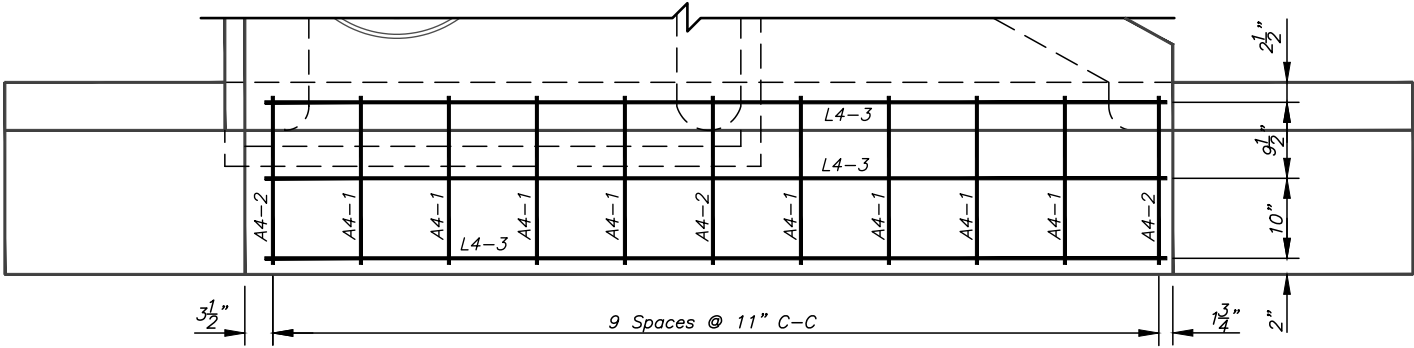


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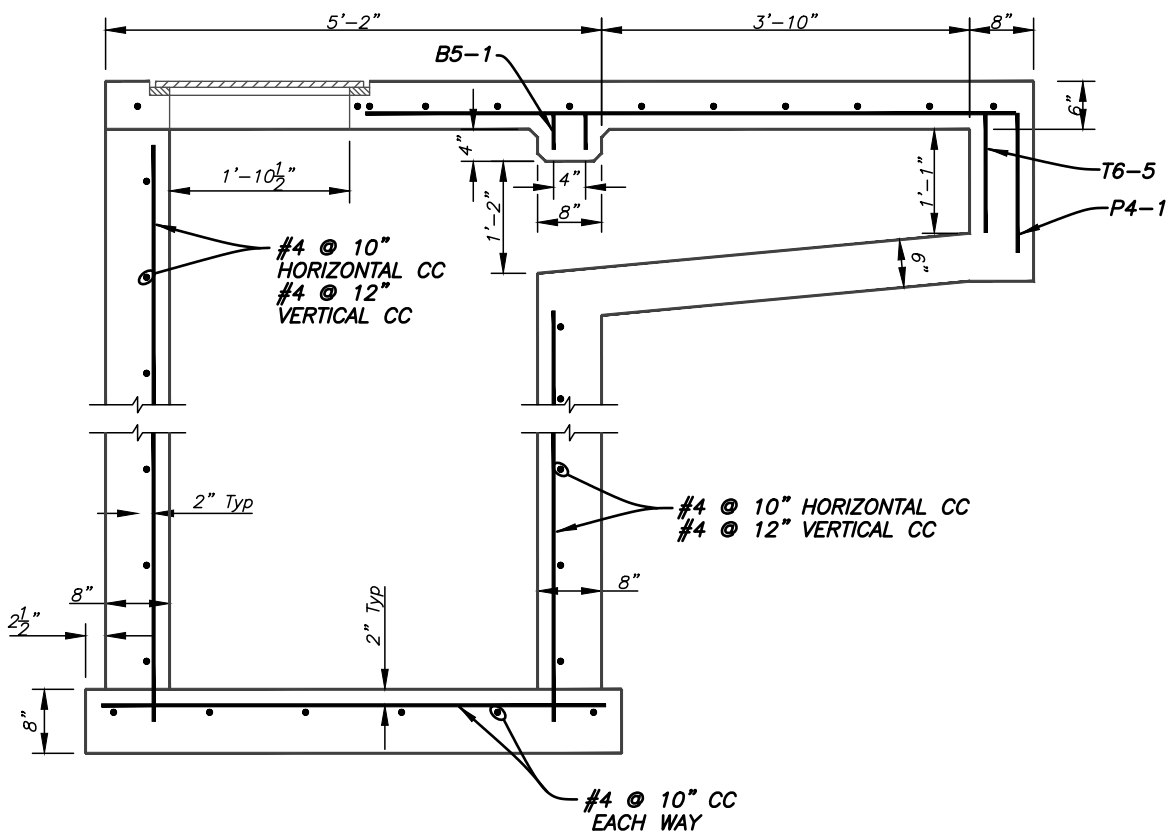


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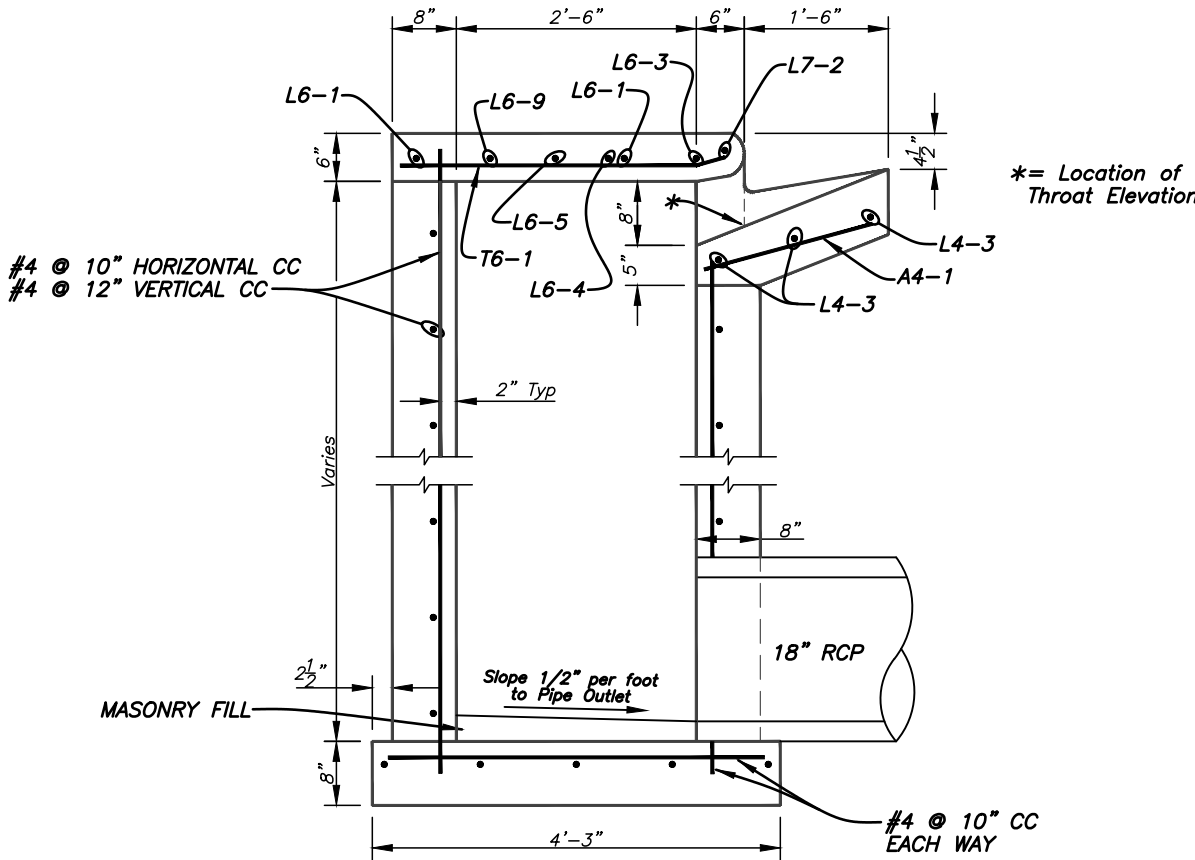
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	6						
	5						
	4						



PLAN - APRON REINFORCEMENT
Scale: 1/2" = 1'-0"



SECTION A-A
Scale: 1/2" = 1'-0"



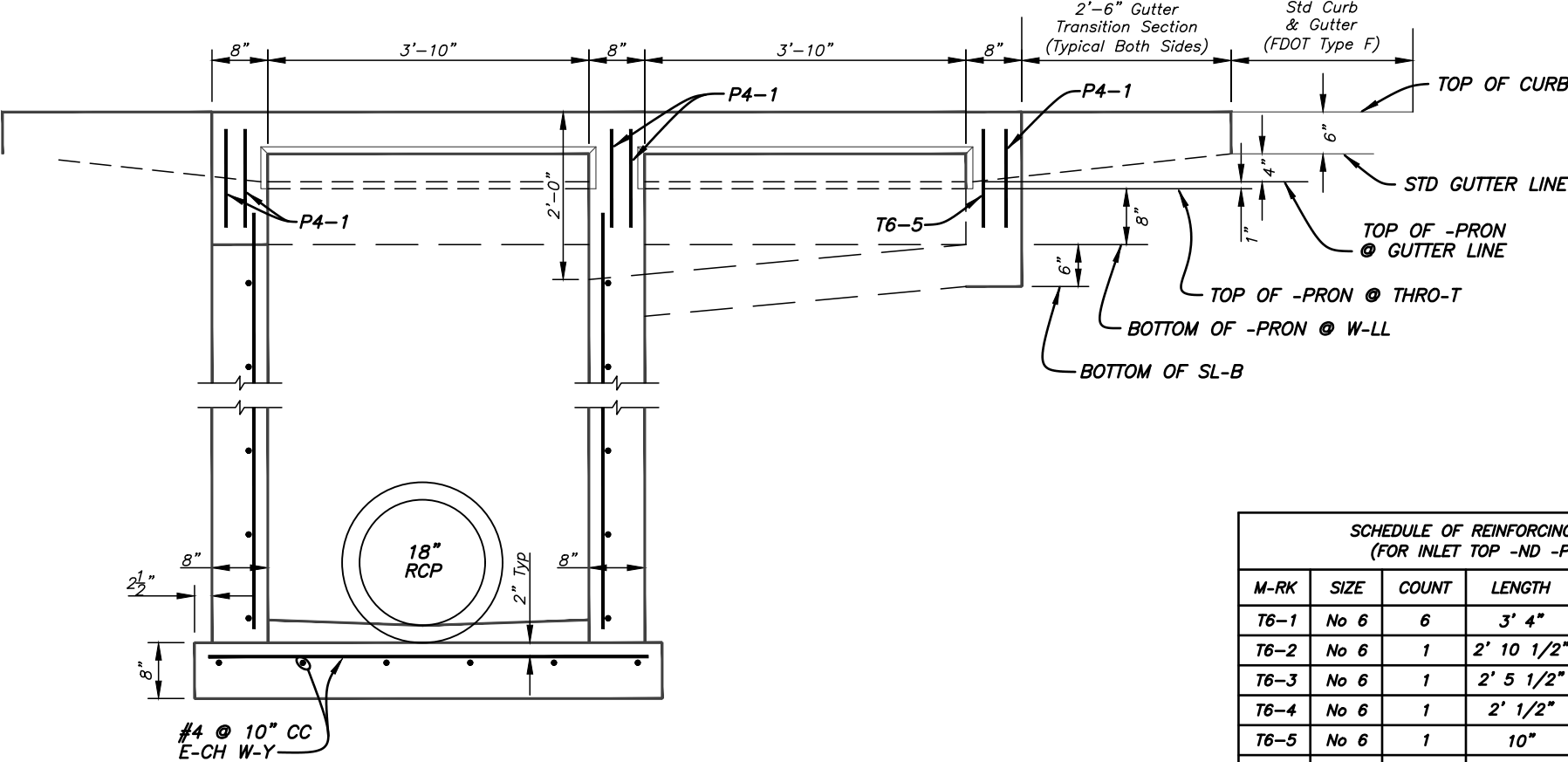
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2			5		
1			4		

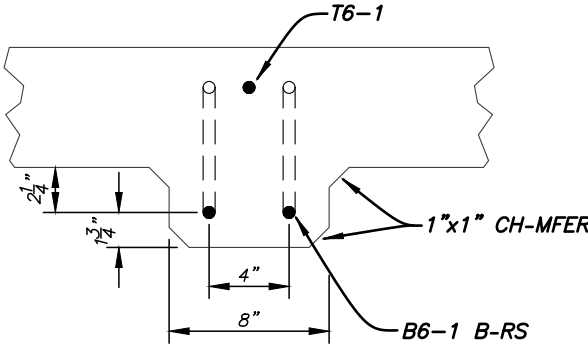
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DRN: STORM
CKD:
DATE: 7/03

CITY of TAMPA
Mobility Department
Stormwater Engineering Division

STANDARD INLET DETAILS
TYPE 2 INLET

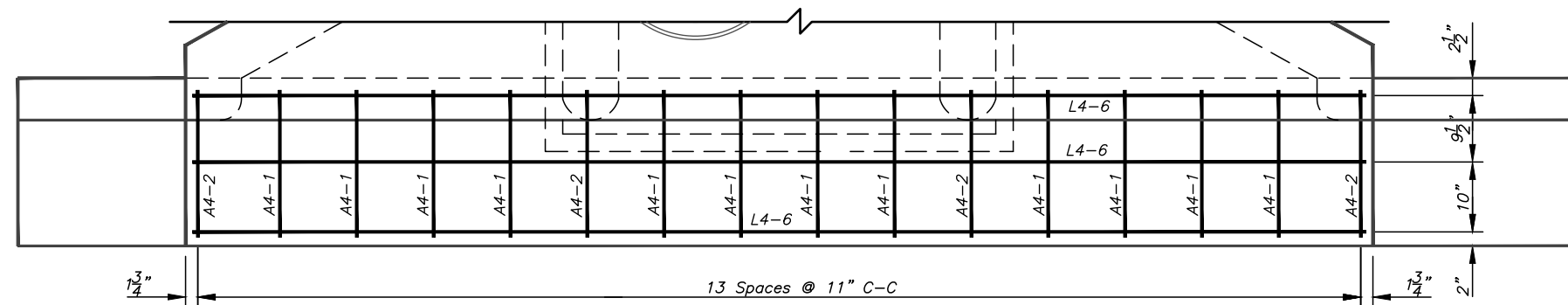


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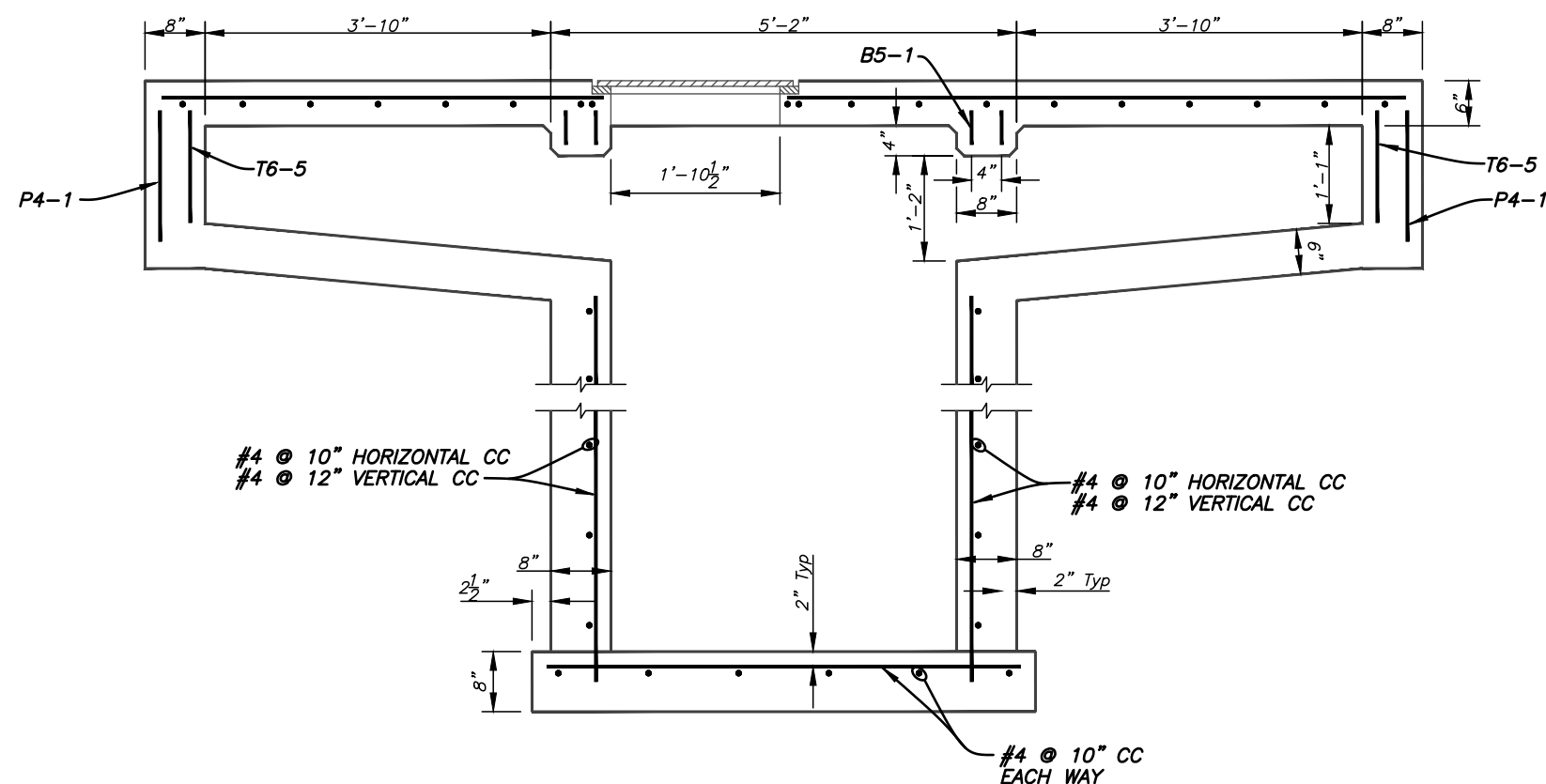
SECTION D-D
Not To Scale

SCHEDULE OF REINFORCING STEEL B-RS (FOR INLET TOP -ND -PRON ONLY)					
M-RK	SIZE	COUNT	LENGTH	WT E-CH	TOT-L WT
T6-1	No 6	6	3' 4"	5.007	30.040
T6-2	No 6	1	2' 10 1/2"	4.318	4.318
T6-3	No 6	1	2' 5 1/2"	3.692	3.692
T6-4	No 6	1	2' 1/2"	3.067	3.067
T6-5	No 6	1	10"	1.252	1.252
T6-6	No 6	2	1' 1"	1.627	3.254
T6-7	No 6	1	1' 7 1/2"	2.441	2.441
T6-8	No 6	1	1' 2 1/2"	1.815	1.815
L6-1	No 6	2	4' 9"	7.135	14.269
L6-3	No 6	1	9' 4"	14.019	14.019
L6-4	No 6	1	8' 10 1/2"	13.330	13.330
L6-5	No 6	1	5' 1 3/4"	7.729	7.729
L6-9	No 6	1	3' 9 3/4"	5.726	5.726
L7-2	No 7	1	9' 4"	19.077	19.077
L4-3	No 4	3	9' 4"	6.235	18.704
-4-1	No 4	8	1' 9"	1.169	9.352
-4-2	No 4	3	2' 9 1/4"	1.851	5.553
P4-1	No 4	5	1' 1 1/2"	0.752	3.758
B6-1	No 6	2	3' 8 1/2"	5.570	11.140
X6-1	No 6	1	5' 8 1/2"	8.574	8.574
TOT-L WEIGHT IN POUNDS					181.109



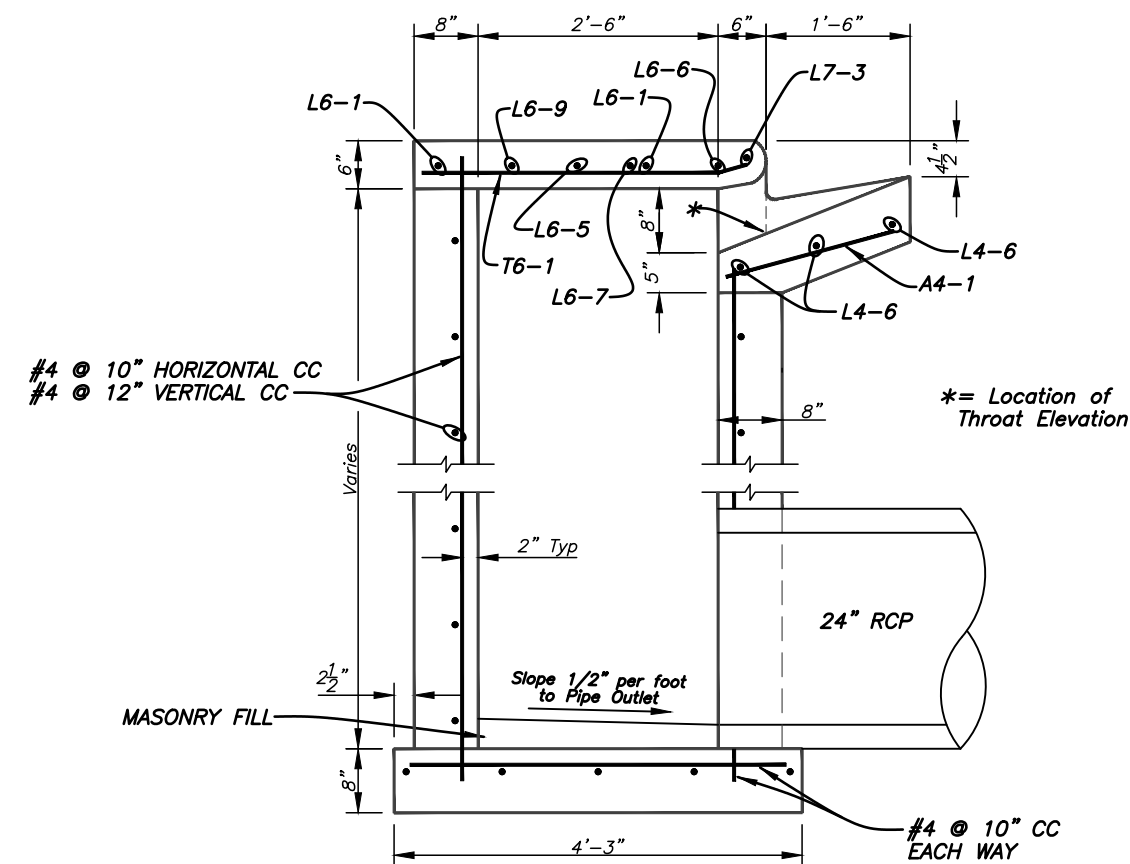
PLAN - APRON REINFORCEMENT

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SECTION A-A

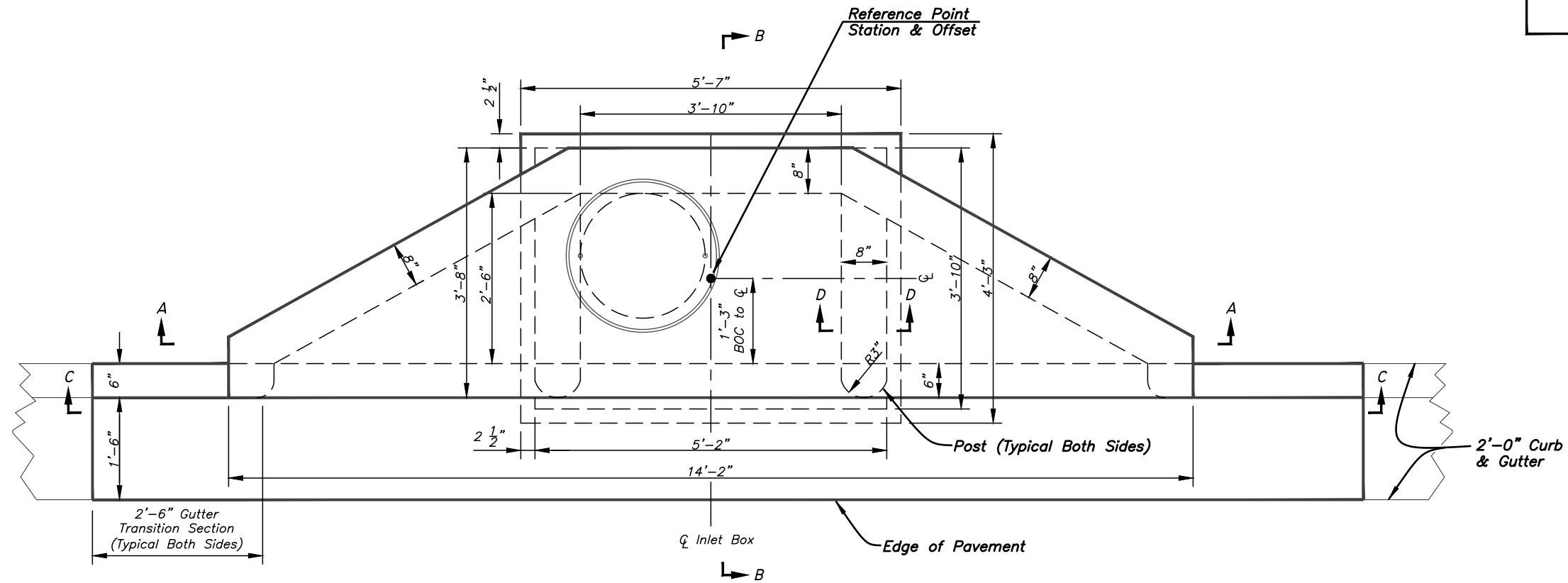
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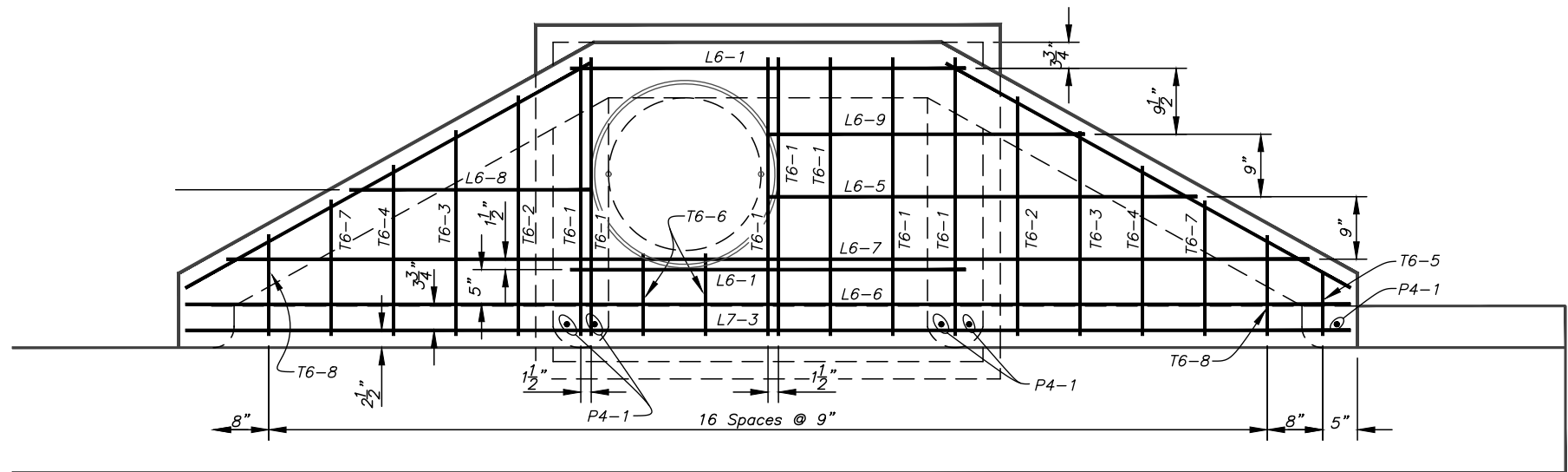
SECTION B-B

Scale: 1/2" = 1'-0"

No.	DATE	REVISIONS	No.	DATE	REVISIONS	DES: STORM	CITY of TAMPA	STANDARD INLET DETAILS	SHEET
3			6			DRN: STORM	Mobility Department	TYPE 3 INLET	8
2			5			CKD:	Stormwater Engineering Division		OF 40
1			4			DATE: 7/03			

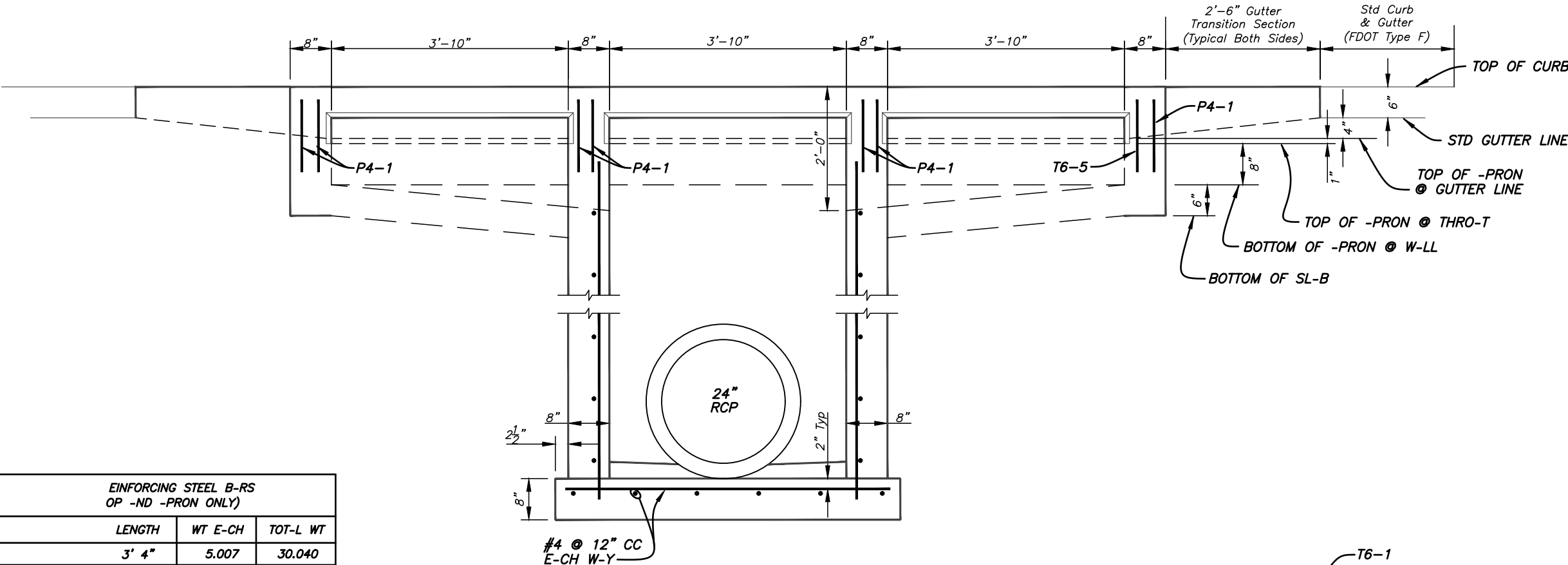


PLAN
Scale: 1/2" = 1'-0"

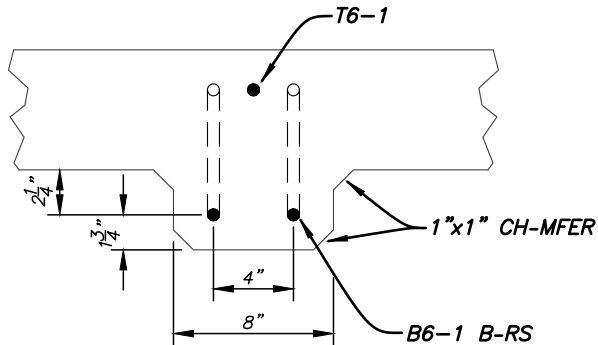


PLAN - TOP SLAB REINFORCEMENT
Scale: 1/2" = 1'-0"

No.	DATE	REVISIONS	DES: STORM	CITY of TAMPA	STANDARD INLET DETAILS	SHEET
6			DRN: STORM	Mobility Department	TYPE 3 INLET	9
5			CKD:	Stormwater Engineering Division		OF 40
4			DATE: 7/03			



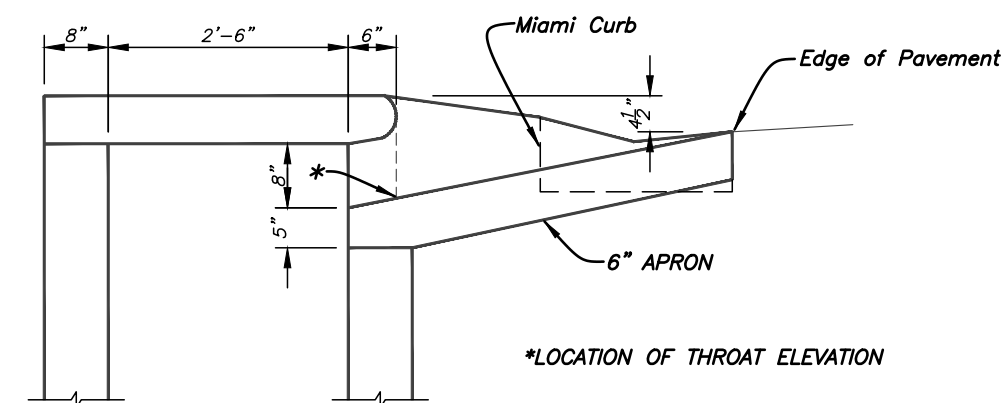
SECTION C-C
Scale: 1/2" = 1'-0"



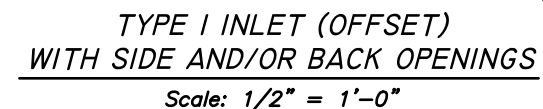
SECTION D-D
Not To Scale

EINFORCING STEEL B-RS OP -ND -PRON ONLY)		
LENGTH	WT E-CH	TOT-L WT
3' 4"	5.007	30.040
2' 10 1/2"	4.318	8.637
2' 5 1/2"	3.692	7.385
2' 1/2"	3.067	6.133
10"	1.252	2.503
1' 1"	1.627	3.254
1' 7 1/2"	2.441	4.882
1' 2 1/2"	1.815	3.630
4' 9"	7.135	14.269
5' 1 3/4"	7.729	7.729
13' 11"	20.903	20.903
13' 1/4"	19.557	19.557
2' 11"	4.381	4.381
3' 9 3/4"	5.726	5.726
13' 11"	28.446	28.446
13' 11"	9.296	9.296
1' 9"	1.169	14.028
2' 9 1/4"	1.851	7.404
1' 1 1/2"	0.752	4.509
3' 8 1/2"	5.570	22.279
5' 8 1/2"	8.574	17.148
		242.138

SW



TYPE I INLET (OFFSET)
Scale: 1/2" = 1'-0"



In cases where a curb inlet is used but no barrier curb is present, the Type 1 inlet shall be offset as shown herein. Preferably, Miami curb shall be used to convey runoff along the edge of pavement to the inlet.

In cases where no Miami curb is used, the offset shall remain as shown herein and the concrete apron shall be extended on a 1.5-to-1 horizontal angle to meet the edge of pavement. The concrete apron shall be reinforced with Number 4 steel bars at 11" on center. (Disregard the A4-designated bar counts and lengths in the Schedule of Reinforcing.)

Payment for the concrete apron, curb transitions and all other work incidental to offsetting the inlet shall be made under the Type 1 Inlet contract pay item and no separate nor additional payment shall be made for this modification to the standard.

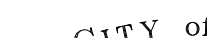
In cases where a curb inlet is used with Type D Curb, the Type 1 Inlet may be offset as shown in "Type 1 Inlet (Offset)" or may be constructed in the same alignment as the standard detail, i.e. with the face of the inlet top aligned with the face of curb.

If the standard alignment is used, the concrete inlet throat shall be constructed as shown in the standard. A 2'6" long concrete transition section shall be constructed on each side of the concrete inlet throat. This section shall transition from the Type D Curb (no gutter) to the 1'6" wide concrete inlet throat.

Payment for the concrete apron or concrete inlet throat, curb transitions and all other work incidental to offsetting the inlet or adapting the inlet to a Type D Curb shall be made under the Type 1 Inlet contract pay item and no separate nor additional payment shall be made for this modification to the standard.

If side and/or back openings are called for in the project plans, dimensions of the openings shall be as shown in the detail included herein. Additional P4-1 reinforcing bars shall be used at the rate of four (4) per post section, as applicable. Six (6) inch thick concrete apron(s) as shown in the project plans shall be constructed at each side and back opening.

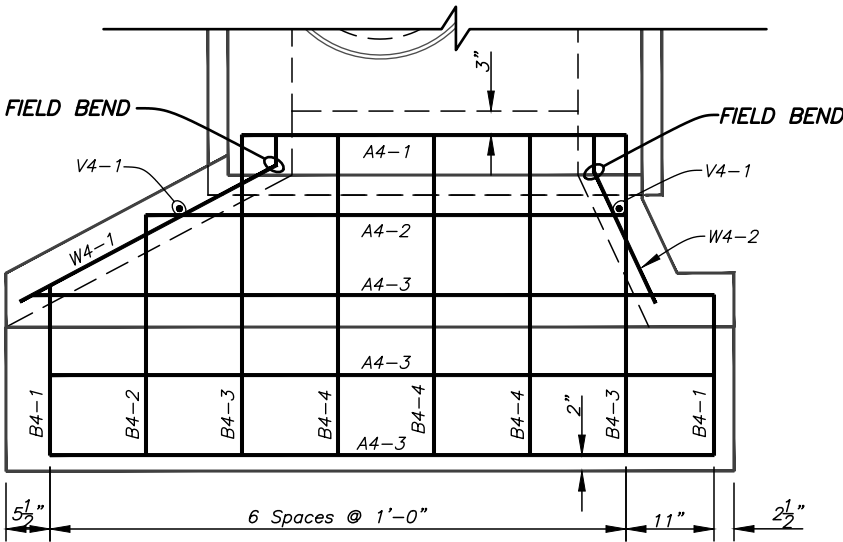
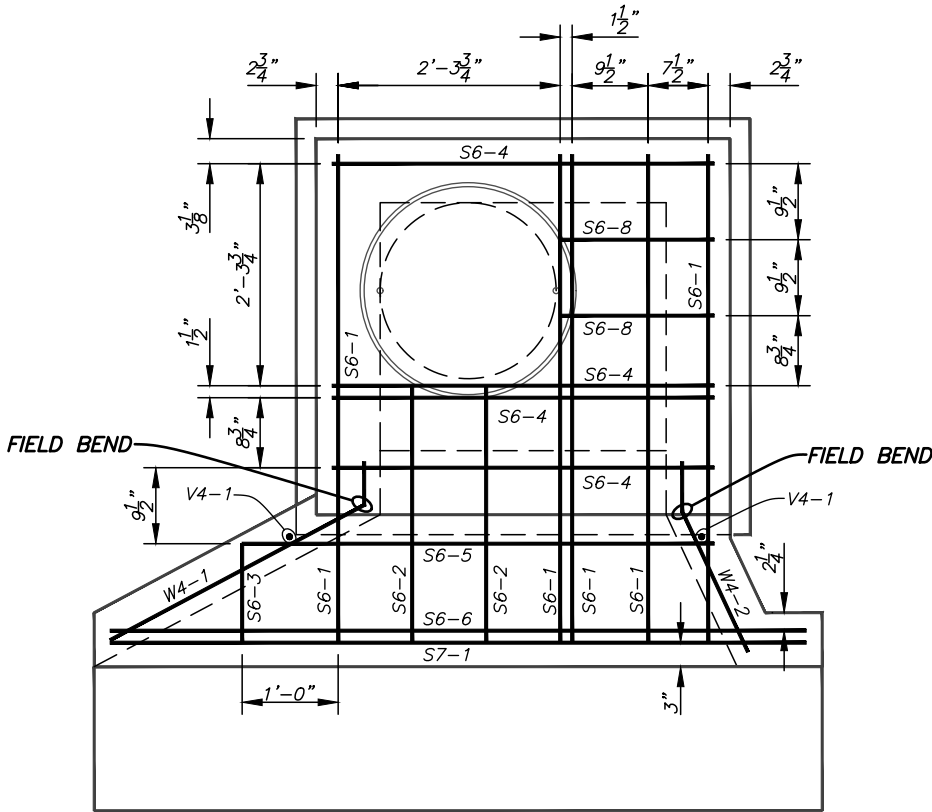
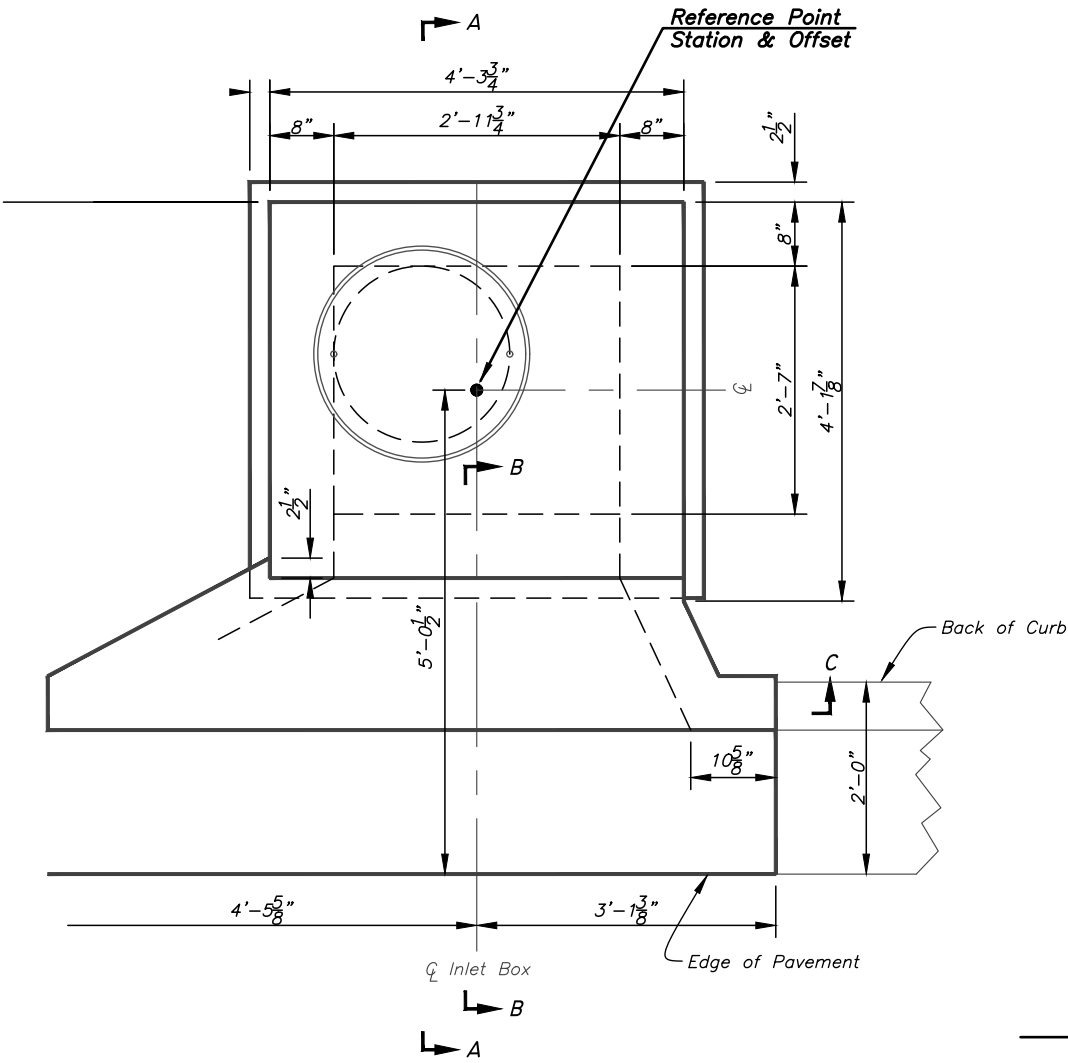
Payment for concrete aprons and all other work incidental to constructing inlets with side and/or back openings shall be made under the Inlet contract pay item and no separate nor additional payment shall be made for this modification to the standard.

DES: STORM	
DRN: STORM	
CKD:	
DATE: 7/03	

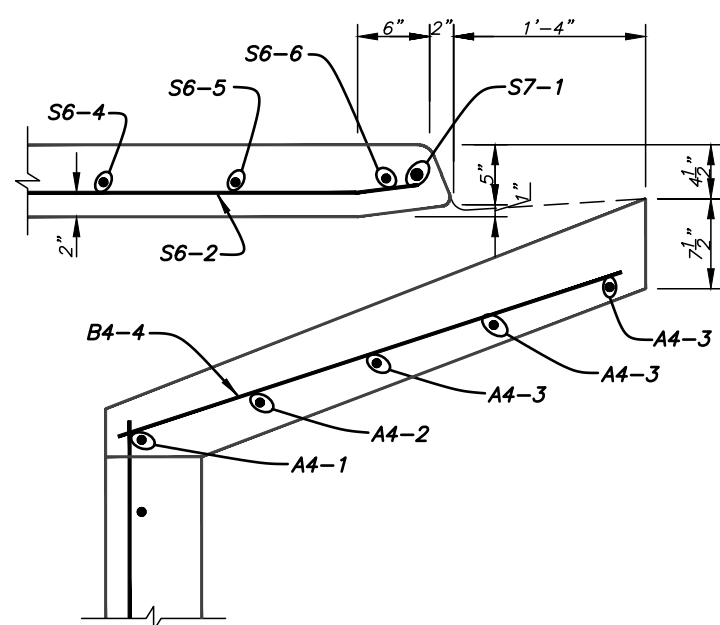
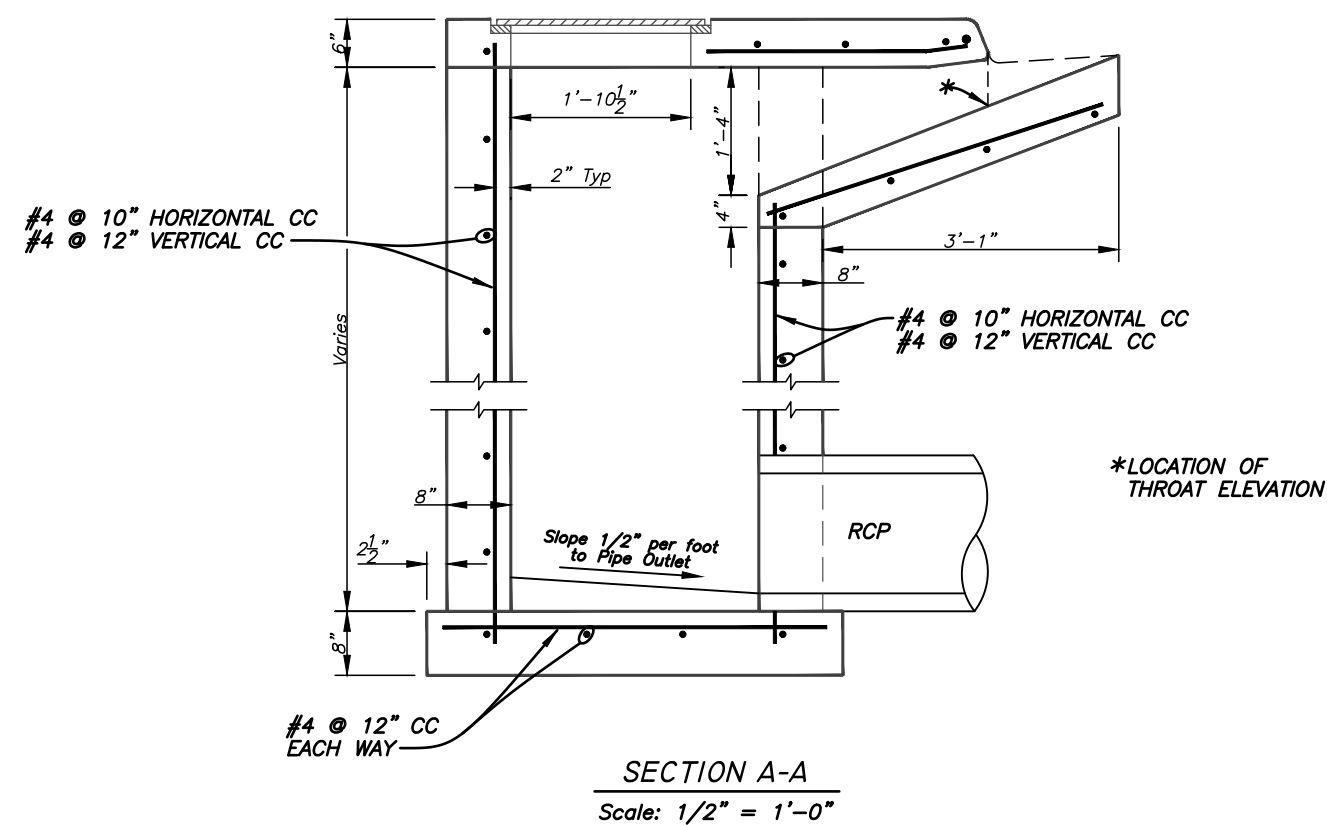
CITY of TAMPA
Mobility Department
Stormwater Engineering Division

STANDARD INLET DETAILS TYPE I INLET MODIFIED

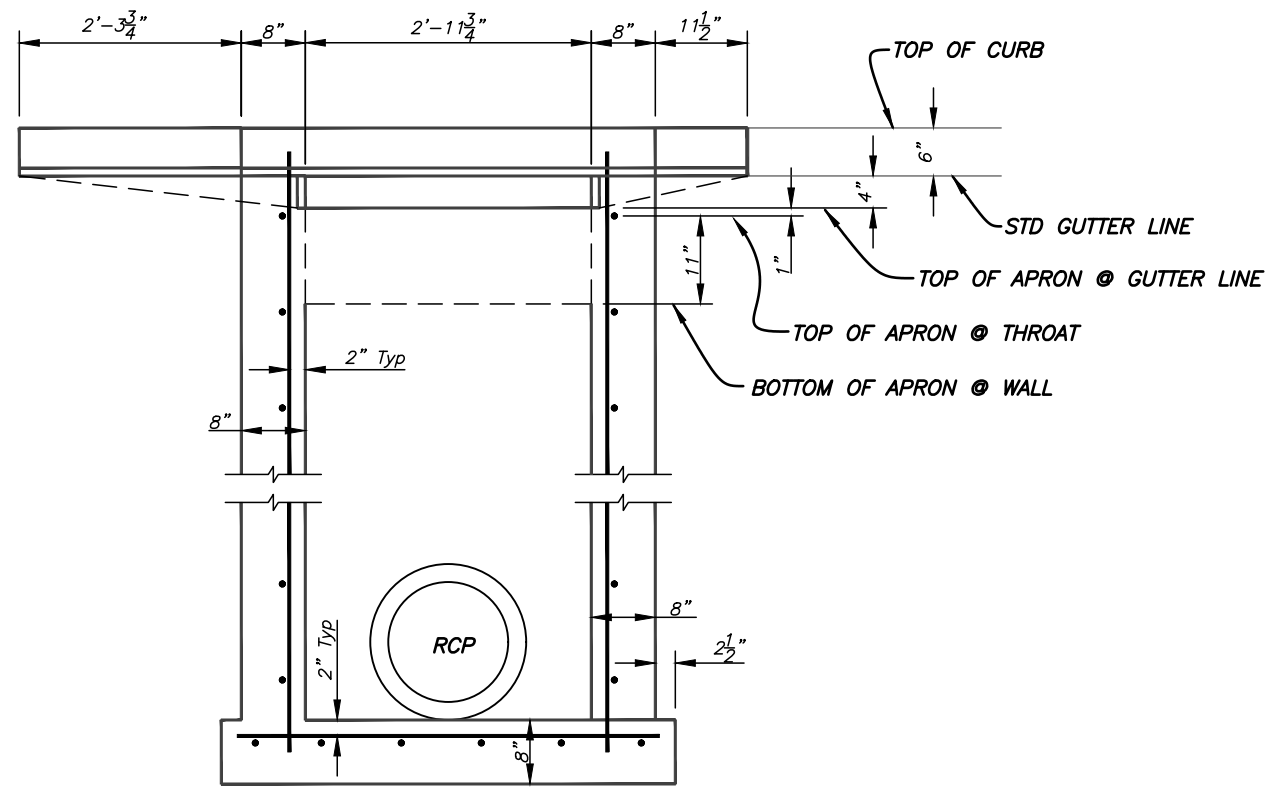
SHEET
11
OF 40



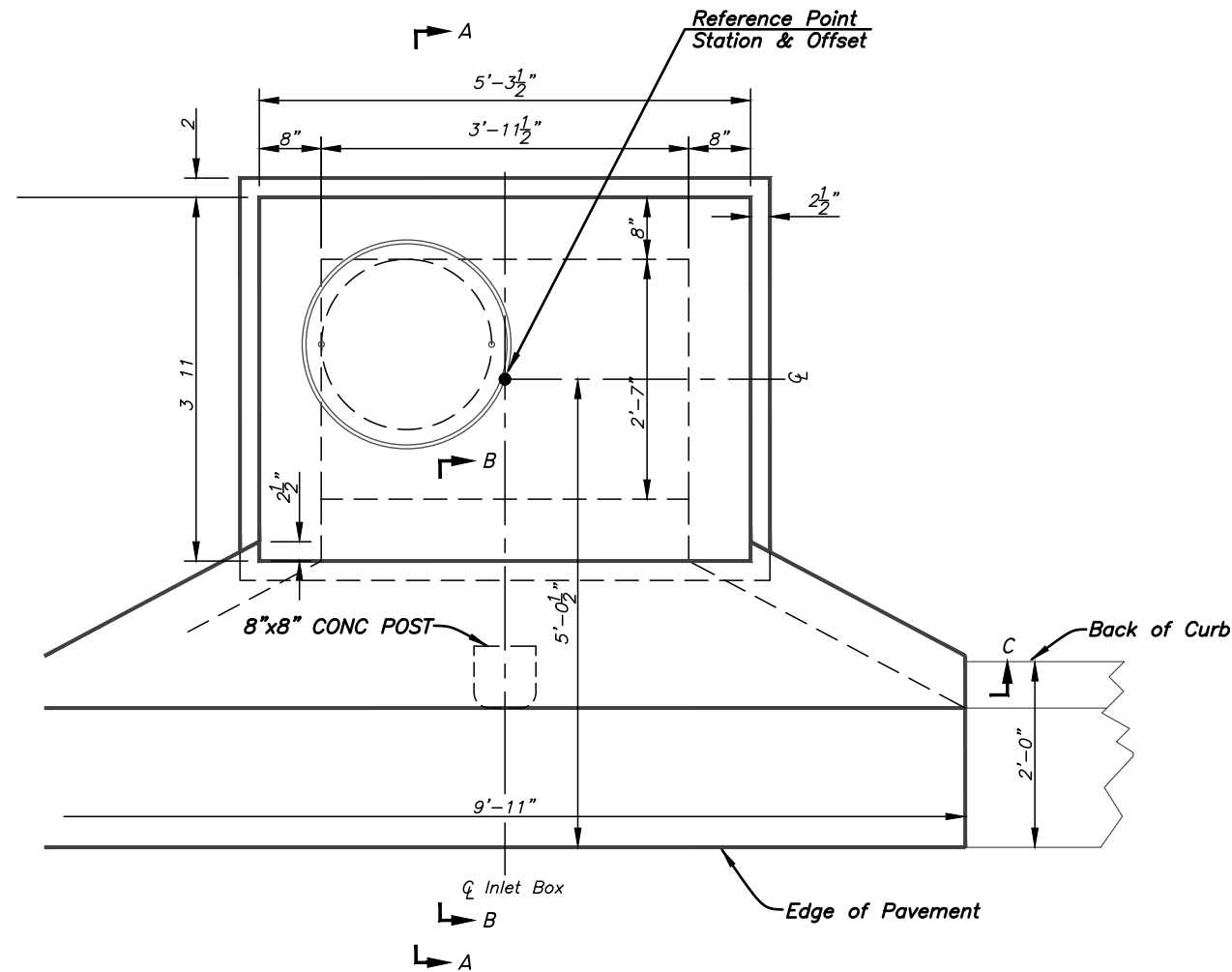
	No.	DATE	REVISIONS	DES: STORM	CITY of TAMPA Mobility Department Stormwater Engineering Division	STANDARD INLET DETAILS TYPE BS-I CURB INLET	SHEET 12 OF 40
	6			DRN: STORM			
	5			CKD:			
	4			DATE: 7/03			



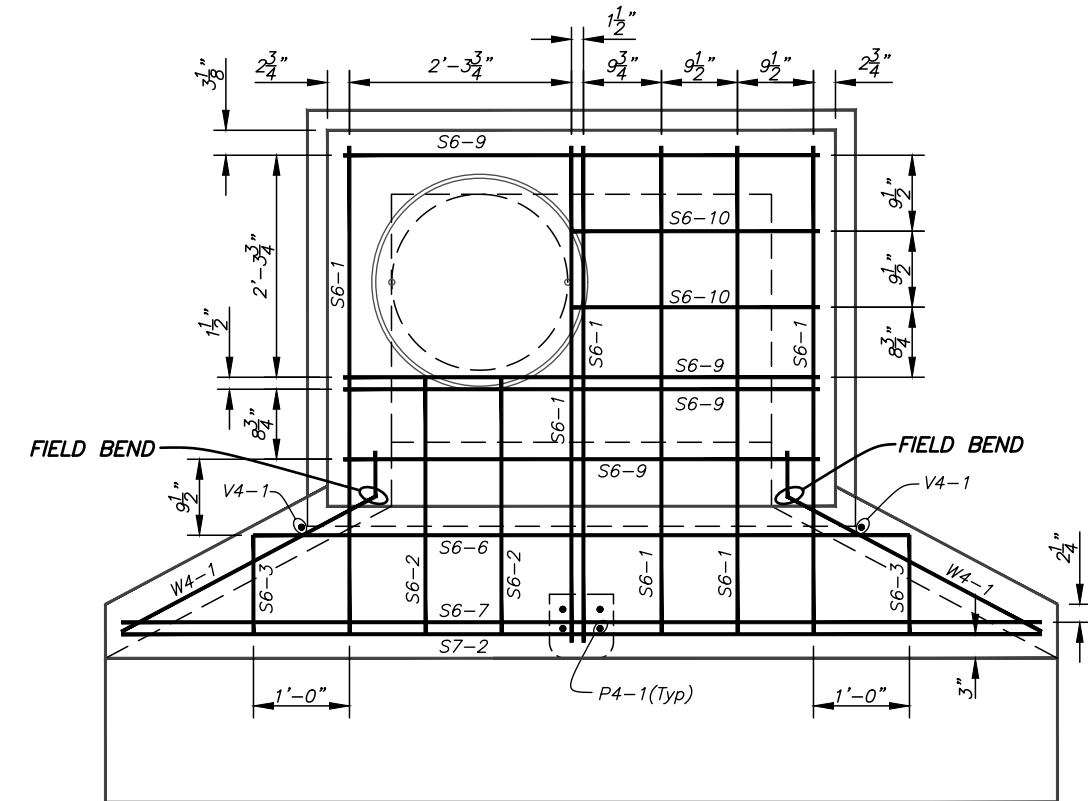
SCHEDULE OF REINFORCING STEEL BARS (FOR INLET TOP AND APRON ONLY)					
MARK	SIZE	COUNT	LENGTH	WT EACH	TOTAL WT
A4-1	No 4	1	3' 11 3/4"	2.658	2.658
A4-2	No 4	1	4' 11"	3.285	3.285
A4-3	No 4	3	7' 4"	4.898	4.898
B4-1	No 4	2	2' 9"	1.837	3.674
B4-2	No 4	2	3' 7 3/4"	2.436	4.871
B4-3	No 4	2	5' 0 3/4"	3.382	6.764
B4-4	No 4	3	3' 6 3/4"	2.380	7.140
S6-1	No 6	5	5' 3"	7.886	39.428
S6-2	No 6	2	2' 11"	4.381	8.763
S6-3	No 6	1	1' 2 1/2"	1.814	1.814
S6-4	No 6	4	3' 11 3/4"	5.976	23.906
S6-5	No 6	1	4' 10 1/2"	7.322	7.322
S6-6	No 6	1	6' 8"	10.014	10.014
S6-8	No 6	2	1' 7 1/2"	29.289	58.578
S7-1	No 7	1	7' 4"	14.989	14.989
V4-1	No 4	2	1' 8 1/2"	1.141	2.282
W4-1	No 4	2	3' 6"	2.338	4.676
W4-2	No 4	2	2' 1"	1.391	2.783
TOTAL WEIGHT IN POUNDS				217.641	



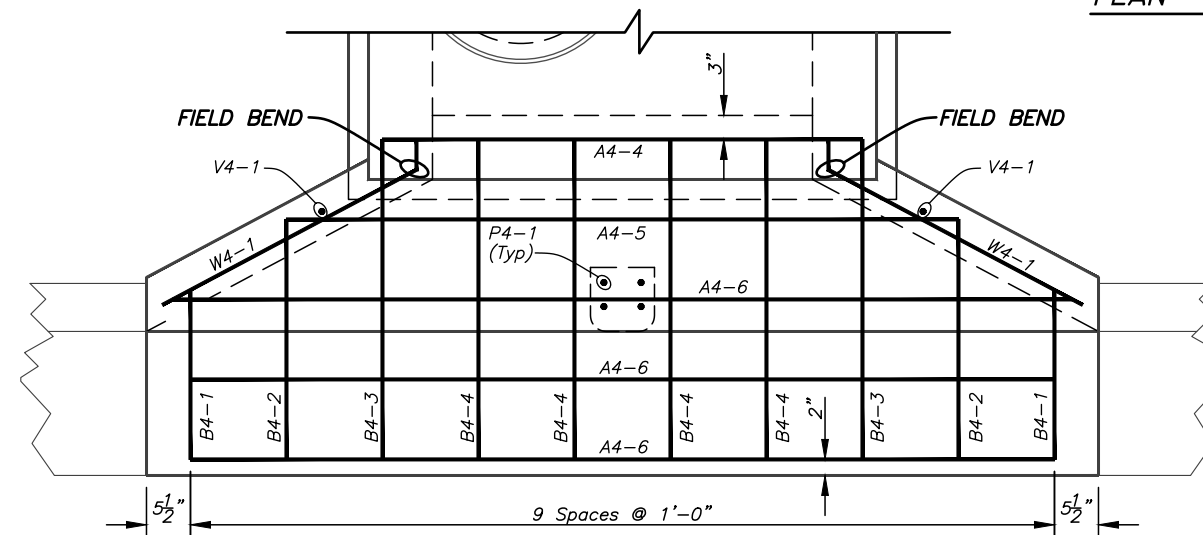
No.	DATE	REVISIONS	No.	DATE	REVISIONS
3			6		
2			5		
1			4		



PLAN
Scale: 1/2" = 1'-0"



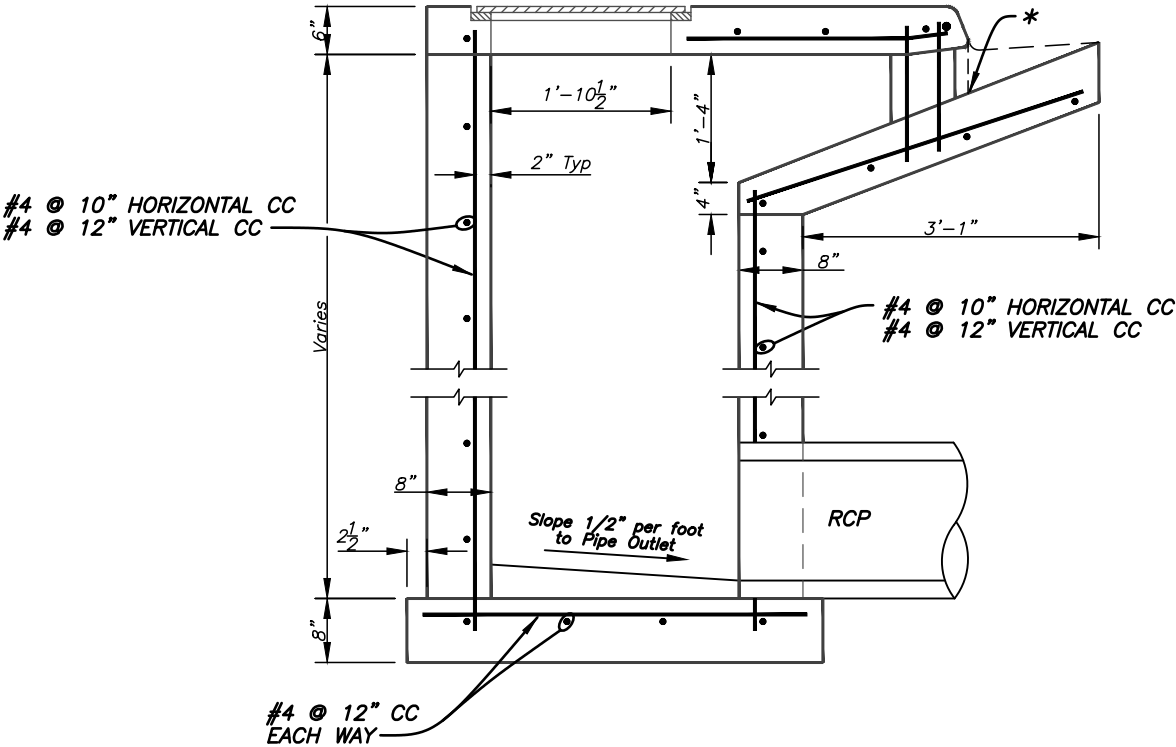
PLAN - TOP SLAB REINFORCEMENT
Scale: 1/2" = 1'-0"



PLAN - APRON REINFORCEMENT
Scale: 1/2" = 1'-0"

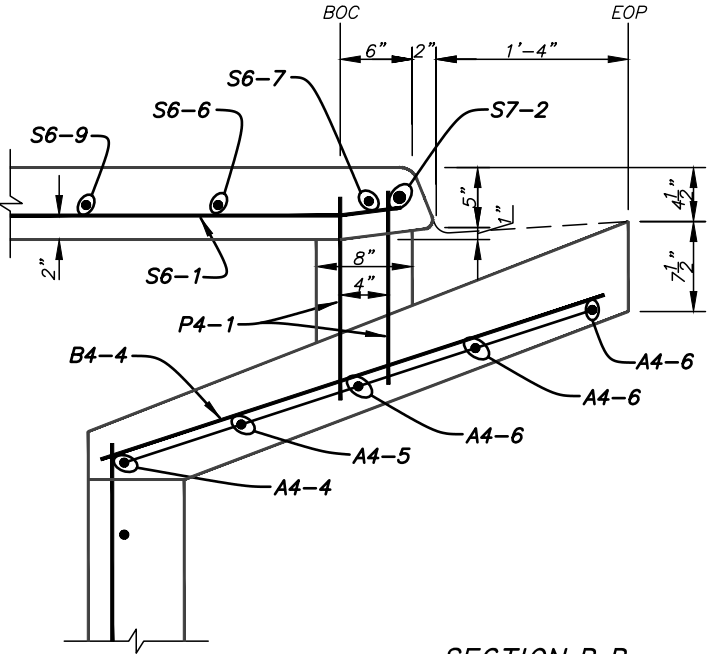
No.	DATE	REVISIONS	DES: STORM	CITY of TAMPA Mobility Department Stormwater Engineering Division	STANDARD INLET DETAILS TYPE BV-I CURB INLET	SHEET 14 OF 40
6			DRN: STORM			
5			CKD:			
4			DATE: 7/03			

*LOCATION OF THROAT ELEVATION

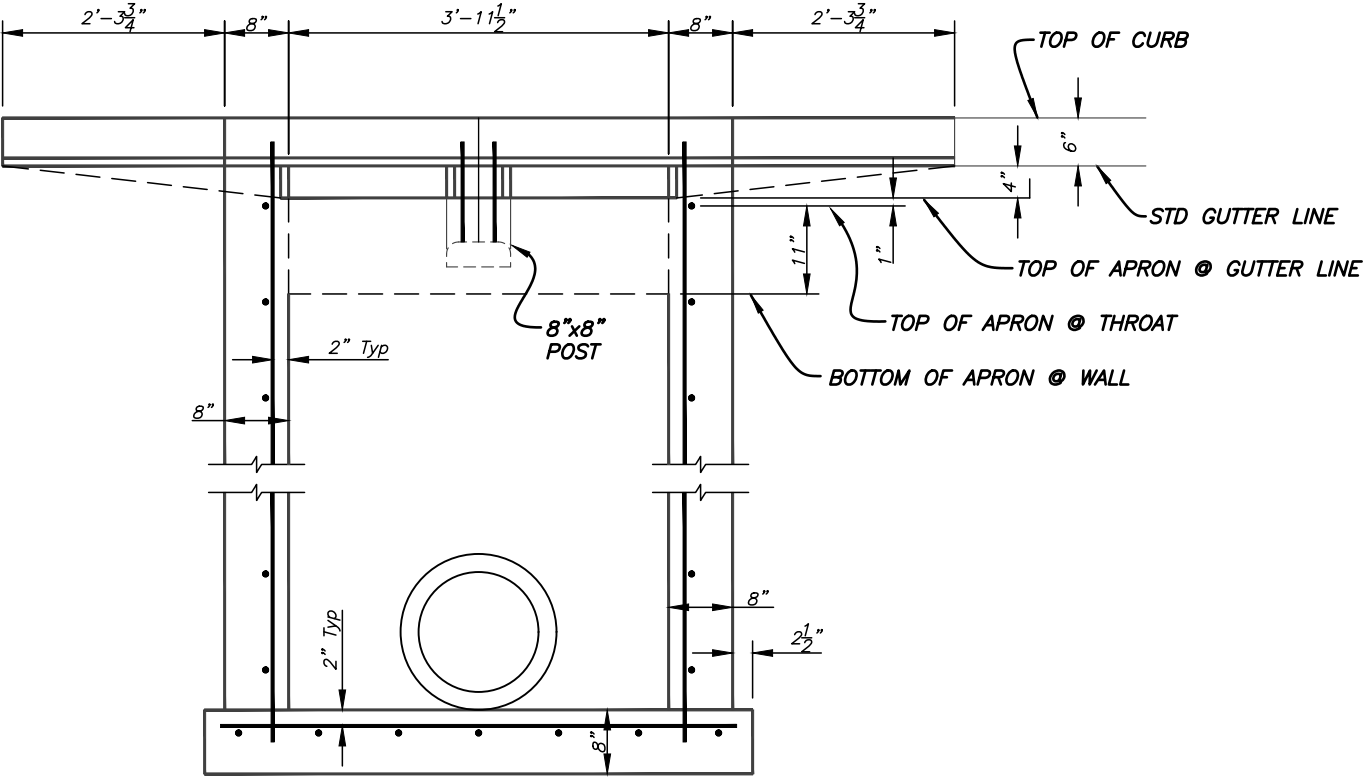


SECTION A-A
Scale: 1/2" = 1'-0"

SCHEDULE OF REINFORCING STEEL BARS (FOR INLET TOP AND APRON ONLY)											
MARK	SIZE	COUNT	LENGTH	WT EACH	TOTAL WT	MARK	SIZE	COUNT	LENGTH	WT EACH	TOTAL WT
A4-4	No 4	1	4' 11 1/2"	3.312	3.312	S6-2	No 6	5	2' 11"	4.381	8.763
A4-5	No 4	1	6' 7"	4.397	4.397	S6-3	No 6	2	1' 2 1/2"	1.814	3.629
A4-6	No 4	3	9' 7 3/4"	6.444	19.331	S6-6	No 6	1	6' 8"	10.014	10.014
B4-1	No 4	2	2' 9"	1.837	3.674	S6-7	No 6	1	9' 7 3/4"	14.488	14.488
B4-2	No 4	2	3' 7 3/4"	2.436	4.871	S6-9	No 6	4	4' 11 1/2"	7.447	29.788
B4-3	No 4	2	3' 6 3/4"	2.380	9.520	S6-10	No 6	2	2' 6"	3.755	7.510
B4-4	No 4	4	3' 6 3/4"	2.380	9.520	S7-2	No 7	1	9' 7 3/4"	19.716	19.716
P4-1	No 4	4	1' 3"	0.835	3.340	V4-1	No 4	2	1' 8 1/2"	1.141	2.282
S6-1	No 6	6	5' 3"	7.886	47.313	W4-1	No 4	4	3' 6"	2.338	9.352
TOTAL WEIGHT IN POUNDS					208.064						

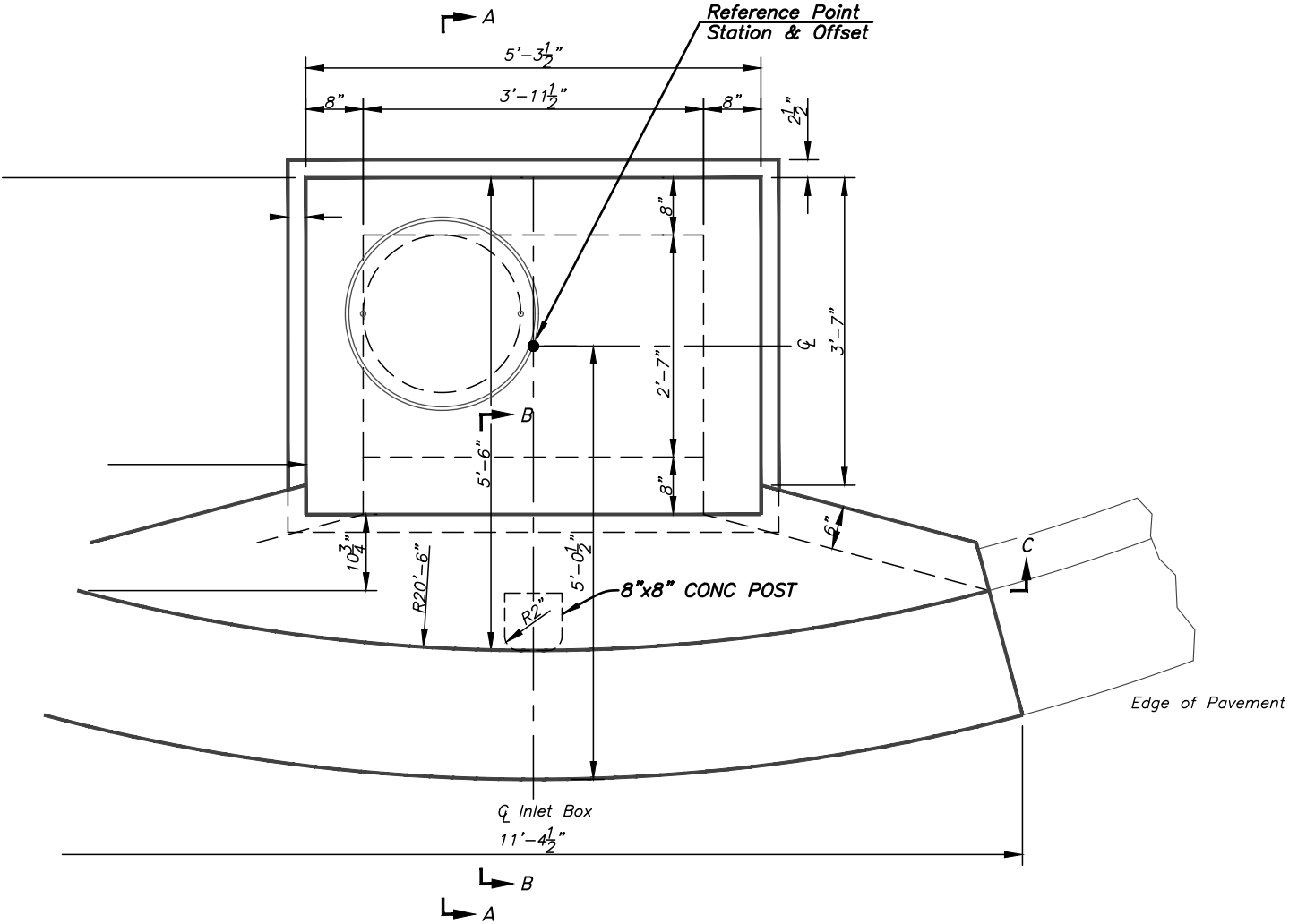


SECTION B-B
Scale: 3/4" = 1'-0"



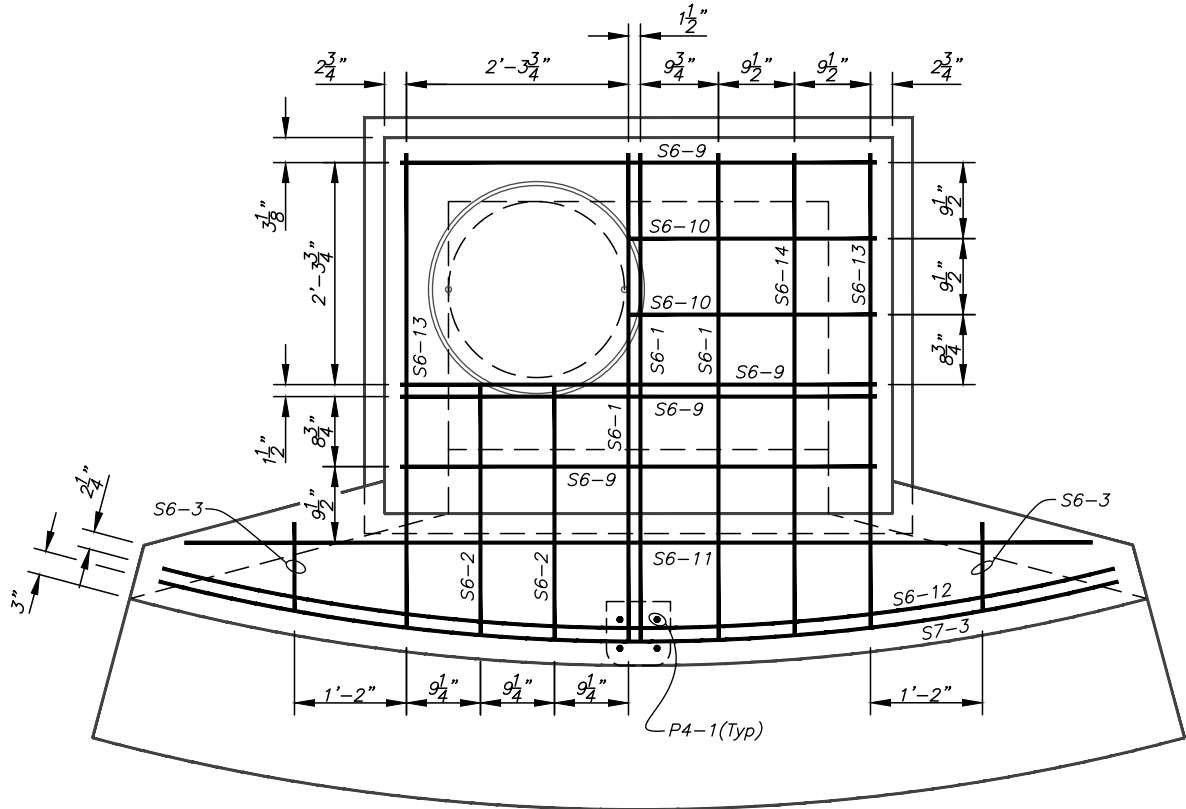
SECTION C-C
Scale: 1/2" = 1'-0"

SW

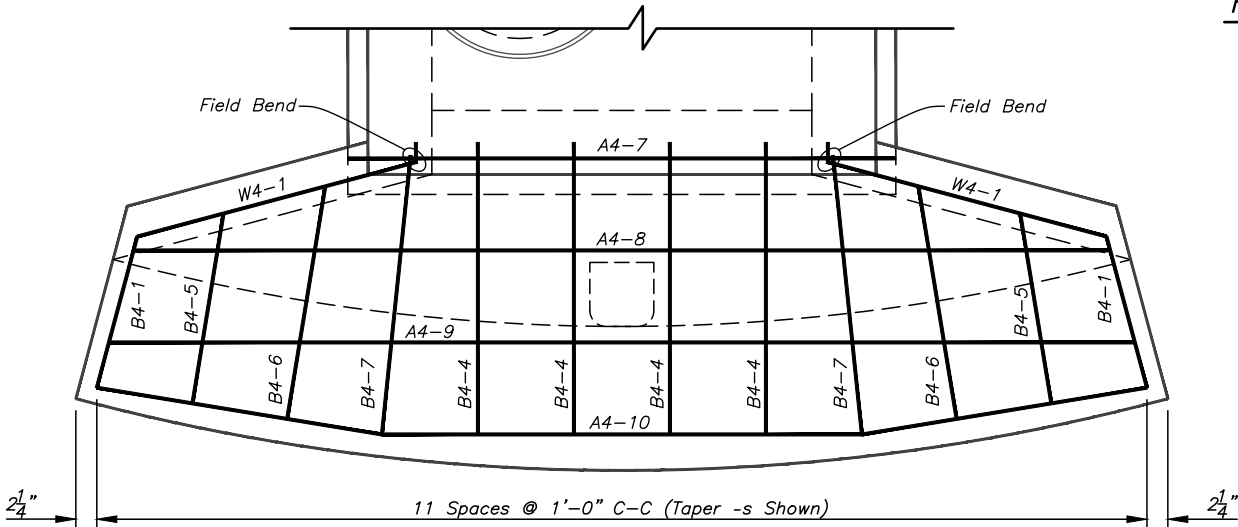


PLAN

Scale: $1/2" = 1'-0"$



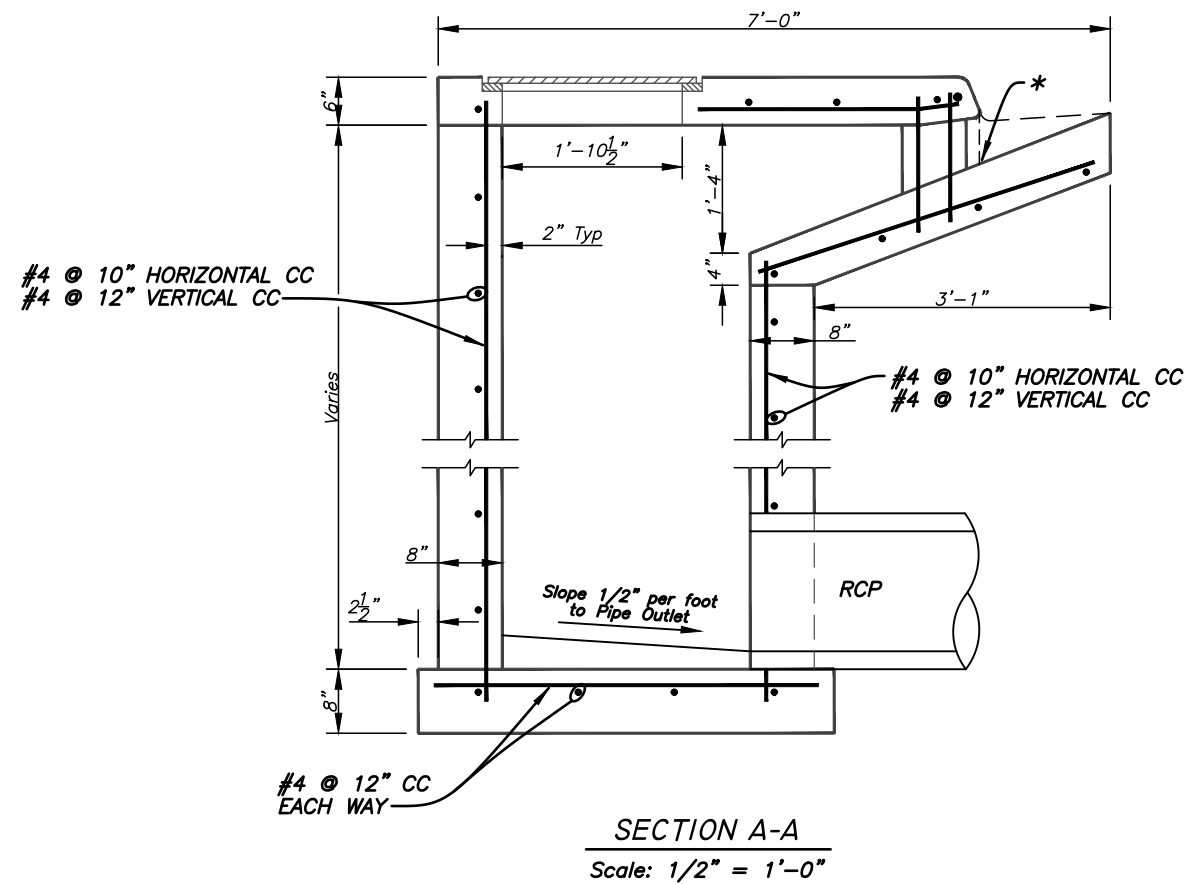
PLAN - TOP SLAB REINFORCEMENT
Scale: 1/2" = 1'-0"



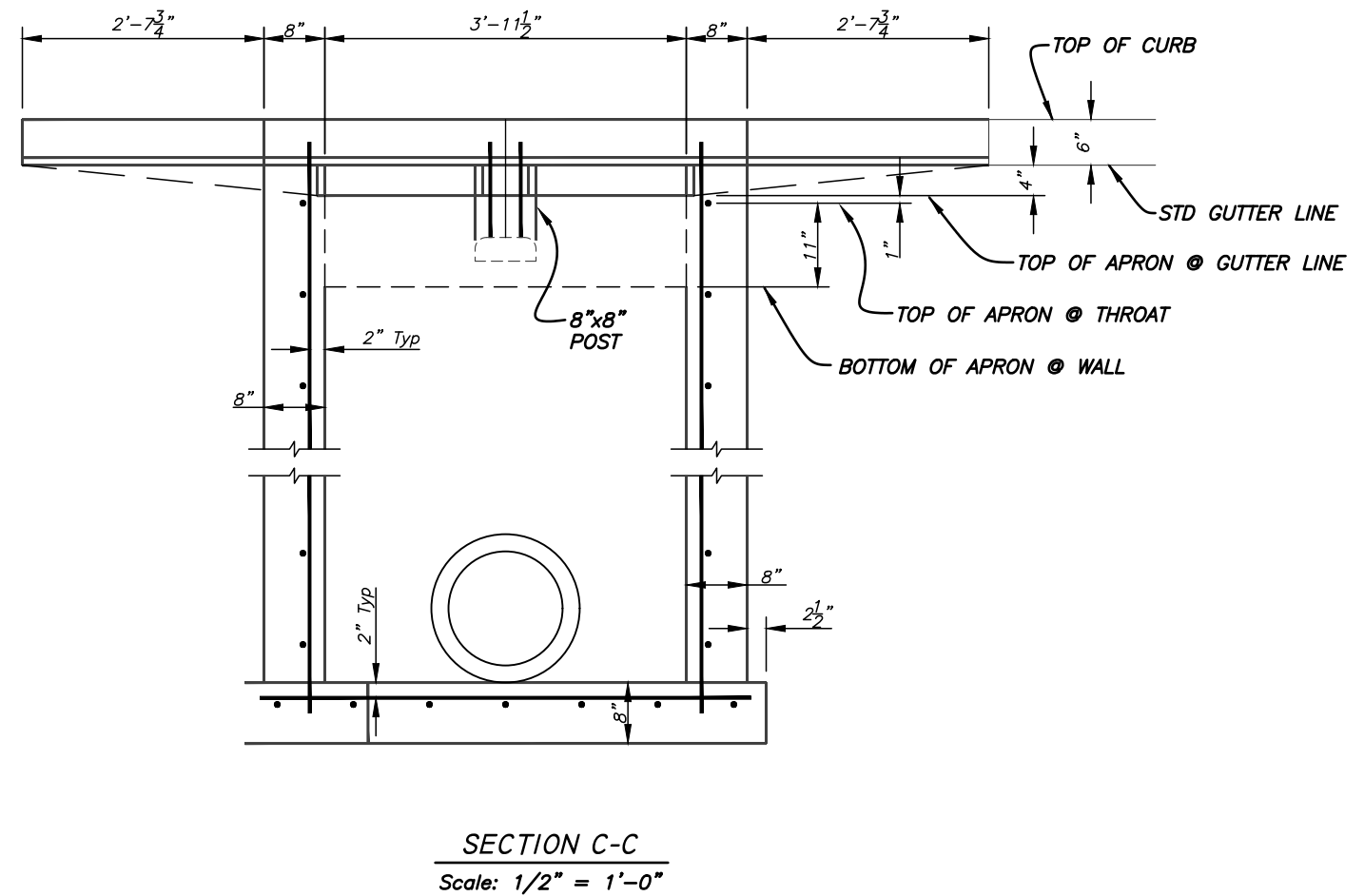
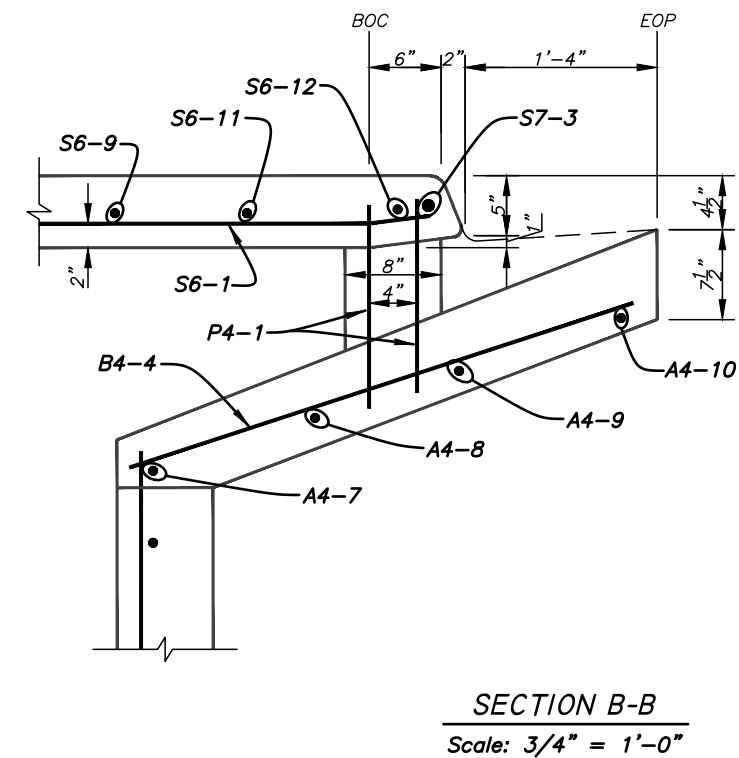
PLAN - APRON REINFORCEMENT
Scale: 1/2" = 1'-0"

	No.	DATE	REVISIONS	DES: STORM	CITY of TAMPA Mobility Department Stormwater Engineering Division	STANDARD INLET DETAILS TYPE BR-1 CURB INLET	SHEET 16 OF 40
	6			DRN: STORM			
	5			CKD:			
	4			DATE: 7/03			

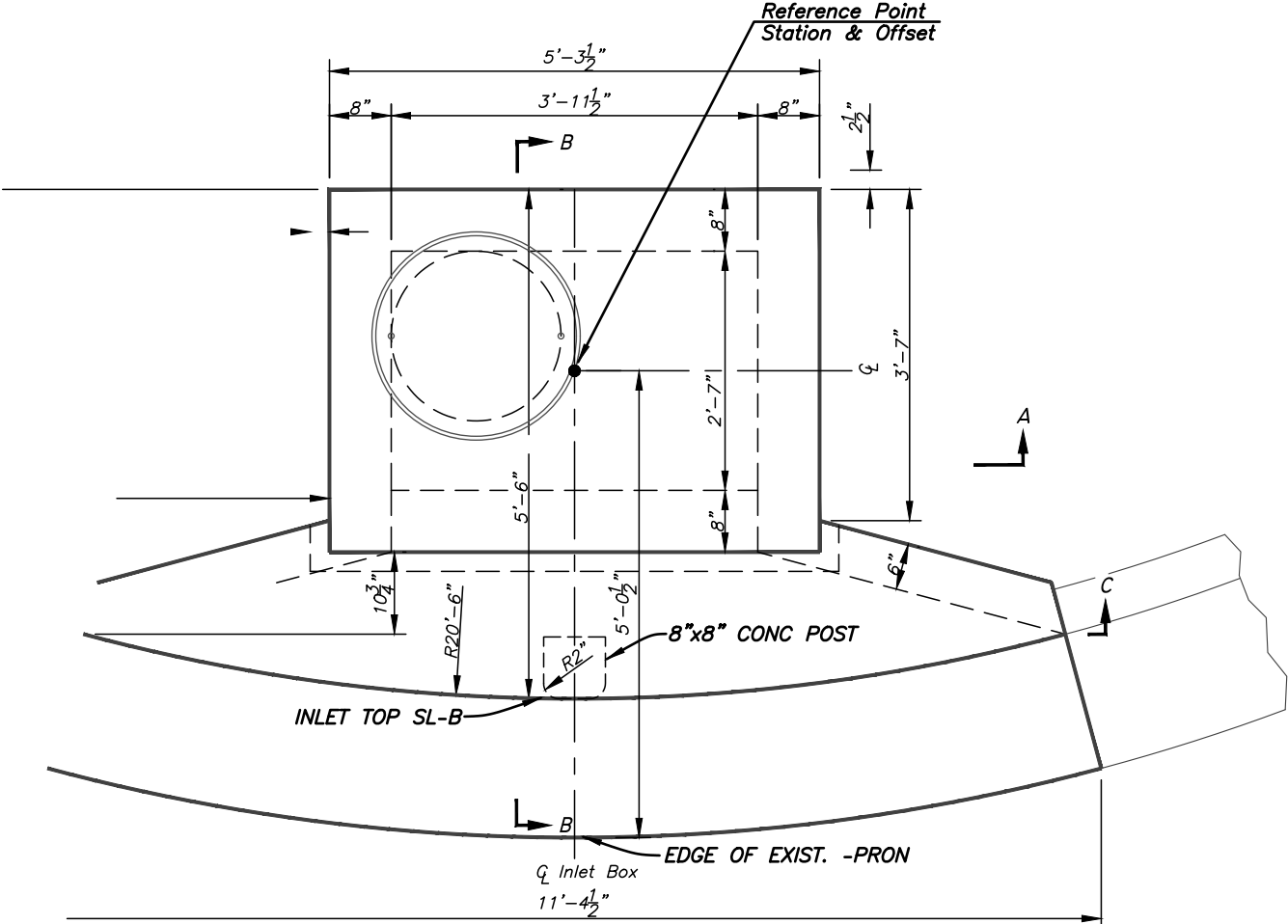
SW



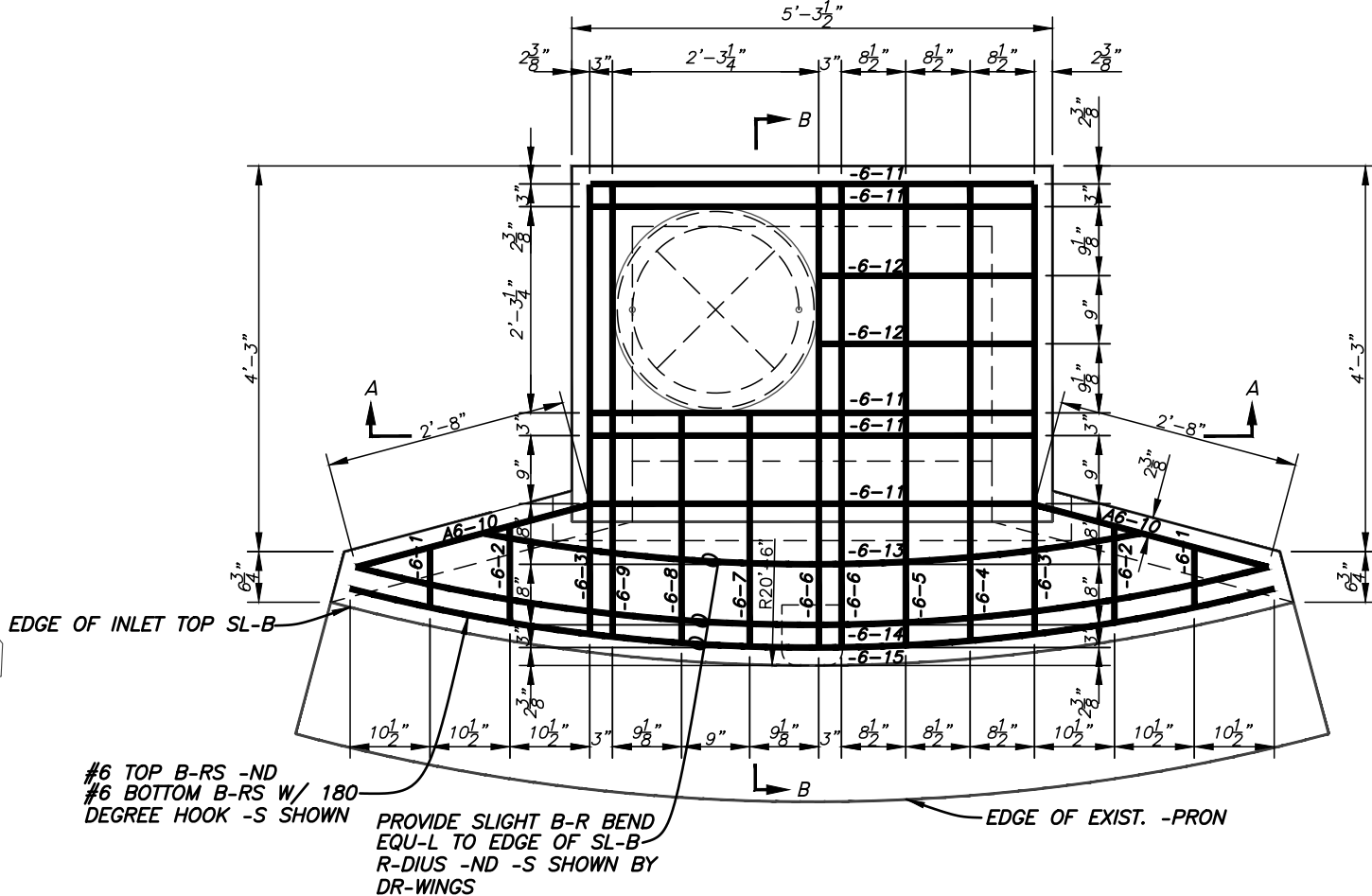
*LOCATION OF
THROAT ELEVATION



SCHEDULE OF REINFORCING STEEL BARS (FOR INLET TOP AND APRON ONLY)											
MARK	SIZE	COUNT	LENGTH	WT EACH	TOTAL WT	MARK	SIZE	COUNT	LENGTH	WT EACH	TOTAL WT
A4-7	No 4	1	5' 4"	3.562	3.562	S6-1	No 6	3	5' 3"	7.886	23.657
A4-8	No 4	1	10' 3 1/2"	6.875	6.875	S6-2	No 6	2	2' 11"	4.381	8.763
A4-9	No 4	1	10' 9 1/2"	7.209	7.209	S6-3	No 6	2	1' 2 1/2"	1.814	3.629
A4-10	No 4	1	11' 2 1/2"	7.487	7.487	S6-9	No 6	4	4' 11 1/2"	7.447	29.788
B4-1	No 4	2	2' 9"	1.837	3.674	S6-10	No 6	2	2' 6"	3.755	7.510
B4-4	No 4	4	3' 6 3/4"	2.380	9.520	S6-11	No 6	1	9' 7"	14.394	14.394
B4-5	No 4	2	3' 3 1/2"	2.199	4.398	S6-12	No 6	1	10' 2"	15.271	15.271
B4-6	No 4	2	4' 0 3/4"	2.714	5.428	S6-13	No 6	2	5' 1 1/2"	7.698	15.396
B4-7	No 4	2	4' 10 1/2"	3.257	6.513	S6-14	No 6	1	5' 2 1/2"	7.822	7.822
P4-1	No 4	4	1' 3"	0.835	3.340	S7-3	No 7	1	10' 4 3/4"	21.249	21.249
						W4-1	No 4	4	3' 6"	2.338	9.352
TOTAL WEIGHT IN POUNDS										214.837	



PLAN - EXIST. INLET
Scale: 1/2" = 1'-0"



PLAN - NEW TOP SLAB REINFORCEMENT

Scale: $1/2" = 1'-0"$

Note:
-LL B-RS SH-LL H-VE
180 DEGREE HOOKS
(TYPIC-L)

	No.	DATE	REVISIONS
	6		
	5		
	4		

DES: STORM
DRN: STORM
CKD:
DATE: 9/23/13

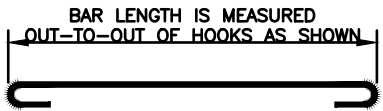
CITY of TAMPA
Mobility Department
Stormwater Engineering Division

STANDARD INLET DETAILS
HS-20 RATED TYPE BR-1 CURB INLET

SCHEDULE OF REINFORCING #6 STEEL BARS (INLET TOP ONLY)					
MARK	SIZE	COUNT	LENGTH	WT EACH	TOTAL WT
A5-1	No 5	2	7 15/16"	.69	1.38
A5-2	No 5	2	1'-0 3/4"	1.15	2.30
A5-3	No 5	2	4'-11 1/4"	5.19	10.38
A5-4	No 5	1	5'-0 1/8"	5.23	5.23
A5-5	No 5	1	5'-0 11/16"	5.29	5.29
A5-6	No 5	2	5'-1"	5.31	10.62
A5-7	No 5	1	2'-6 7/8"	2.69	2.69
A5-8	No 5	1	2'-6 3/8"	2.65	2.65
A5-9	No 5	1	4'-11 9/16"	5.16	5.16
A5-10	No 5	2	2'-8"	2.78	5.56
A5-11	No 5	5	4'-10 1/2"	5.09	25.45
A5-12	No 5	2	2'-4 1/2"	2.48	4.96
A5-13	No 5	1	7'-3"	7.56	7.56
A5-14	No 5	1	10'-1 7/8"	10.60	10.60
A5-15	No 5	1	10'-3 7/16"	10.73	10.73
TOTAL WEIGHT IN POUNDS FOR TOP BARS					110.56

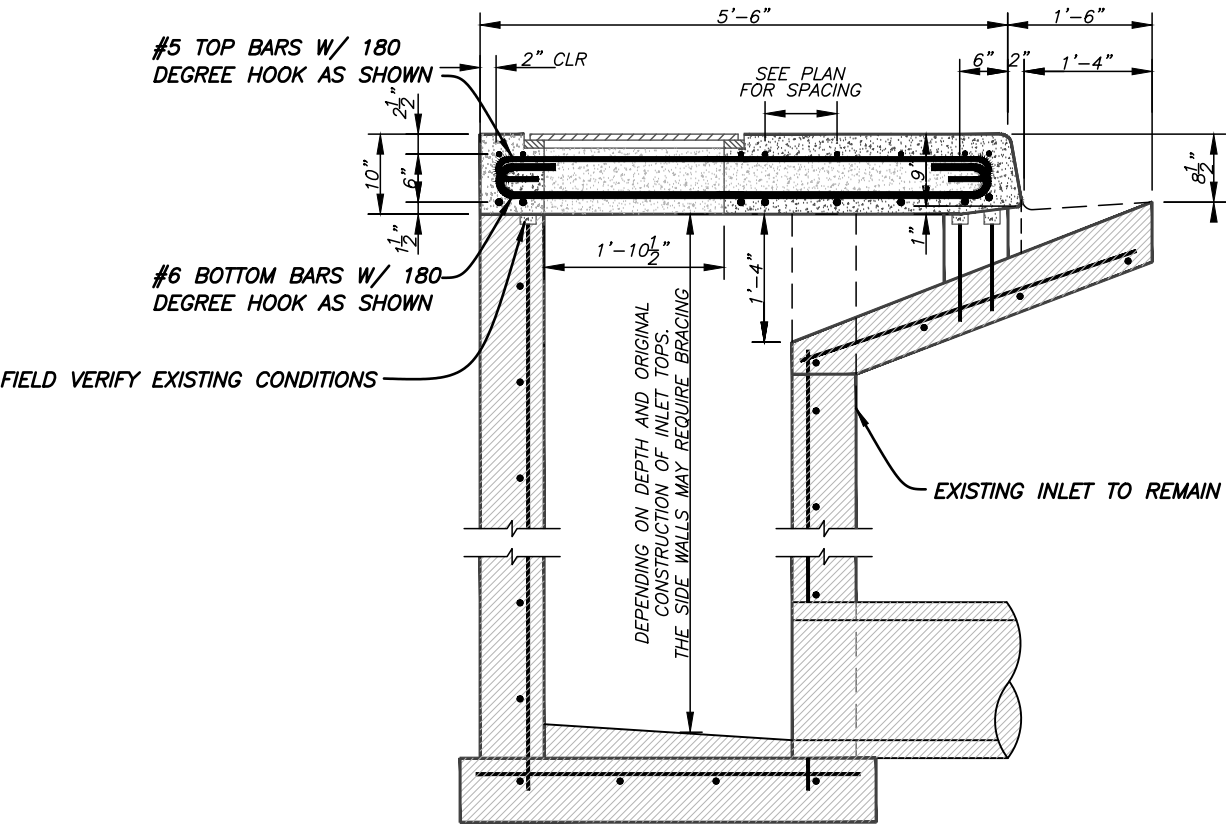
SCHEDULE OF REINFORCING #6 STEEL BARS (INLET TOP ONLY)					
MARK	SIZE	COUNT	LENGTH	WT EACH	TOTAL WT
A6-1	No 6	2	7 15/16"	1.0	2.0
A6-2	No 6	2	1'-0 3/4"	1.65	3.30
A6-3	No 6	2	4'-11 1/4"	7.5	15
A6-4	No 6	1	5'-0 1/8"	7.53	7.53
A6-5	No 6	1	5'-0 11/16"	7.61	7.61
A6-6	No 6	2	5'-1"	7.66	15.32
A6-7	No 6	1	2'-6 7/8"	3.91	3.91
A6-8	No 6	1	2'-6 3/8"	3.88	3.88
A6-9	No 6	1	4'-11 9/16"	7.51	7.51
A6-10	No 6	2	2'-8"	4.13	8.26
A6-11	No 6	5	4'-10 1/2"	7.36	36.8
A6-12	No 6	2	2'-4 1/2"	3.75	7.5
A6-13	No 6	1	7'-3"	10.81	10.81
A6-14	No 6	1	10'-1 7/8"	15.17	15.17
A6-15	No 6	1	10'-3 7/16"	15.51	15.51
TOTAL WEIGHT IN POUNDS FOR BOTTOM BARS					160.11

NOTE 1)

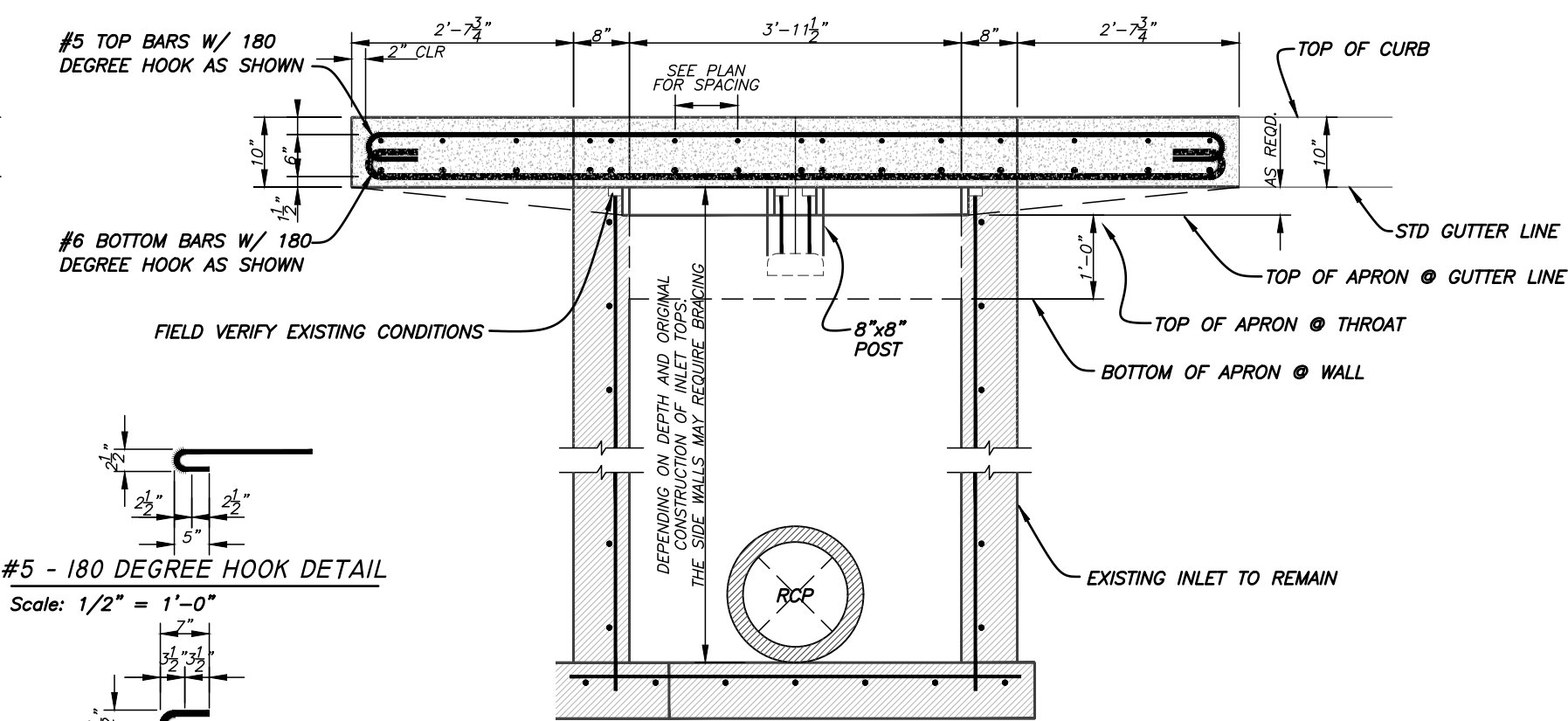


NOTE 2)

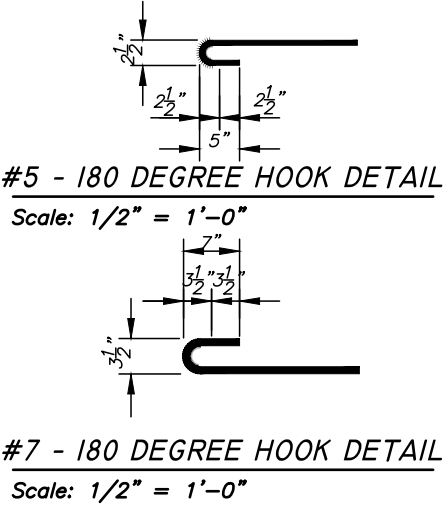
BAR LENGTH AND ASSOCIATED WEIGHT PROVIDED DOES
NOT INCLUDE THE BAR HOOK LENGTH AND WEIGHT.

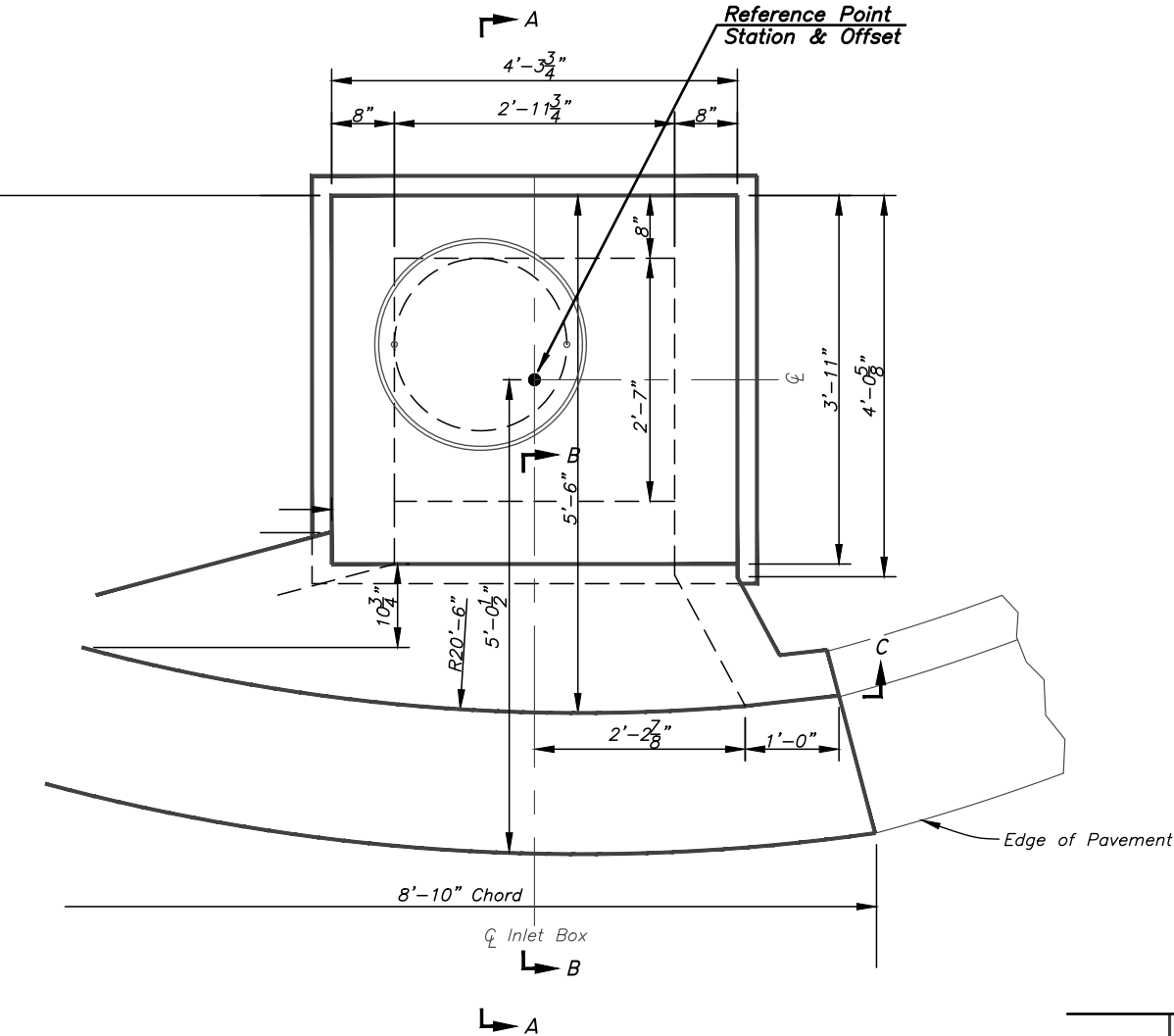


SECTION B-B
Scale: 1/2" = 1'-0"

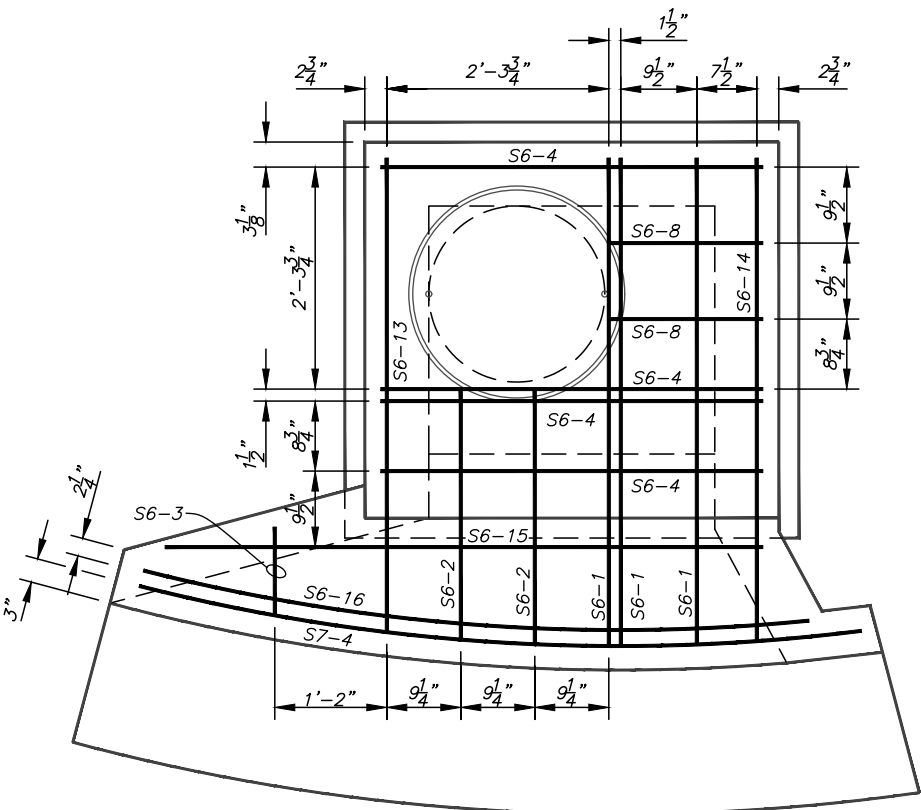


SECTION A-A
Scale: 1/2" = 1'-0"

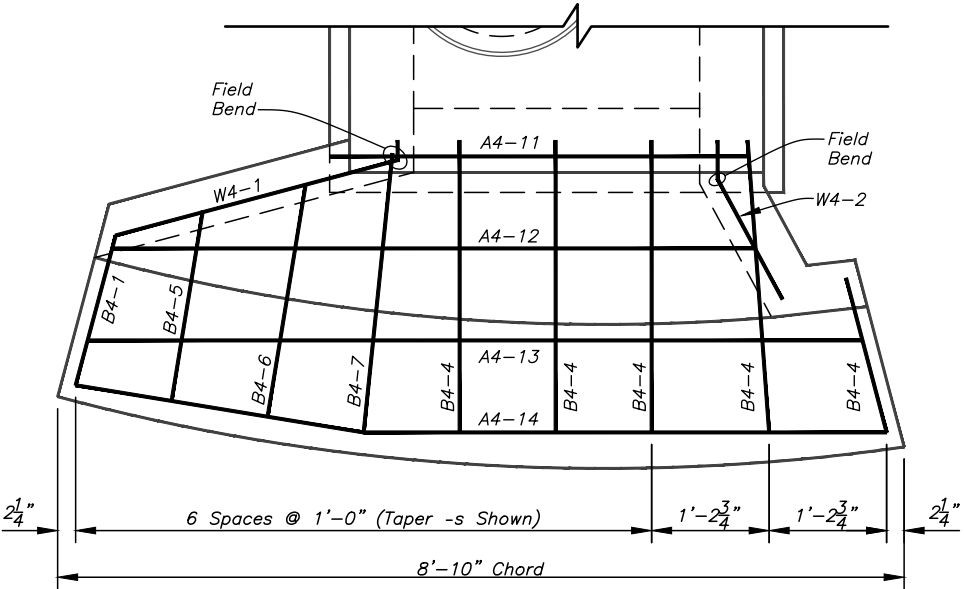




PLAN
Scale: 1/2" = 1'-0"



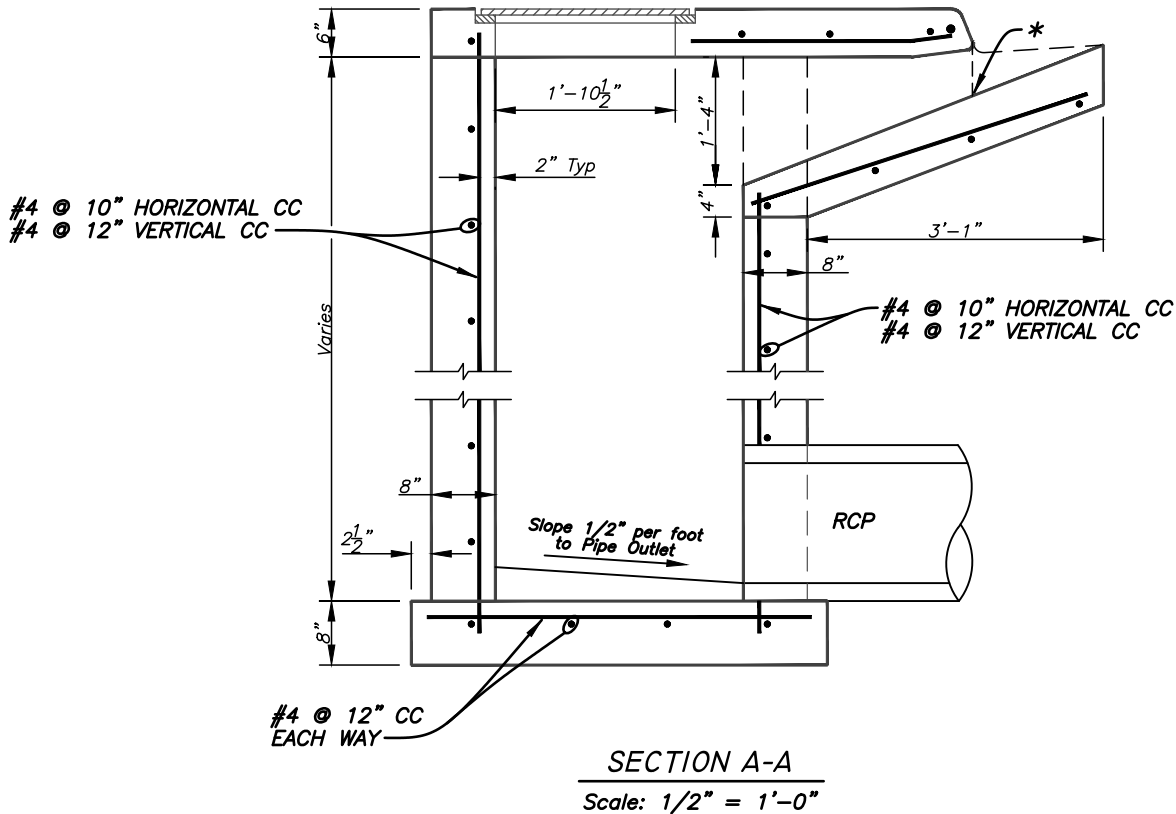
PLAN - TOP SLAB REINFORCEMENT
Scale: 1/2" = 1'-0"



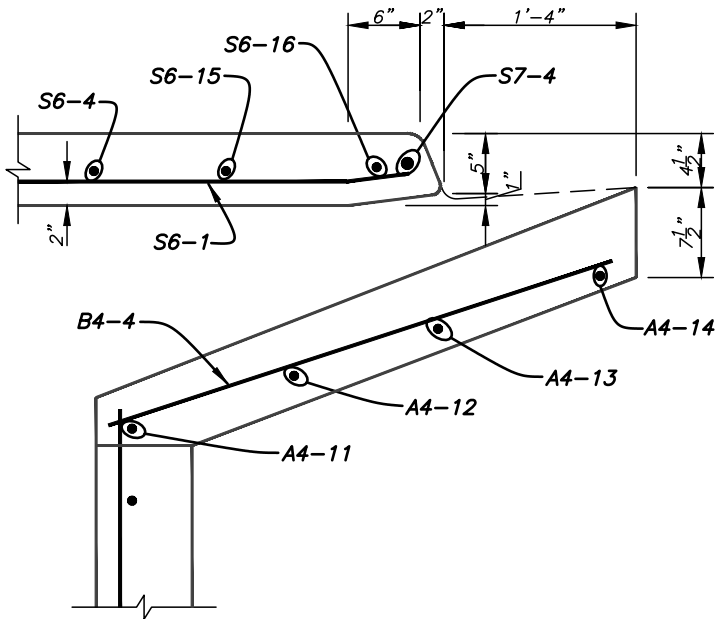
PLAN - APRON REINFORCEMENT
Scale: 1/2" = 1'-0"

No.	DATE	REVISIONS	DES: STORM	CITY of TAMPA Mobility Department Stormwater Engineering Division	STANDARD INLET DETAILS TYPE BR-2 CURB INLET	SHEET 20 OF 40
6			DRN: STORM			
5			CKD:			
4			DATE: 7/03			

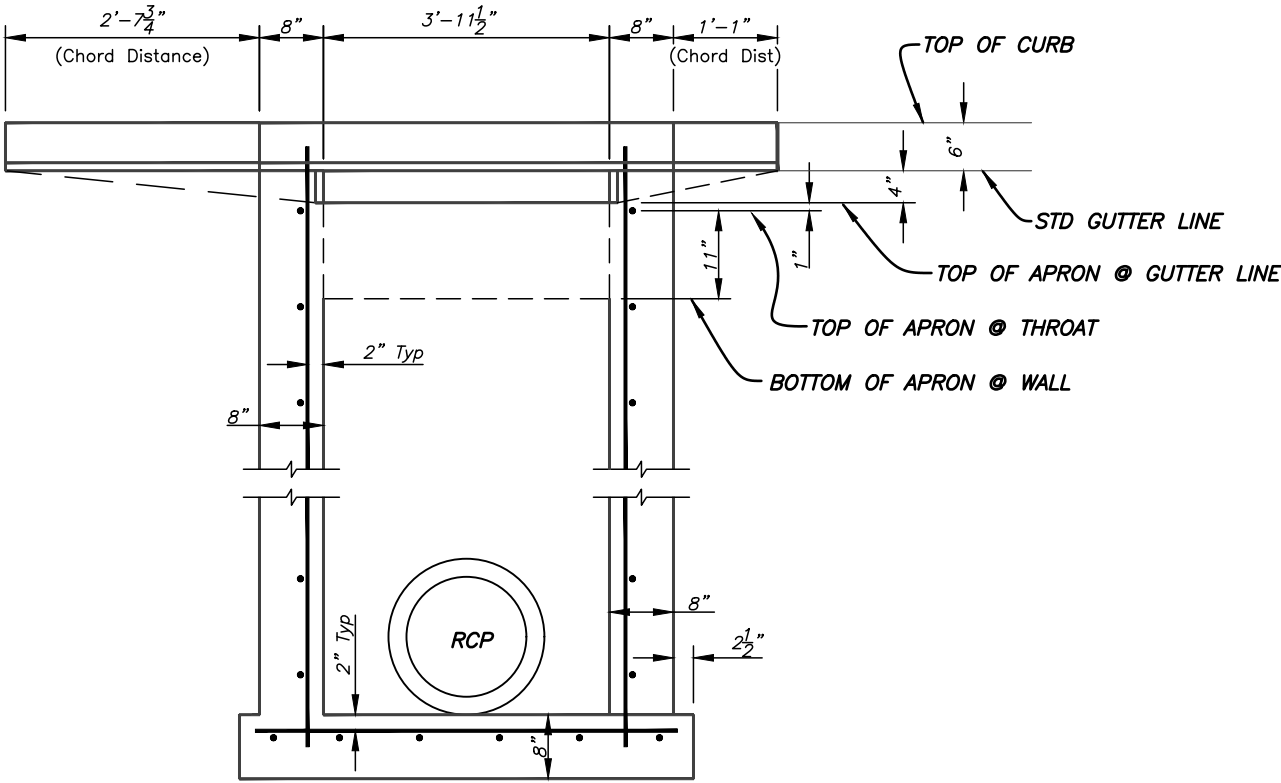
*LOCATION OF THROAT ELEVATION



SCHEDULE OF REINFORCING STEEL BARS (FOR INLET TOP AND APRON ONLY)											
MARK	SIZE	COUNT	LENGTH	WT EACH	TOTAL WT	MARK	SIZE	COUNT	LENGTH	WT EACH	TOTAL WT
A4-11	No 4	1	4' 2"	2.784	2.784	S6-3	No 6	1	1' 2 1/2"	1.814	1.814
A4-12	No 4	1	6' 11"	4.621	4.621	S6-4	No 6	4	3' 11 3/4"	5.976	23.906
A4-13	No 4	1	8' 1"	5.399	5.399	S6-8	No 6	2	1' 7 1/2"	2.441	4.882
A4-14	No 4	1	8' 5"	5.623	5.623	S6-13	No 6	1	5' 1 1/2"	7.698	7.698
B4-1	No 4	2	2' 9"	1.837	3.674	S6-14	No 6	1	5' 2 1/2"	7.822	7.822
B4-4	No 4	3	3' 6 3/4"	2.380	7.140	S6-15	No 6	1	6' 4 1/2"	9.575	9.575
B4-5	No 4	1	3' 3 1/2"	2.199	2.199	S6-16	No 6	1	7' 8"	11.516	11.516
B4-6	No 4	1	4' 0 3/4"	2.714	2.714	S7-4	No 7	1	7' 9 3/4"	15.970	15.970
B4-7	No 4	1	4' 10 1/2"	3.257	3.257	W4-1	No 4	2	3' 6"	2.338	4.676
S6-1	No 6	3	5' 3"	7.886	23.657	W4-2	No 4	2	2' 1"	1.391	2.783
S6-2	No 6	2	2' 11"	4.381	8.763						
TOTAL WEIGHT IN POUNDS										160.471	



SECTION B-B
Scale: 3/4" = 1'-0"



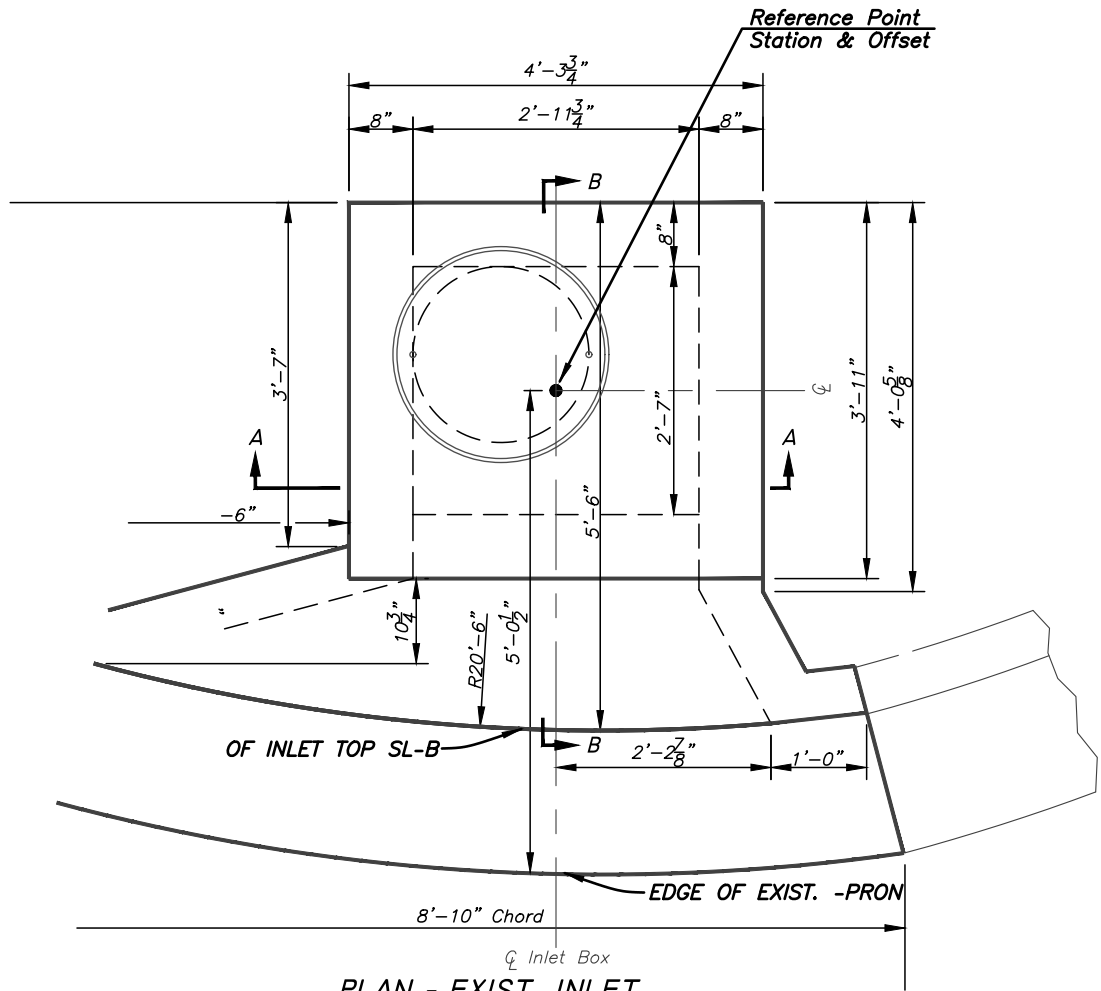
SECTION C-C
Scale: 1/2" = 1'-0"

No.	DATE	REVISIONS	No.	DATE	REVISIONS
3			6		
2			5		
1			4		

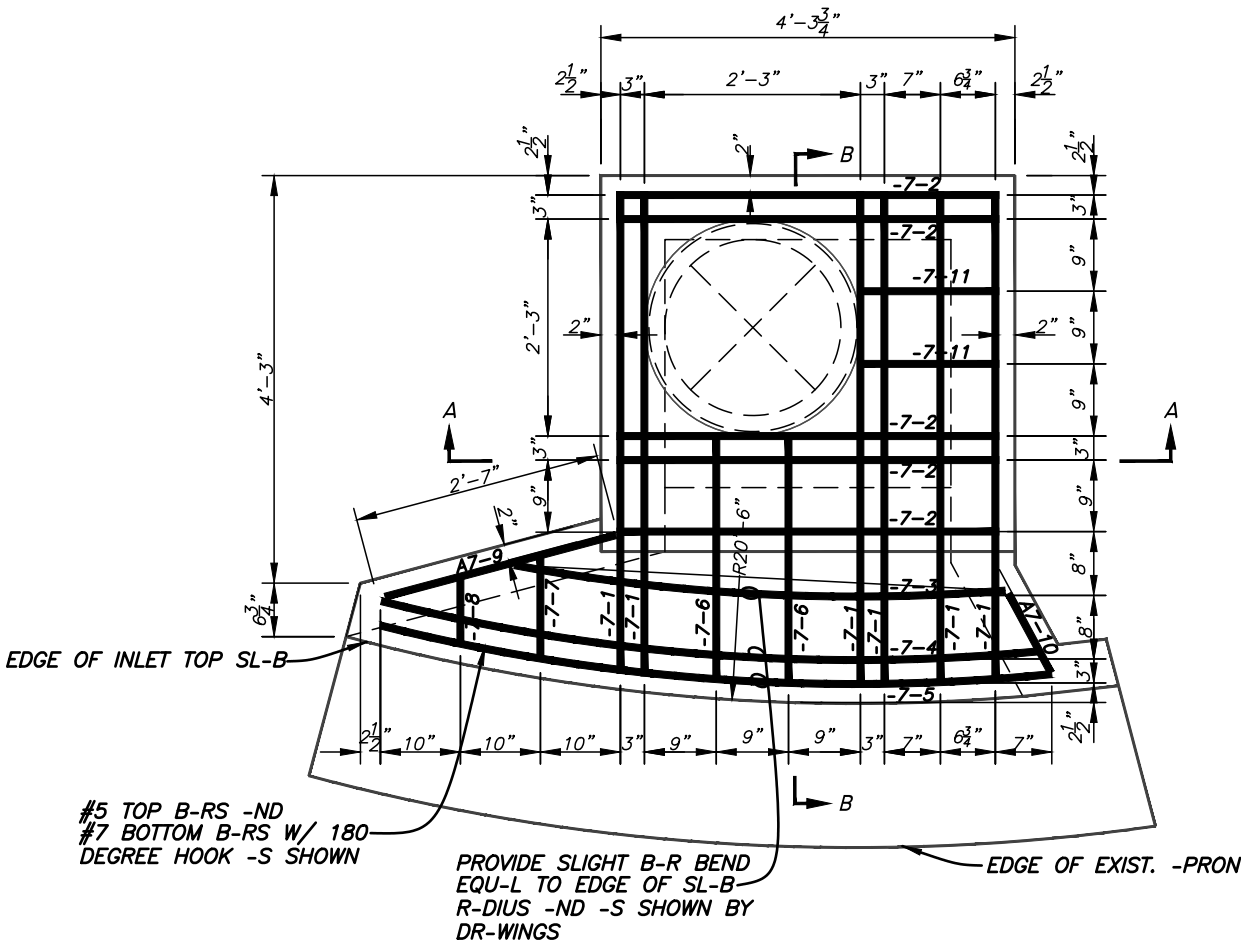
DES: STORM
DRN: STORM
CKD:
DATE: 7/03

CITY of TAMPA
Mobility Department
Stormwater Engineering Division

STANDARD INLET DETAILS
TYPE BR-2 CURB INLET



PLAN - EXIST. INLET
Scale: 1/2" = 1'-0"



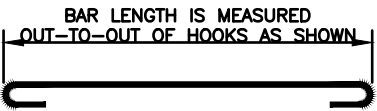
PLAN - NEW TOP SLAB REINFORCEMENT
Scale: 1/2" = 1'-0"
Note:
-LL B-RS SH-LL H-VE
180 DEGREE HOOKS
(TYPIC-L)

No.	DATE	REVISIONS	DES: STORM	CITY of TAMPA Mobility Department Stormwater Engineering Division	STANDARD INLET DETAILS HS-20 RATED TYPE BR-2 CURB INLET	SHEET 22 OF 40
6			DRN: STORM			
5			CKD:			
4			DATE: 9/23/13			

SCHEDULE OF REINFORCING #5 STEEL BARS (INLET TOP ONLY)					
MARK	SIZE	COUNT	LENGTH	WT EACH	TOTAL WT
A5-1	No 5	6	5'-1 1/4"	5.424	32.544
A5-2	No 5	5	3'-11 3/4"	4.172	20.86
A5-3	No 5	1	5'-1 1/2"	5.5	5.5
A5-4	No 5	1	6'-11"	7.3	7.3
A5-5	No 5	1	7'-0 1/2"	7.40	7.40
A5-6	No 5	2	2'-6 7/8"	2.72	5.44
A5-7	No 5	1	1'-1"	1.147	1.147
A5-8	No 5	1	8 1/2"	.78	.78
A5-9	No 5	1	2'-5 7/8"	2.575	2.575
A5-10	No 5	1	11"	.956	.956
A5-11	No 5	2	1'-5 1/2"	1.56	3.12
TOTAL WEIGHT IN POUNDS FOR TOP BARS					87.622

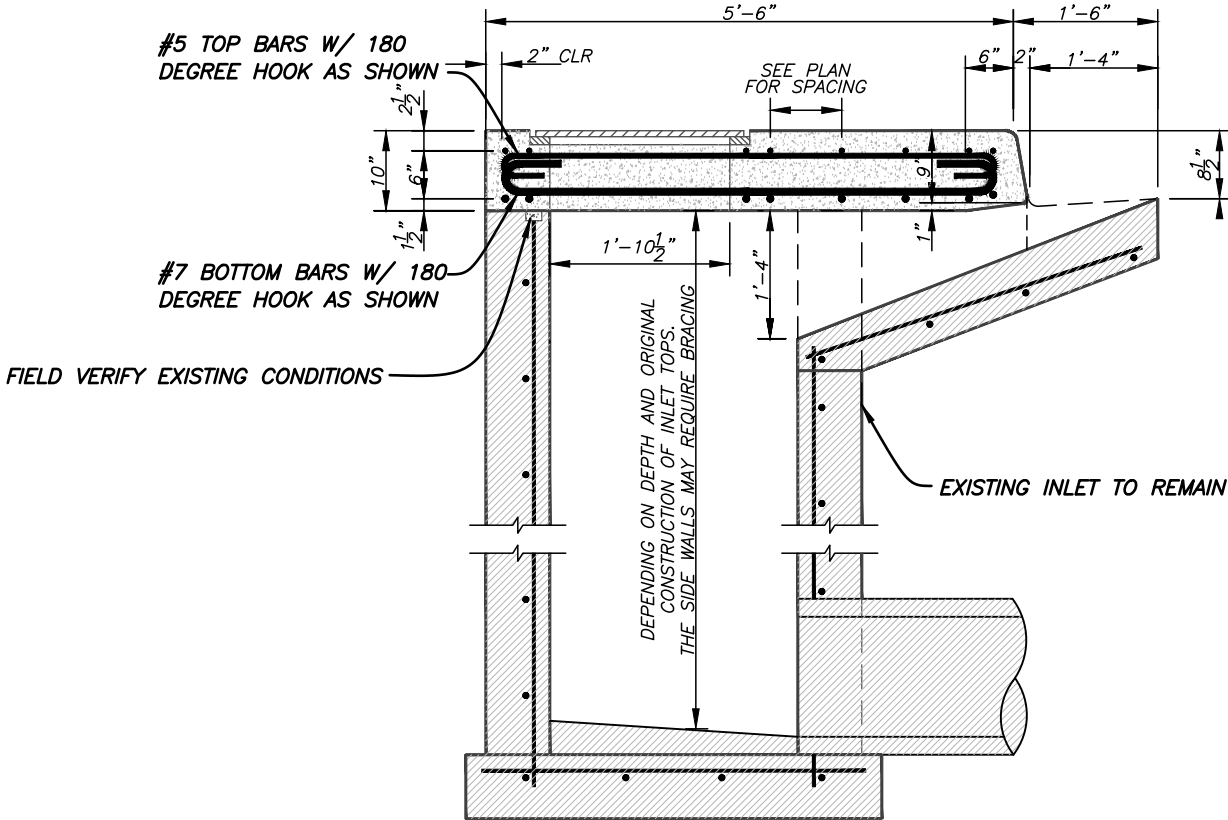
SCHEDULE OF REINFORCING #7 STEEL BARS (INLET TOP ONLY)					
MARK	SIZE	COUNT	LENGTH	WT EACH	TOTAL WT
A7-1	No 7	6	5'-1 1/4"	10.25	61.5
A7-2	No 7	5	3'-11 3/4"	8.176	40.88
A7-3	No 7	1	5'-1 1/2"	10.25	10.25
A7-4	No 7	1	6'-11"	14.3	14.3
A7-5	No 7	1	7'-0 1/2"	14.5	14.5
A7-6	No 7	2	2'-6 7/8"	5.32	10.64
A7-7	No 7	1	1'-1"	2.25	2.25
A7-8	No 7	1	8 1/2"	1.65	1.65
A7-9	No 7	1	2'-5 7/8"	5.11	5.11
A7-10	No 7	1	11"	1.874	1.874
A7-11	No 7	2	1'-5 1/2"	3.0	6.0
TOTAL WEIGHT IN POUNDS FOR BOTTOM BARS					168.954

NOTE 1)

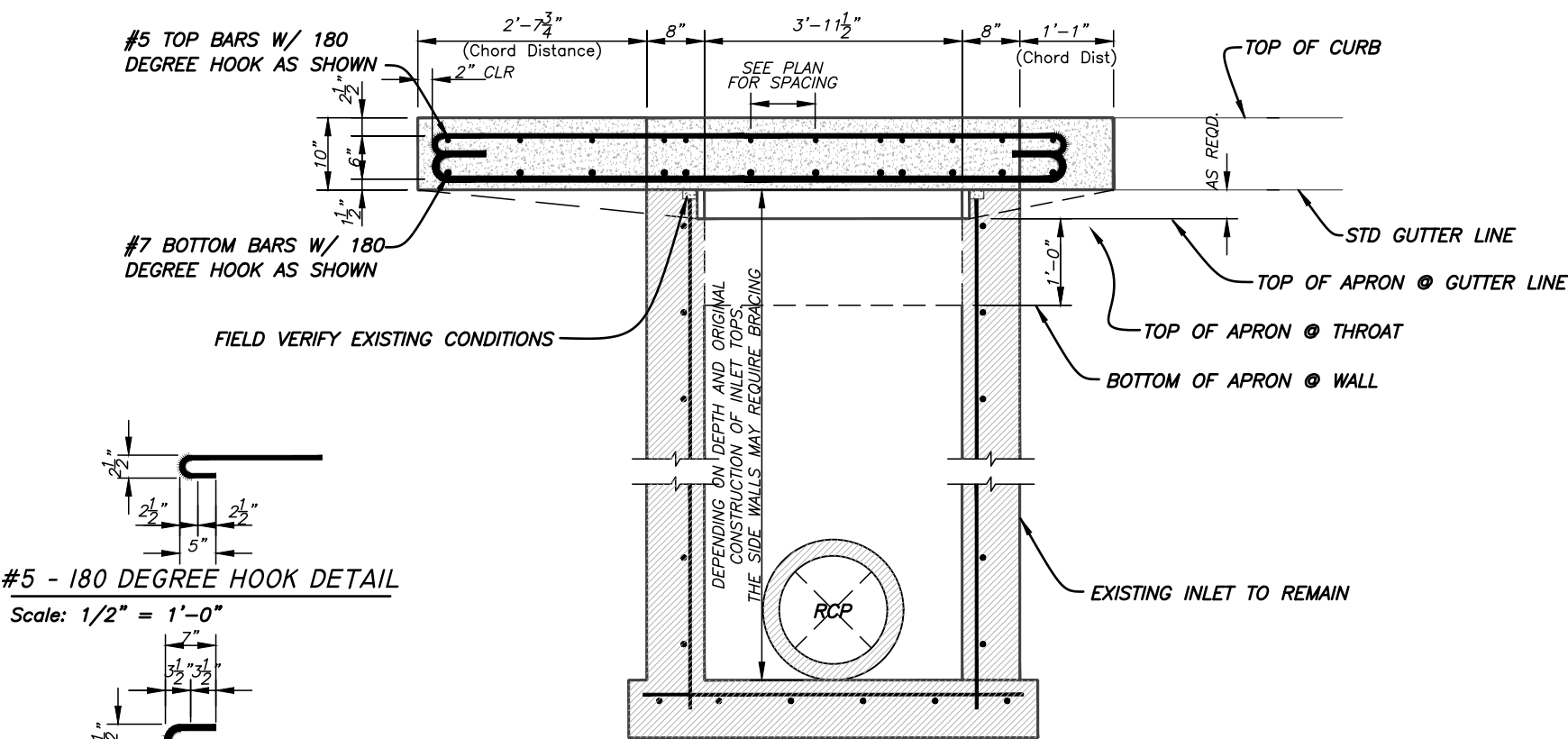


NOTE 2)

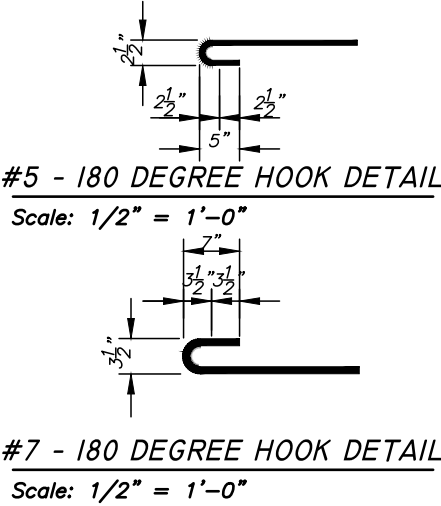
BAR LENGTH AND ASSOCIATED WEIGHT PROVIDED DOES
NOT INCLUDE THE BAR HOOK LENGTH AND WEIGHT.

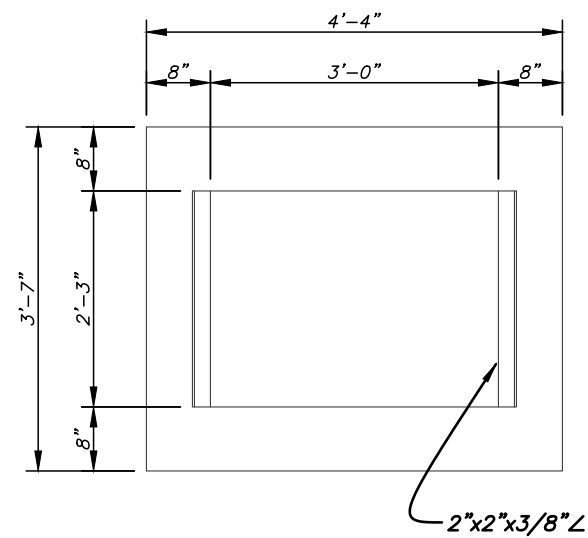


SECTION B-B
Scale: 1/2" = 1'-0"

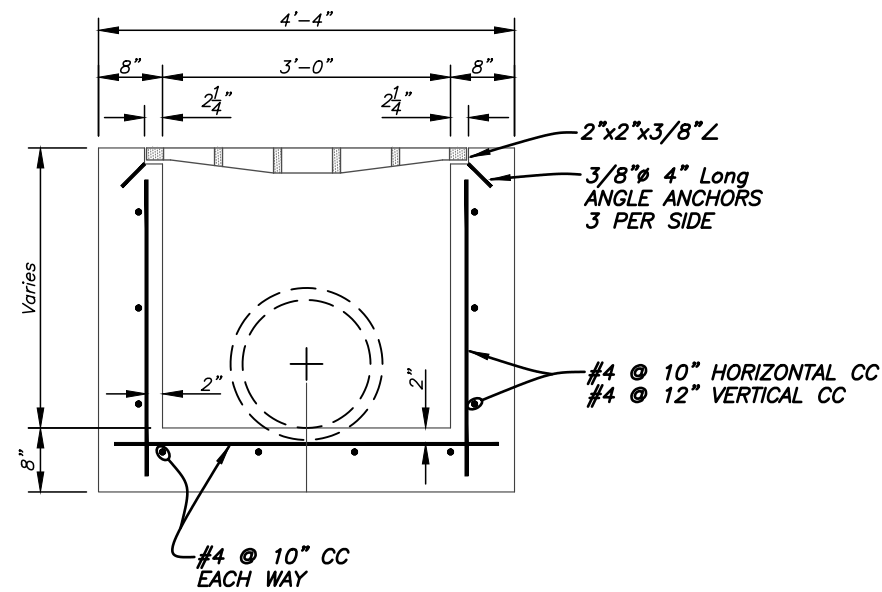


SECTION A-A
Scale: 1/2" = 1'-0"



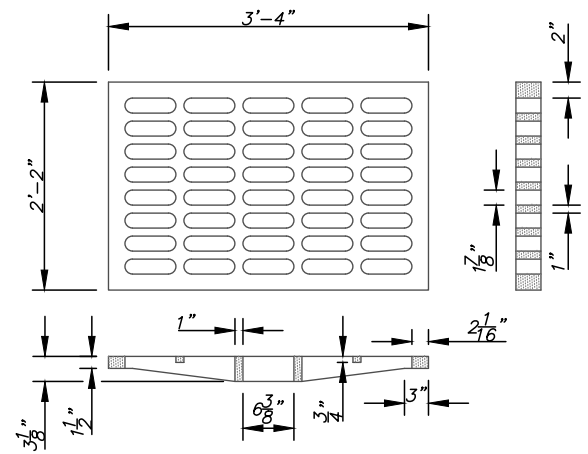


PLAN

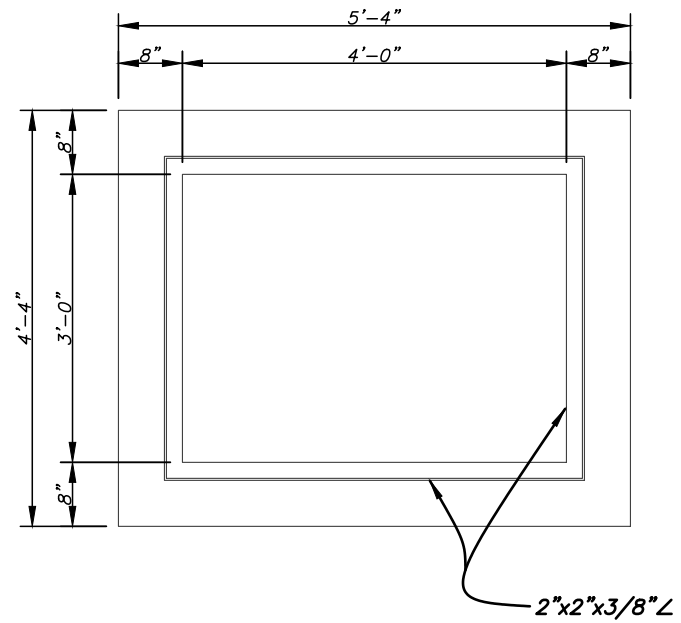


SECTION

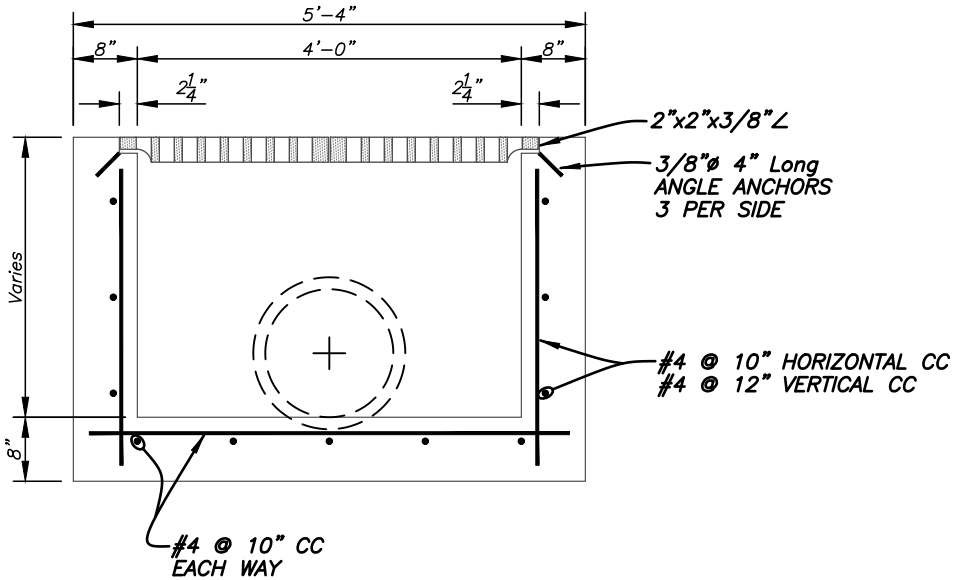
TYPE "T" GRATE INLET
Scale: 1/2" = 1'-0"



CAST IRON GRATING
Traffic Bearing

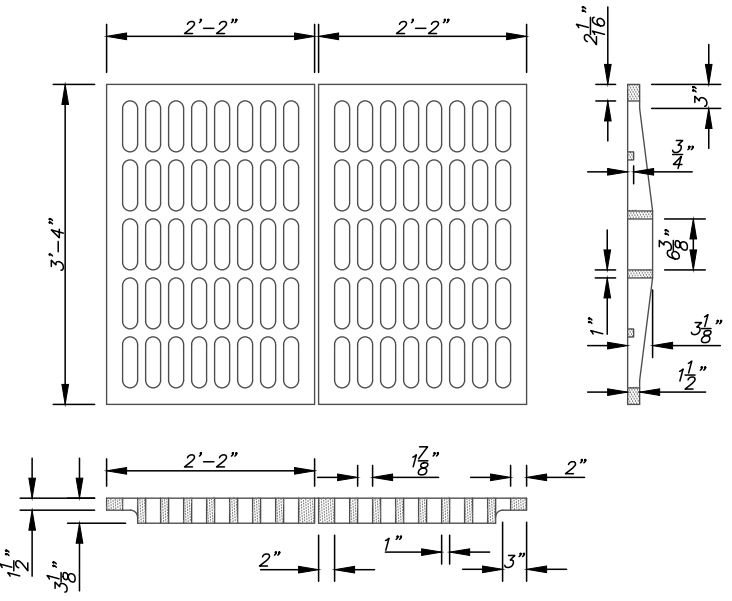


PLAN

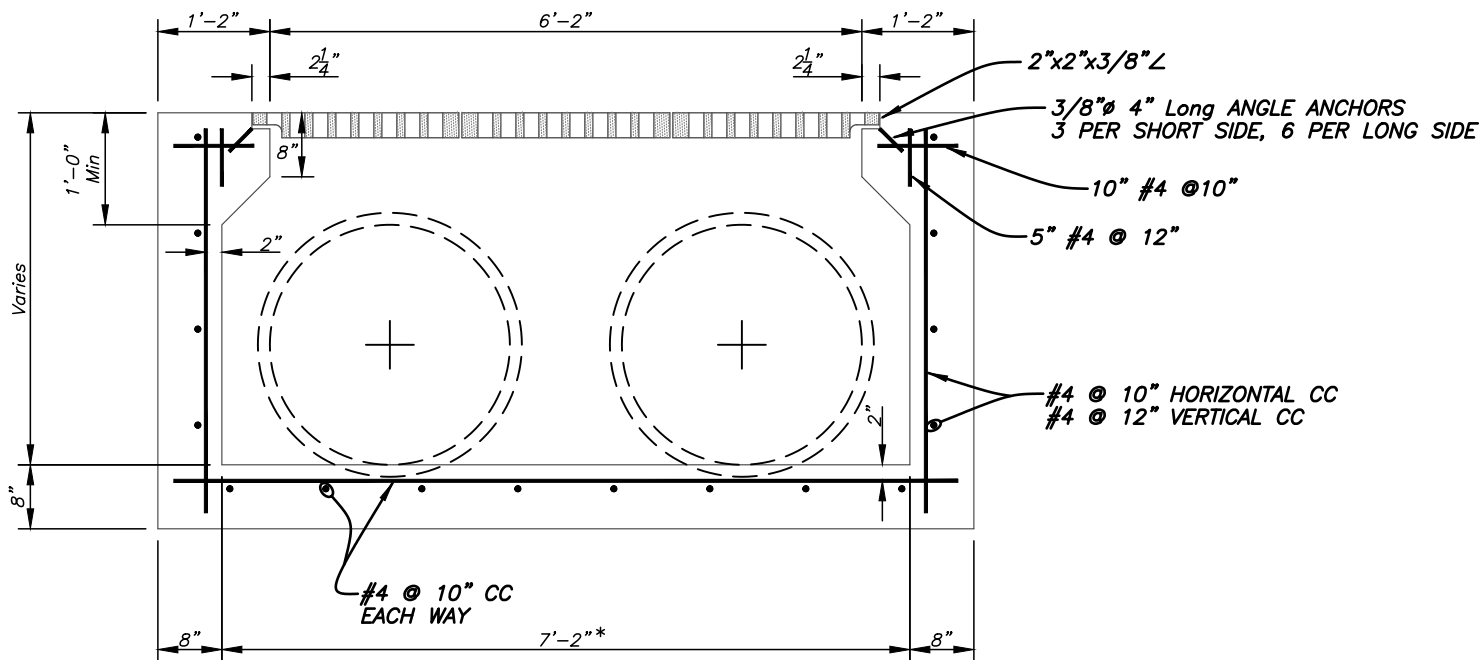
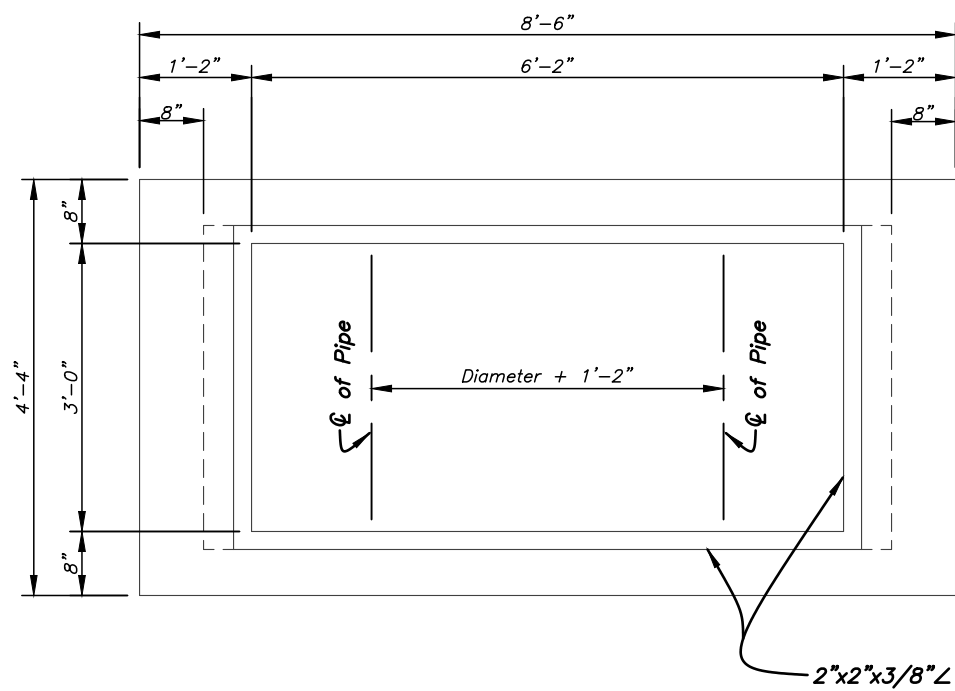


SECTION

TYPE "E" GRATE INLET
Scale: 1/2" = 1'-0"



CAST IRON GRATING
Traffic Bearing

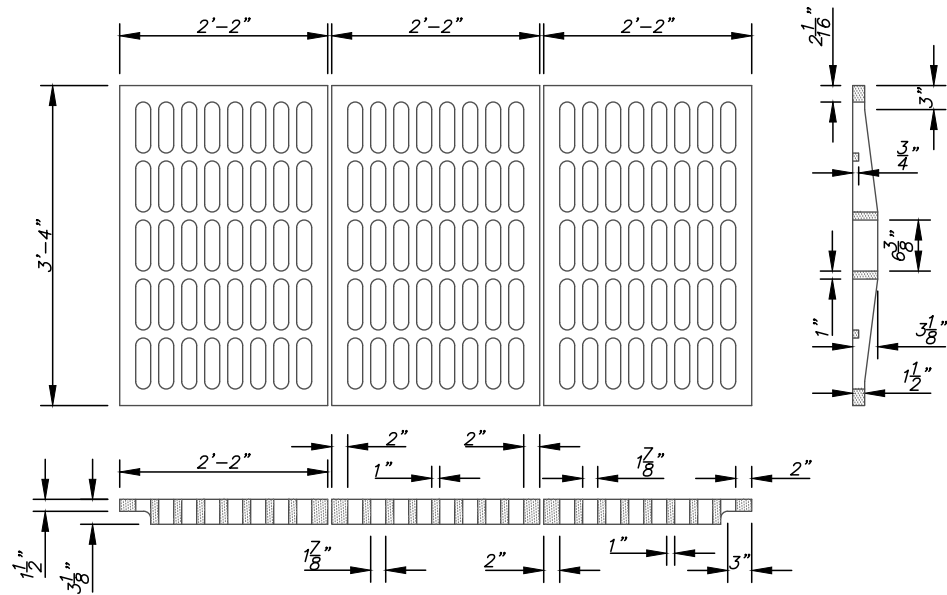


PLAN

SECTION

* WHEREVER POSSIBLE, 6'-2"x3'-0" INSIDE
DIMENSION BOX MAY BE USED WITH THE
ENGINEER'S APPROVAL.

NOTE:
IF SIDE OPENINGS (SLOTS) ARE DESIRED IN GRATE INLETS,
OPENINGS SHALL BE DESIGNED ON A CASE-BY-CASE BASIS,
AND SHALL ACCOUNT FOR SUPPORT OF THE CAST IRON GRATE
ABOVE THE OPENING.



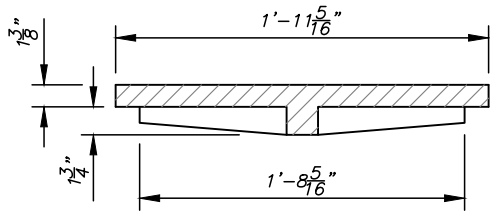
CAST IRON GRATING

Traffic Bearing

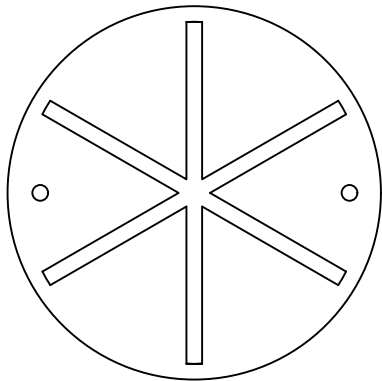
TYPE "H" GRATE INLET

Scale: 1/2" = 1'-0"

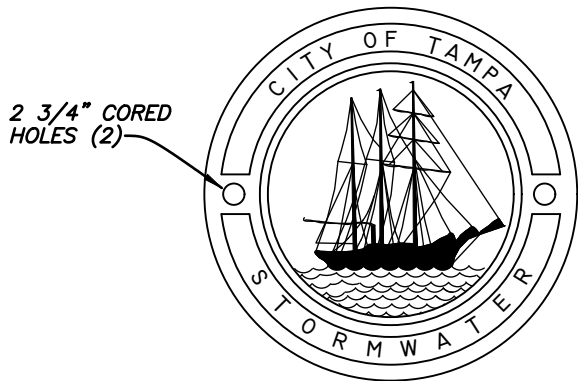
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3			6			DRN: STORM			
2			5			CKD:			
1			4			DATE: 7/03			



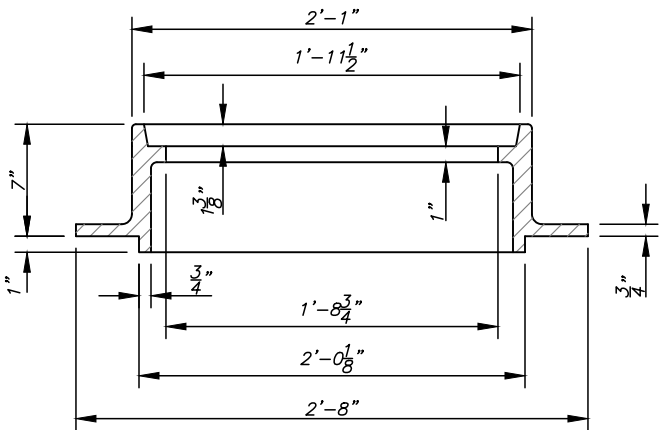
COVER SECTION



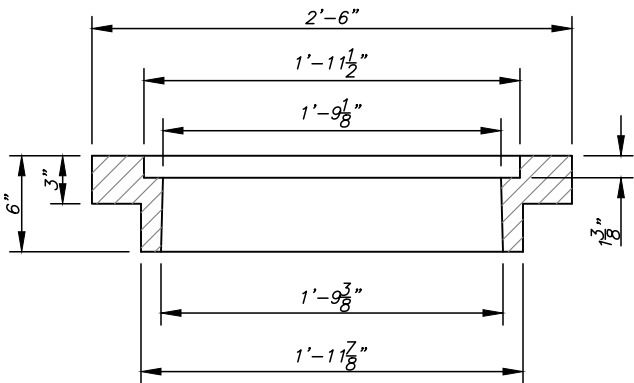
COVER B-CK



COVER F-CE



ST-ND-RD FR-ME SECTION



INVERTED FR-ME SECTION

MANHOLE FRAMES & COVER

Not To Scale

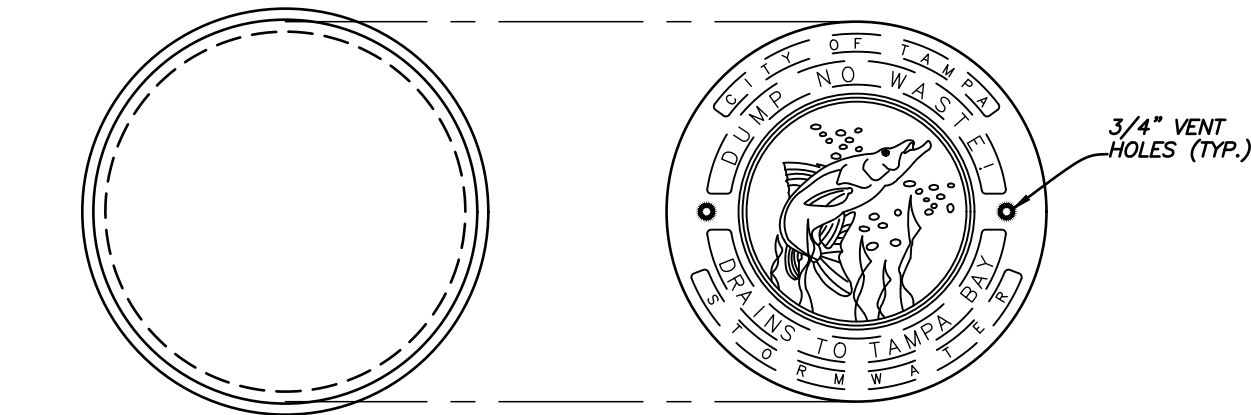
NOTE: Manhole structures shall be per FDOT Standard Index #200.

FOR CLOSED BASINS

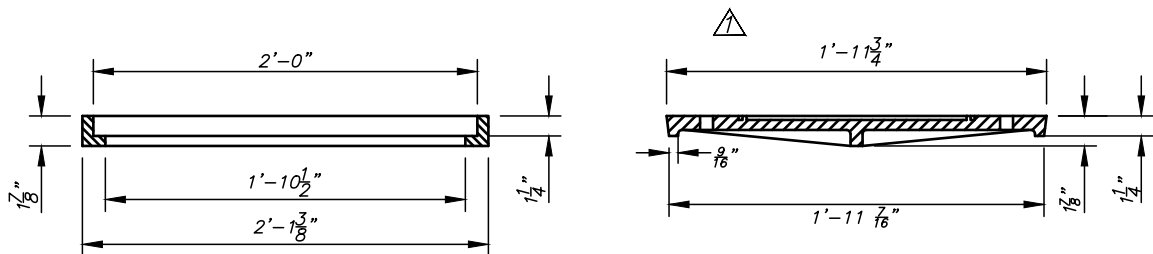
	No.	DATE	REVISIONS	DES: STORM	CITY of TAMPA Mobility Department Stormwater Engineering Division	STANDARD MANHOLE DETAILS	SHEET 26 OF 40
	6			DRN: STORM			
	5			CKD:			
	4			DATE: 7/03			

CURB INLET CONSTRUCTION NOTES
TYPES 1,2,3 AND BS-1, BV-1, BR-1, BR-2

1. Concrete for top slabs, bottom slabs, walls, aprons and curb-and-gutter transition sections shall be Class II Concrete, conforming to Section 346 of the project specifications, with reinforcing bars placement and spacing as indicated herein. Top slabs shall not be poured until all reinforcing bars have been placed, inspected and approval obtained.
2. Curb inlets are typically designed with the outlet pipe at the front wall of the structure. Otherwise, maximum pipe size that will fit the side wall of any standard curb inlet is 24 inches. Larger pipe sizes and 24-inch pipes meeting the side wall at an angle other than 90 degrees require a larger substructure. Curb inlets may be modified to utilize inlet risers and tops meeting City inlet standards with substructures meeting FDOT standards for structure bottoms (Index #200). Design of these non-standard inlet structures shall be on case-specific basis.
3. Refer to FDOT Standard Index #200 for reinforcing steel requirements at pipe openings. Any portion of the pipe protruding beyond the inside wall surface of the box shall be broken off and mortared to a smooth finish flush with the inside wall surface.
4. At the discretion of the Engineer, boxes may be constructed of solid clay or portland cement concrete brick and mortar. The inside surface of all brick walls shall be plastered with one-half inch minimum thickness of 1:2 mix sand-cement mortar and left with a smooth finish.
5. Minimum brick wall thickness shall be 7½ inches when the distance (depth) from the rim of the cast ring and cover to the top of the bottom slab does not exceed 8 feet, and shall be 12 inches when such depth exceeds 8 feet. Brick shall be laid in stretcher courses with every sixth course a header course.
6. Minimum clearance for all reinforcing bars shall be 1½ inches from the nearest surface of the concrete member. Top slab reinforcement shall be 2 inches from the bottom of the slab. Other minimum clearances are as shown in drawings.
7. Wing for inlet Types 2, BS-1 and BR-2 shall be placed on the upstream side of the center of box, with plan reversed if necessary because of the direction of gutter flow.
8. Curb transition sections shall be included in the contract price of the inlet, and no separate payment shall be made.
9. Top slab of all curb inlets shall be sloped at 2 percent toward the street.
10. Dimensions shown for inlet types BR-1 and BR-2 are for the indicated curb radius only. Chord dimensions at the curb shall remain constant for other curb radii. Contractor shall adjust other inlet dimensions and reinforcing steel quantities to fit actual curb radius shown in the project plans.
11. Reinforcing steel shall be ASTM Grade 60. Ring and cover material shall be ASTM-A48 Class 30 B Gray Iron.
12. Inlet cover weight is 85 lbs. (approximate).
13. All construction joints shall follow FDOT Standard Index #201.
14. Side openings (slots) for curb inlets are to be used on Type 1 inlets (offset) only. Rear openings (slots) may be used on any curb inlet type. Refer to Sheet 10 for guidance.
15. Refer to Section 425 of the project specifications for additional requirements.
- NOTE TO ENGINEER:**
Inlet types BS-1 and BV-1 shall be the preferred types for application on tangents. Inlet types 1, 2 and 3 shall only be used when dictated by conditions that would preclude the use of types BS-1 and BV-1.



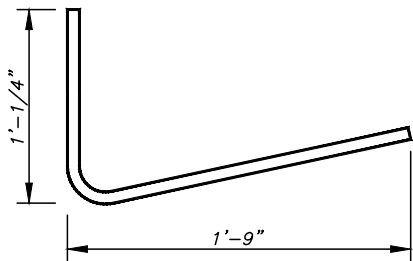
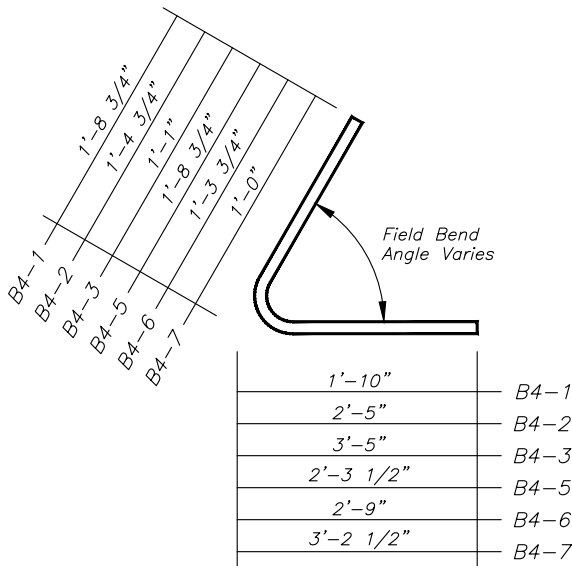
PLAN



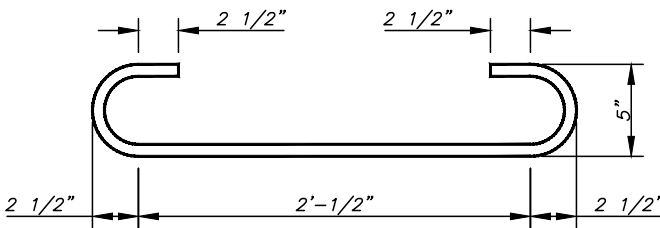
SECTION

STANDARD CAST IRON INLET
RING AND COVER

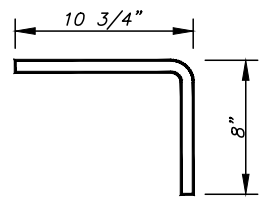
Scale: 1" = 1'-0"



A4-2



B6-1

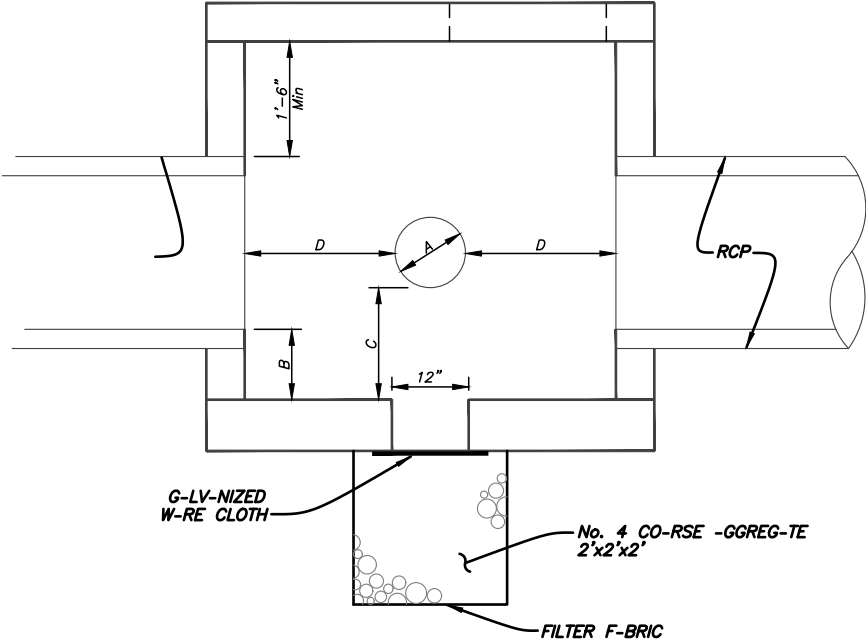


T6-5

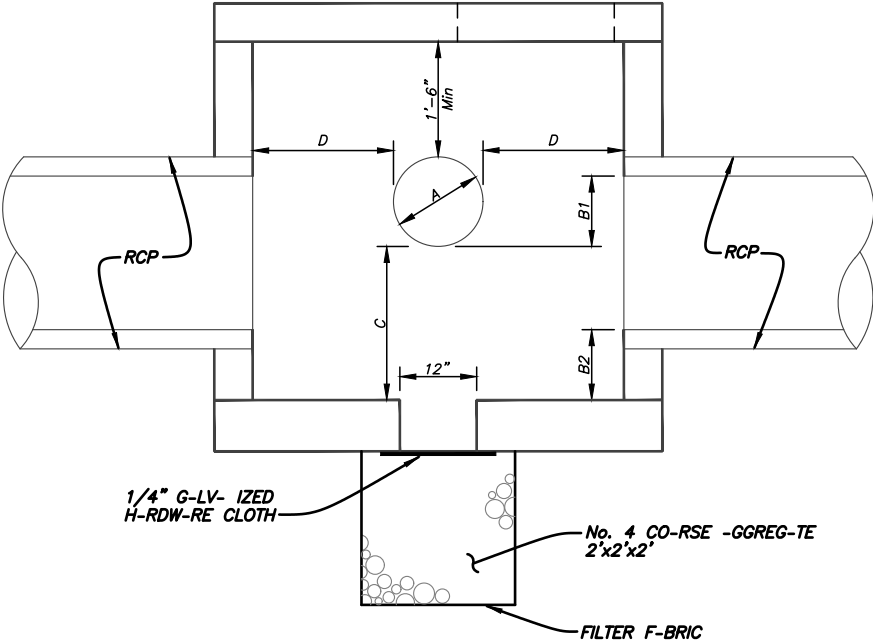
BENDING DIAGRAMS

Not To Scale

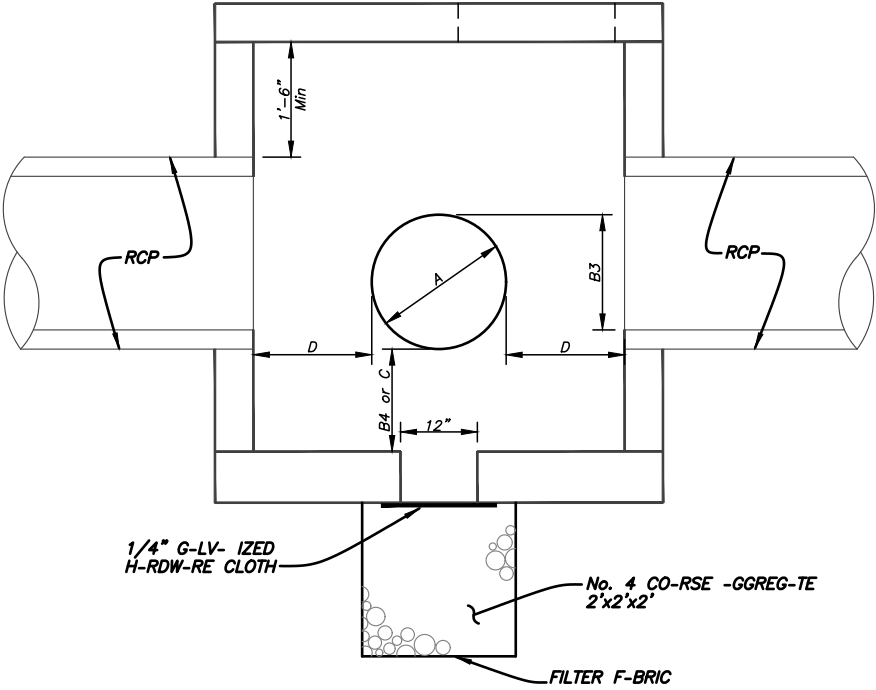
No.	DATE	REVISIONS	No.	DATE	REVISIONS	DES: STORM	CITY of TAMPA	STANDARD INLET DETAILS	SHEET
3			6			DRN: STORM	Mobility Department	WITH NP (SNOOK) LID	27
2			5			CKD:	Stormwater Engineering Division		OF 40
1	12/09/04	REVISED COVER DIMENSIONS	4			DATE: 7/03			



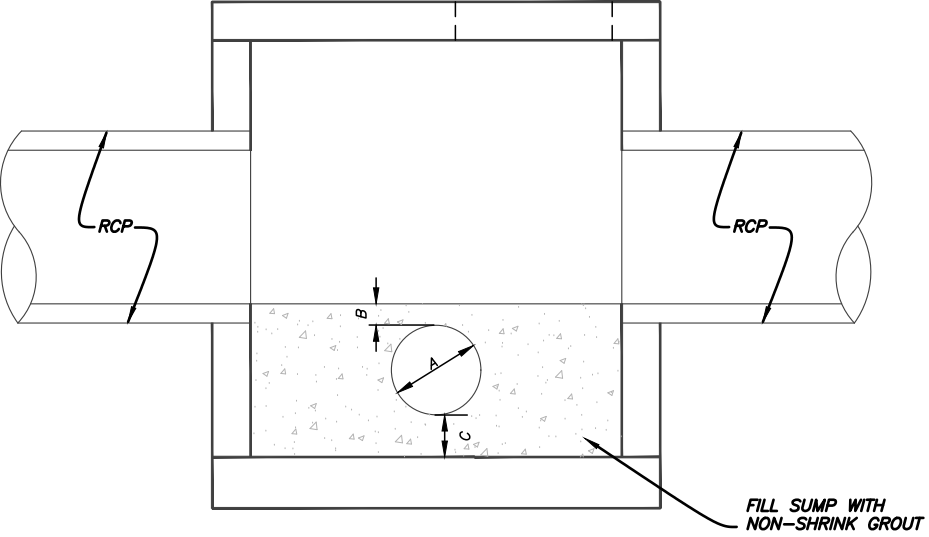
$B = -$
 $C = 1'-6"$ Minimum
(Use the greater of the two)
CONFLICT AT MID-POINT
Not To Scale



$B2 = B1$
 $C = 1'-6"$ Minimum
(Use the greater of the two)
CONFLICT AT CROWN
Not To Scale



$B4 = B3$
 $C = 1'-6"$ Minimum
(Use the greater of the two)
CONFLICT AT FLOWLINE
Not To Scale



$C = B$
CONFLICT BELOW FLOWLINE
WITH INSUFFICIENT CLEARANCE
Not To Scale

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utility line or sleeve.

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	No.	DATE	REVISIONS
	6		
	5		
LINE	4		

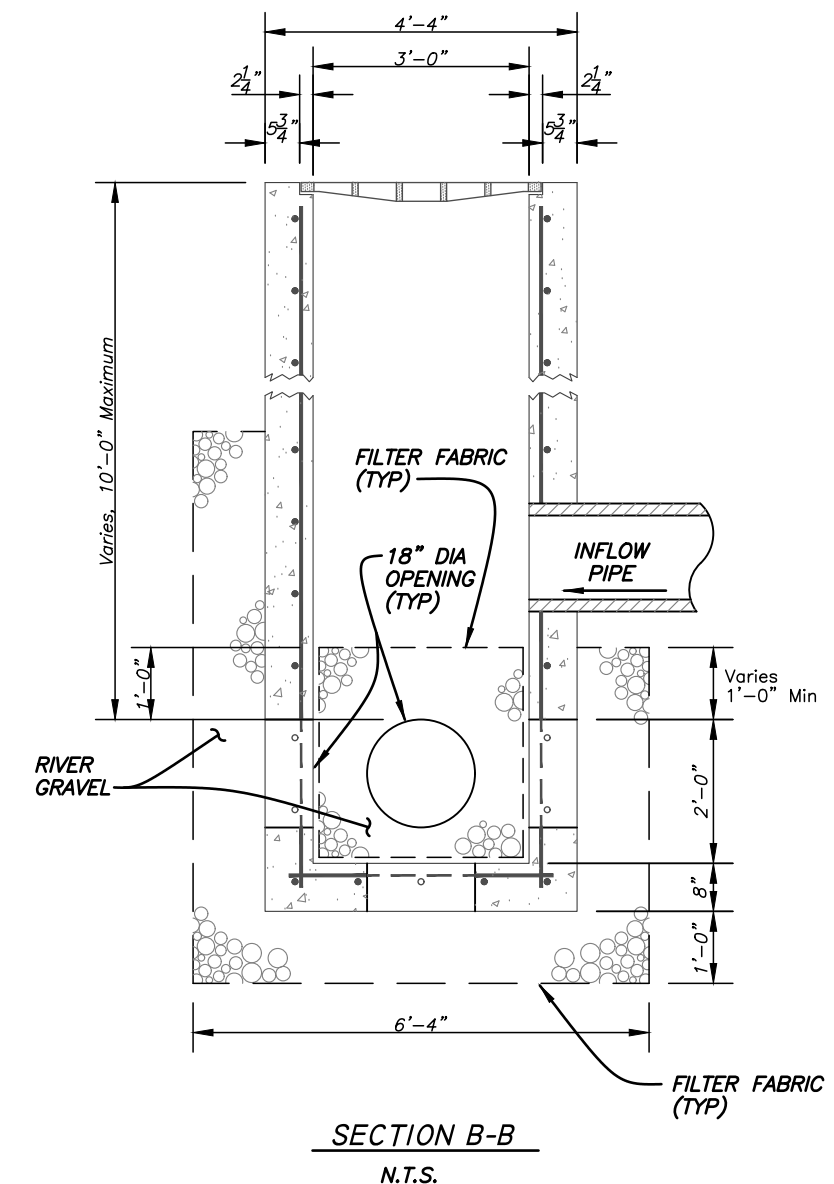
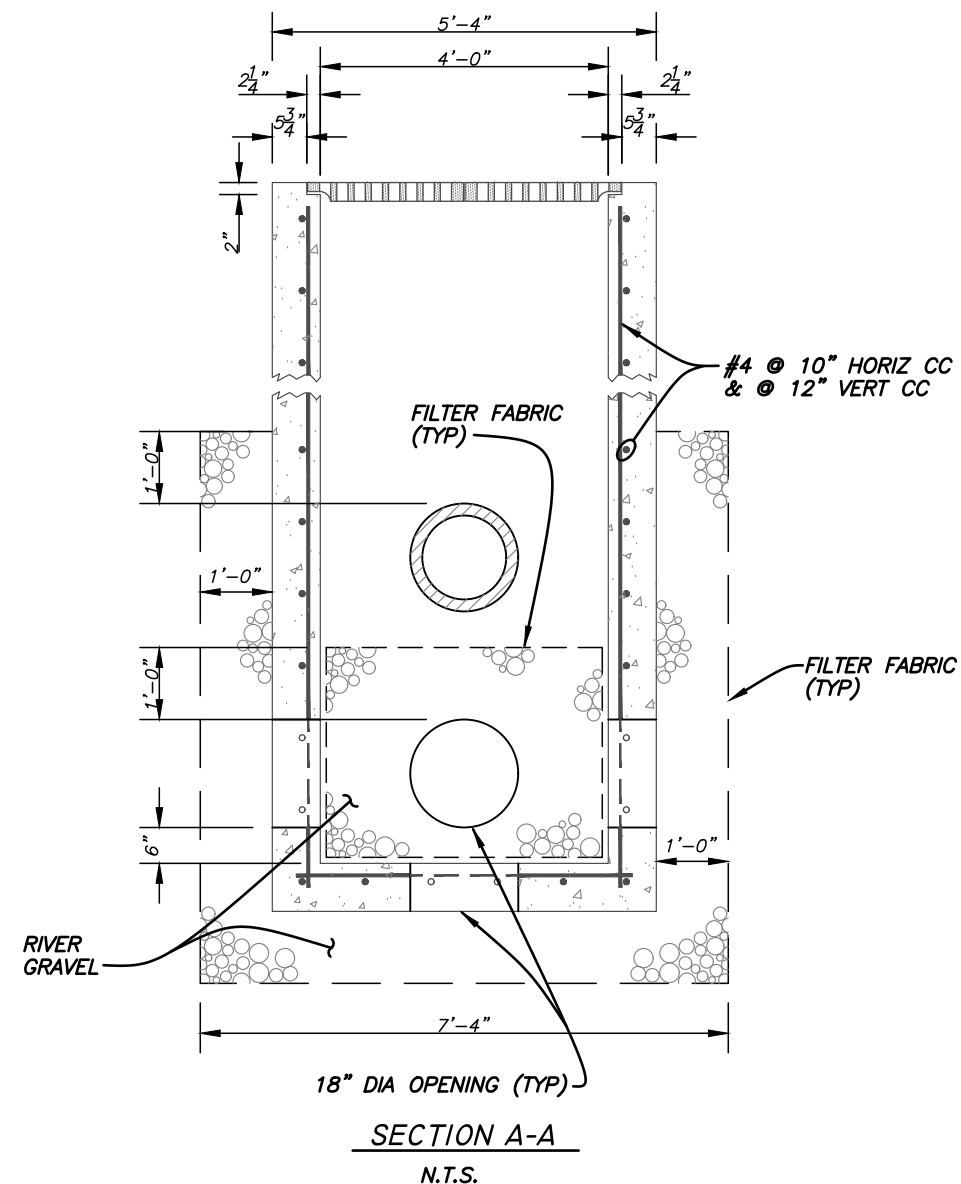
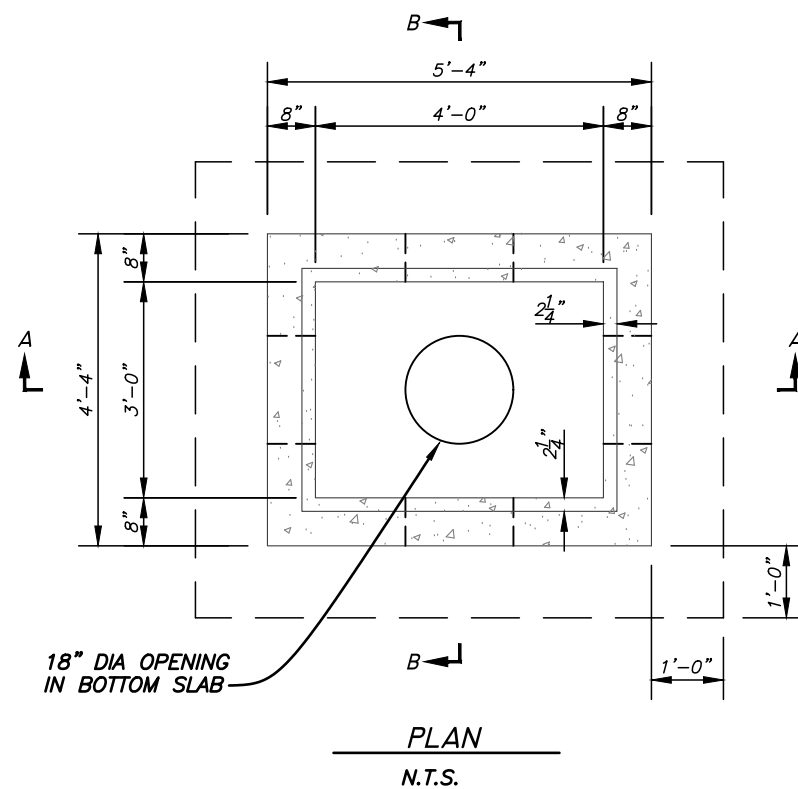
DES: STORM
DRN: STORM
CKD:
DATE: 7/03

CITY of TAMPA
Mobility Department
Stormwater Engineering Division

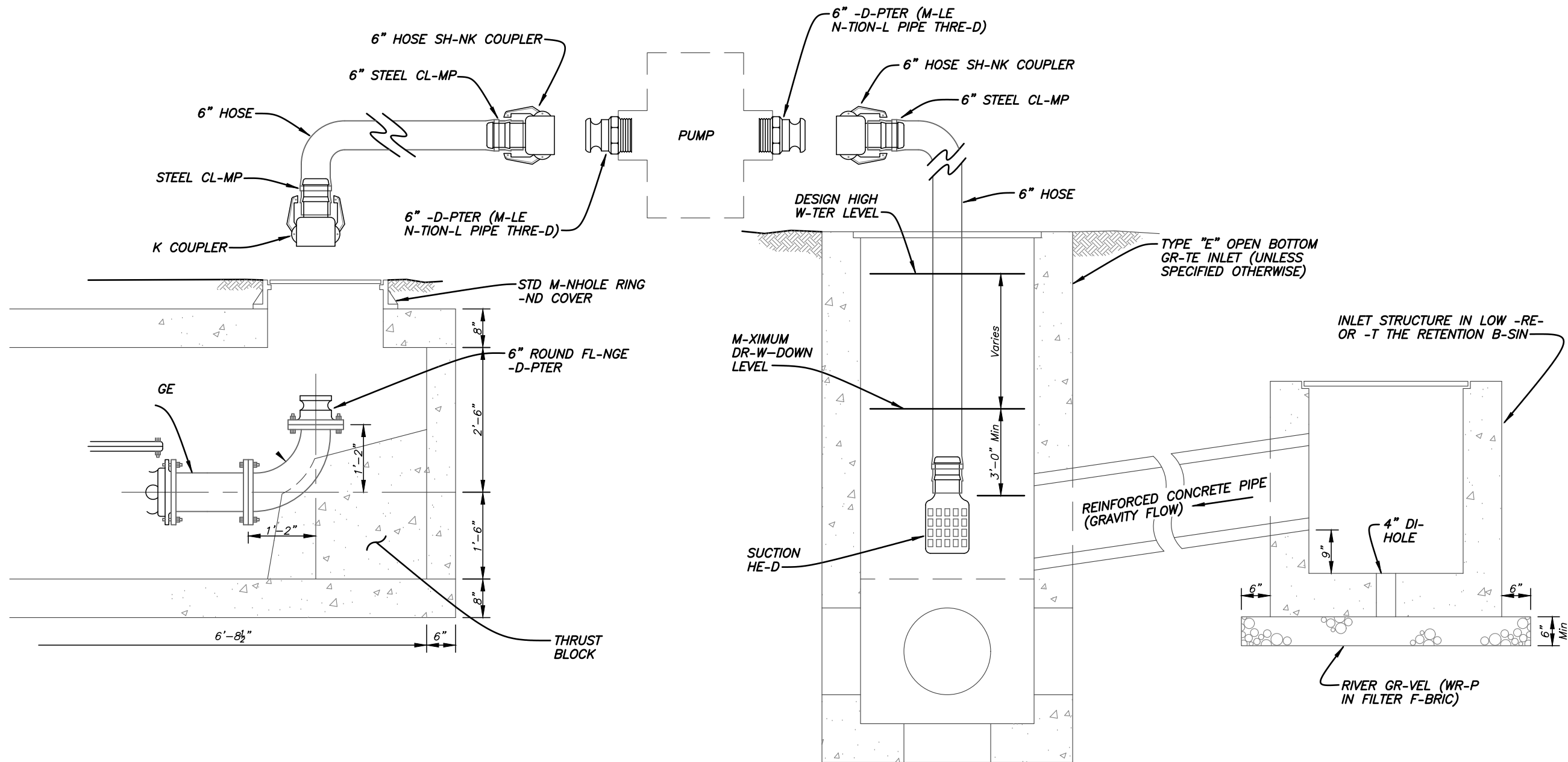
GUIDELINES FOR CONFLICT MANHOLES

NOTE:

1. *Open-bottom inlet shown herein is intended to be used at portable-pump locations (see temporary force main and pumping standards). For other open-bottom inlet applications, refer to FDOT Index #201 for guidance.*
2. *Follow Type "E" grate inlet standard for steel reinforcement of concrete.*
3. *For grate type and dimensions see Type "E" grate inlet standard.*
4. *A similar open-bottom substructure may be used in conjunction with City of Tampa curb type open-bottom inlets.*
5. *River gravel shall be clean and conform to D.O.T. specifications under Section 901-2 and shall meet ASTM size no. 4 gradation (1-1/2" to 3/4" size).*
6. *All exposed concrete corners and edges shall be chamfered 3/4".*
7. *Filter fabric shall meet FDOT Standard Specification 441-2.3.*



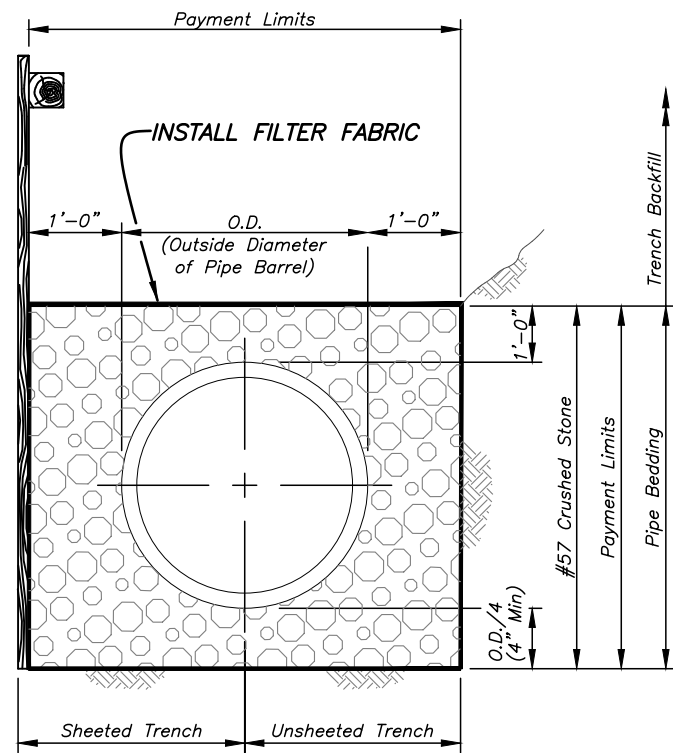
No.	DATE	REVISIONS	No.	DATE	REVISIONS	DES: STORM DRN: STORM CKD: DATE: 7/03	CITY of TAMPA Mobility Department Stormwater Engineering Division	STANDARD INLET DETAILS OPEN BOTTOM INLET (TYPE "E")	SHEET 29 OF 40
3			6						
2			5						
1			4						



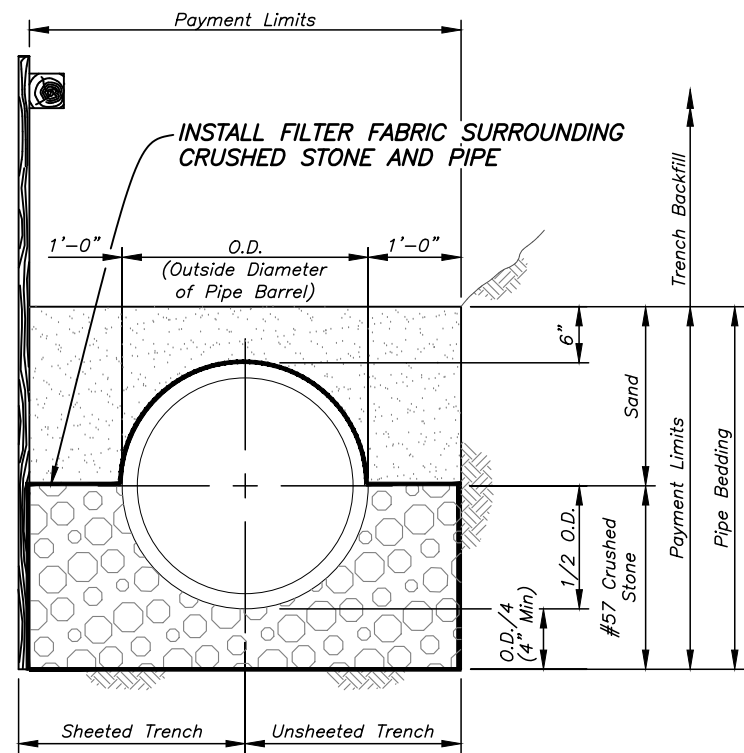
SECTION
Scale: 1/2" = 1'-0"

	No.	DATE	REVISIONS	DES: STORM	CITY of TAMPA Mobility Department Stormwater Engineering Division	TEMPORARY FORCE MAIN AND PUMPING STANDARDS	SHEET 30 OF 40
	6			DRN: STORM			
	5			CKD:			
	4			DATE:			

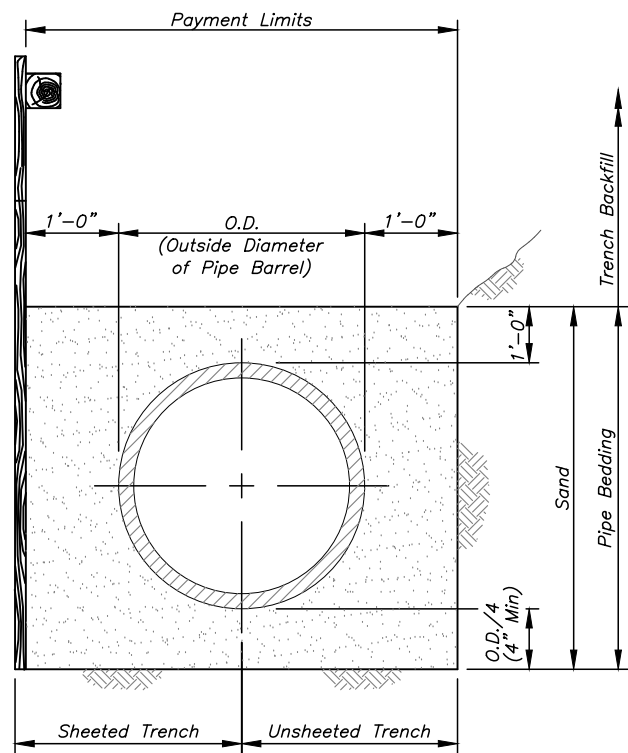
- Notes:
- 1. All types of pipe bedding shall extend to undisturbed earth at sides and bottom of the trench.
 - 2. Sand and crushed stone pipe bedding shall be placed and compacted in accordance with specifications.
 - 3. Bedding materials shall meet project specifications for Class B and Class C Bedding.
 - 4. Filter fabric shall meet FDOT Standard Specification 441-2.3.



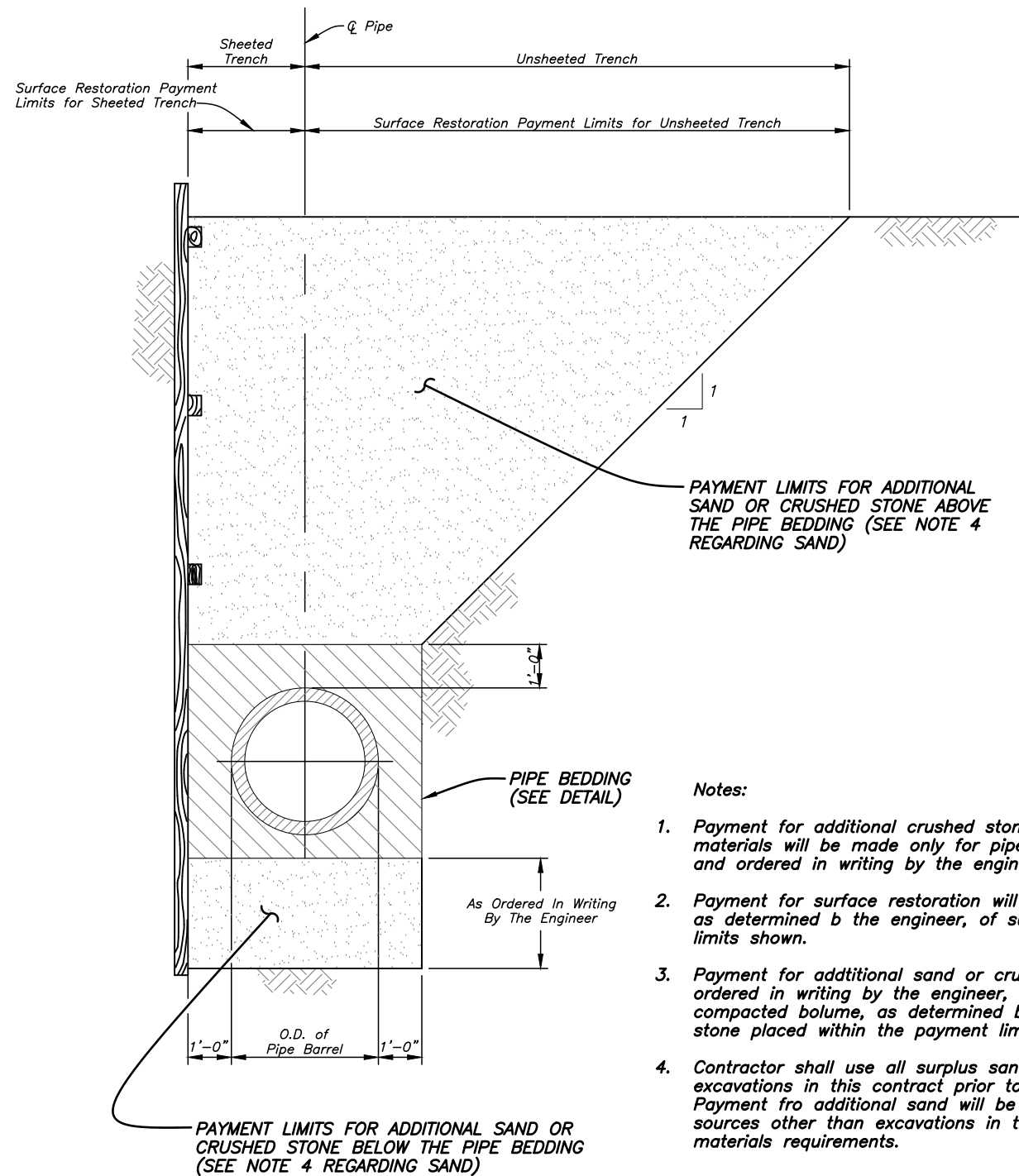
CLASS B-I BEDDING



CLASS B BEDDING



CLASS C BEDDING

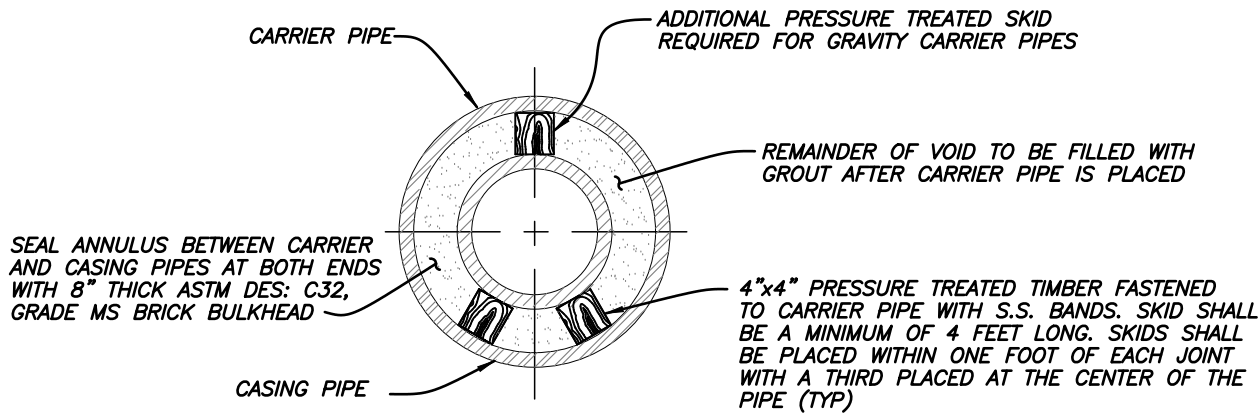


PAYMENT LIMITS FOR SURFACE RESTORATION
AND ADDITIONAL SAND OR CRUSHED STONE
FOR TRENCH STABILIZATION
Not To Scale

Notes:

1. Payment for additional crushed stone of Class D concrete pipe bedding materials will be made only for pipe bedding not shown in the plans and ordered in writing by the engineer.
2. Payment for surface restoration will be made for the actual quantities, as determined b the engineer, of surface restored within the payment limits shown.
3. Payment for additional sand or crushed stone fro trench stabilization, ordered in writing by the engineer, will be made for the actual compacted bolume, as determined by the engineer, of sand or crushed stone placed within the payment limits shown,
4. Contractor shall use all surplus sand, approved as suitable, from excavations in this contract prior to suppling sand from other sources. Payment fro additional sand will be made only for sand supplied from sources other than excavations in this contract. See specifications for materials requirements.

QUANTITIES FOR PAYMENT FOR ADDITIONAL PIPE BEDDING MATERIALS ORDERED IN WRITING BY THE ENGINEER											
NOMINAL INSIDE DIAMETER (INCHES)	15	18	24	30	36	42	48	54	60	66	72
CUBIC YARDS OF CONCRETE PER LINEAR FOOT OF PIPE IN CONCRERE ENCASEMENT	0.258	0.299	0.383	0.472	0.588	0.690	0.797	0.909	1.027	1.150	1.279
CUBIC YARDS OF CONCRETE PER LINEAR FOOT OF PIPE IN CLASS A BEDDING (CONCRETE CRADLE)	0.128	0.150	0.192	0.236	0.294	0.345	0.399	0.455	0.514	0.514	0.640
CUBIC YARDS OF CRUSHED STONE PER LINEAR FOOT OF PIPE IN CLASS B-1 BEDDING	0.304	0.362	0.479	0.608	0.781	0.936	1.103	1.281	1.471	1.673	1.887
CUBIC YARDS OF CRUSHED STONE PER LINEAR FOOT OF PIPE IN CLASS B BEDDING	0.111	0.143	0.207	0.280	0.381	0.475	0.578	0.590	0.810	0.939	1.078

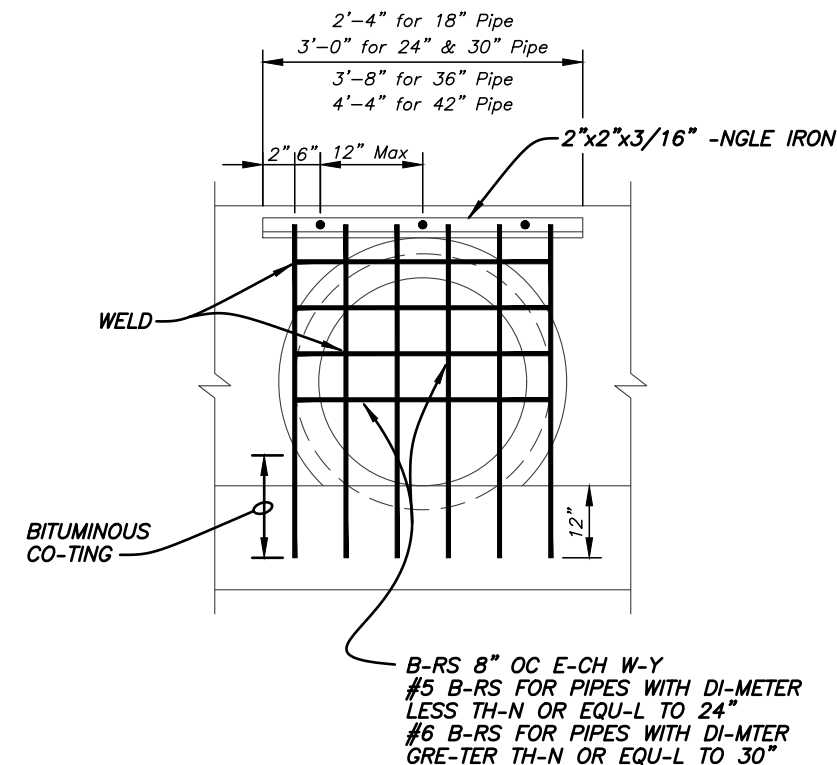
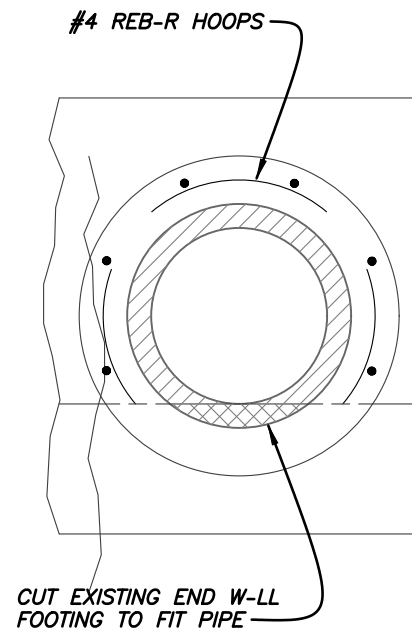


Notes:

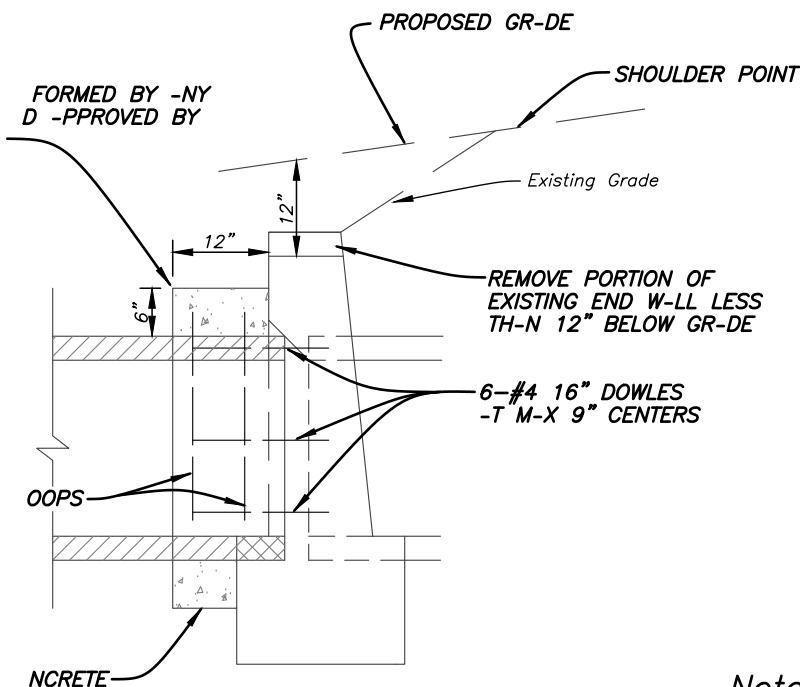
1. Stainless steel casing spacers as manufactured by Cascade or equal may be used rather than a timber skid system.
2. All casing ipes shall be welded steel pipe conforming to ASTM DES A139 Grade B or ASTMDES A53 Grade B, having a minimum inside diameter as indicated on plans. The minimum wall thickness shall be 3/8" or thicker if so indicated on the plan and profile drawings.

CORRESPONDING CARRIER AND CASING PIPE SIZES											
NOMINAL INSIDE DIAMETER OF CARRIER PIPE (INCHES)	15	18	24	30	36	42	48	54	60	66	72
MINIMUM INSIDE DIAMETER OF CASING PIPE (INCHES)	30	36	48	60	60	66	78	84	90	96	102

DETAIL OF JACKED CROSSINGS
Not To Scale



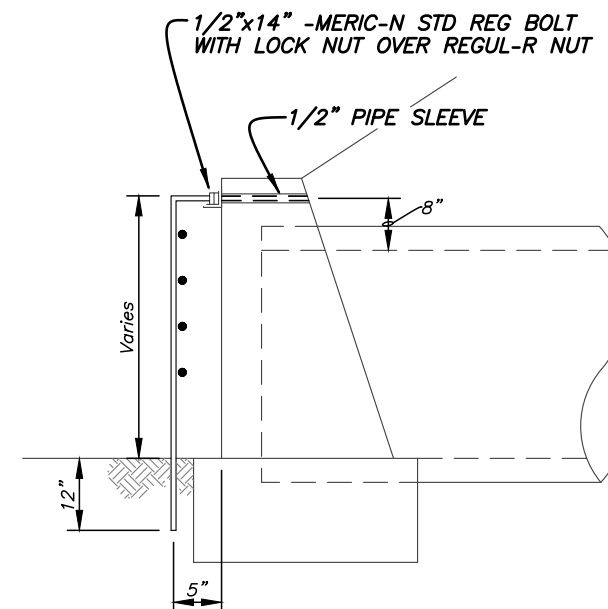
Note:
Guards to be constructed
only at locations
specified in detail plans



CRETE COLLAR FOR EXTENSION
OF EXISTING PIPE CULVERT

Not To Scale

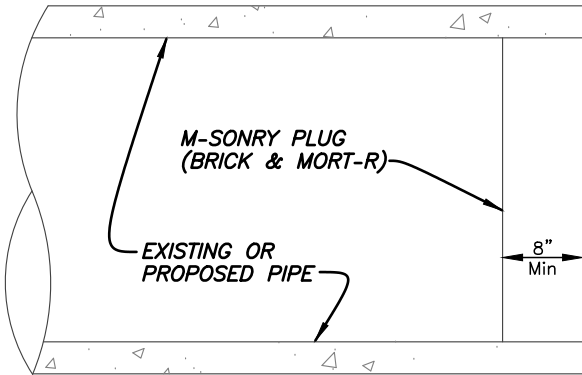
Note:
Stormwater Engineering
does not allow blind
conections to existing or
proposed pipes.



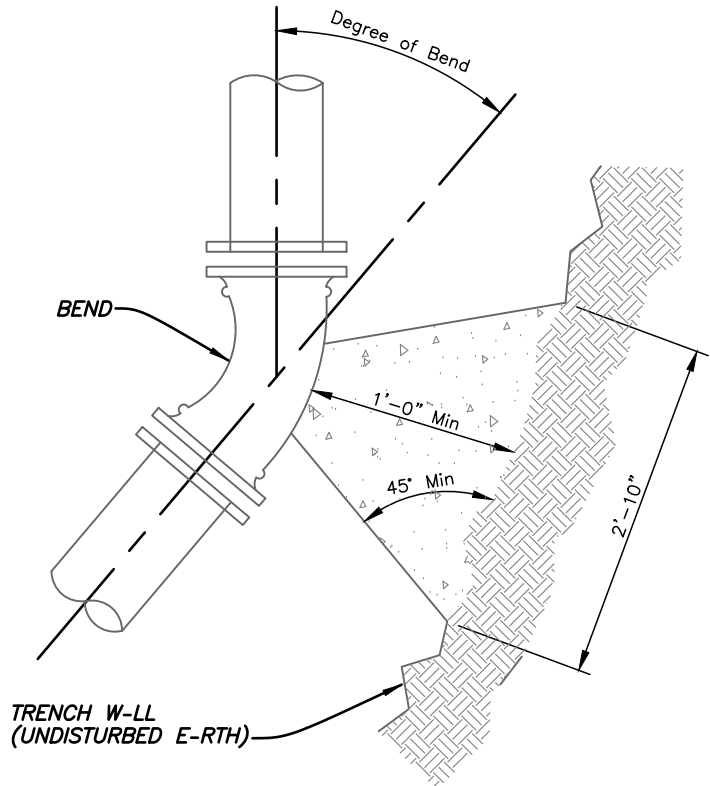
GUARD AT PIPE ENDS

Not To Scale

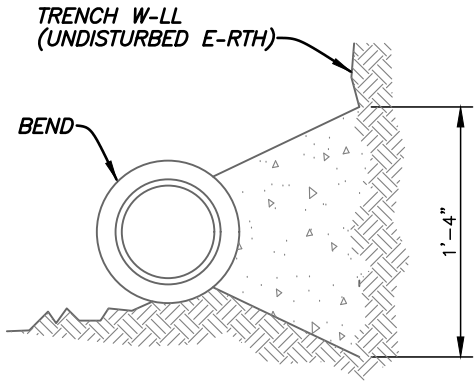
No.	DATE	REVISIONS	DES: STORM	CITY of TAMPA Mobility Department Stormwater Engineering Division	MISCELLANEOUS DETAILS	SHEET 33 OF 40
6			DRN: STORM			
5			CKD:			
4			DATE: 6/19			



PIPE PLUG
Not To Scale



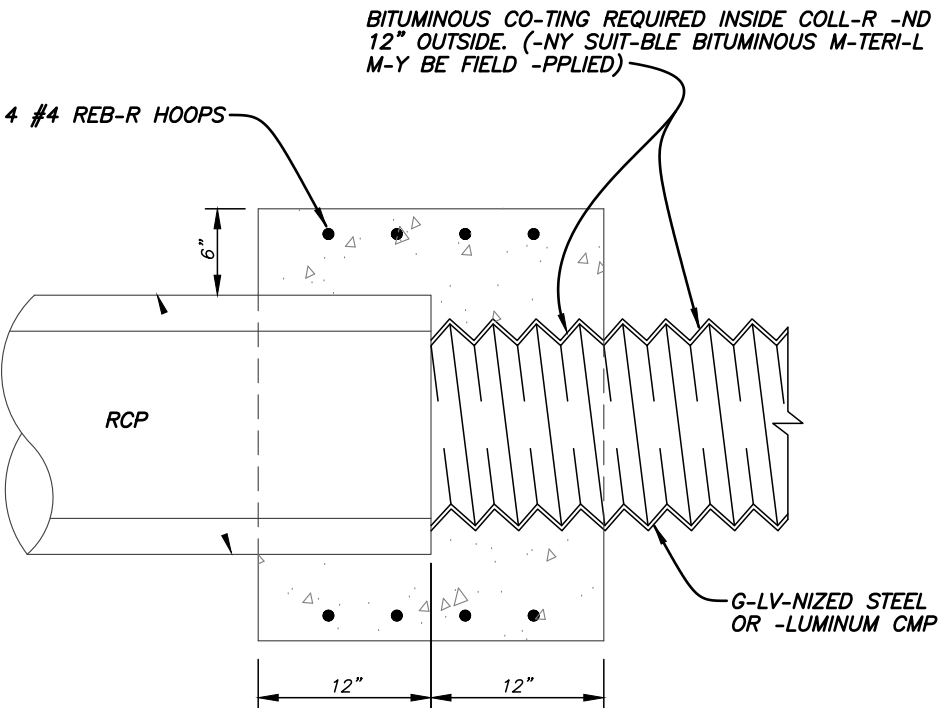
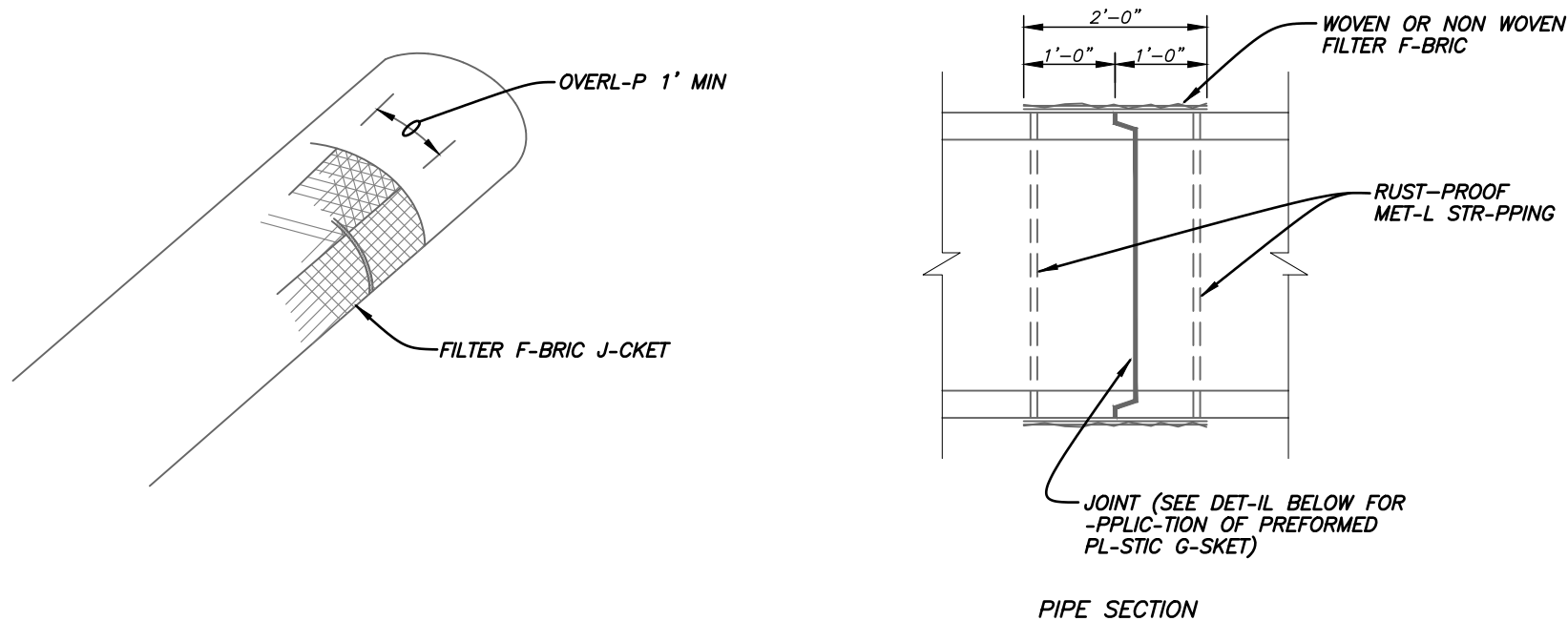
THRUST BLOCK
Not To Scale



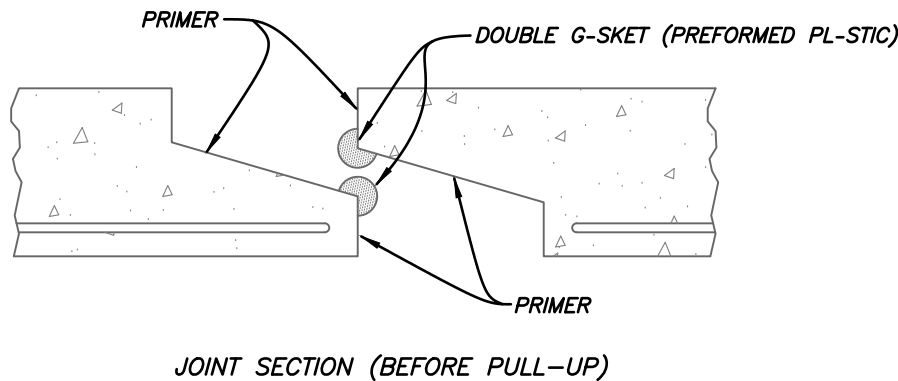
Notes:

1. Concrete shall be kept at sufficient distance from joints for removal of all joint accessories including bolts.
2. All bearing surfaces are to be carried to undisturbed soil.
3. Poor soil (silty soils, clay, muck or peat) will require larger thrust blocks.

	No.	DATE	REVISIONS	DES: STORM	CITY of TAMPA Mobility Department Stormwater Engineering Division	MISCELLANEOUS DETAILS	SHEET 34 OF 40
	6			DRN: STORM			
	5			CKD:			
	4			DATE: 7/03			



CONCRETE JACKET FOR CONNECTING
DISSIMILAR TYPES OF PIPES
Not To Scale



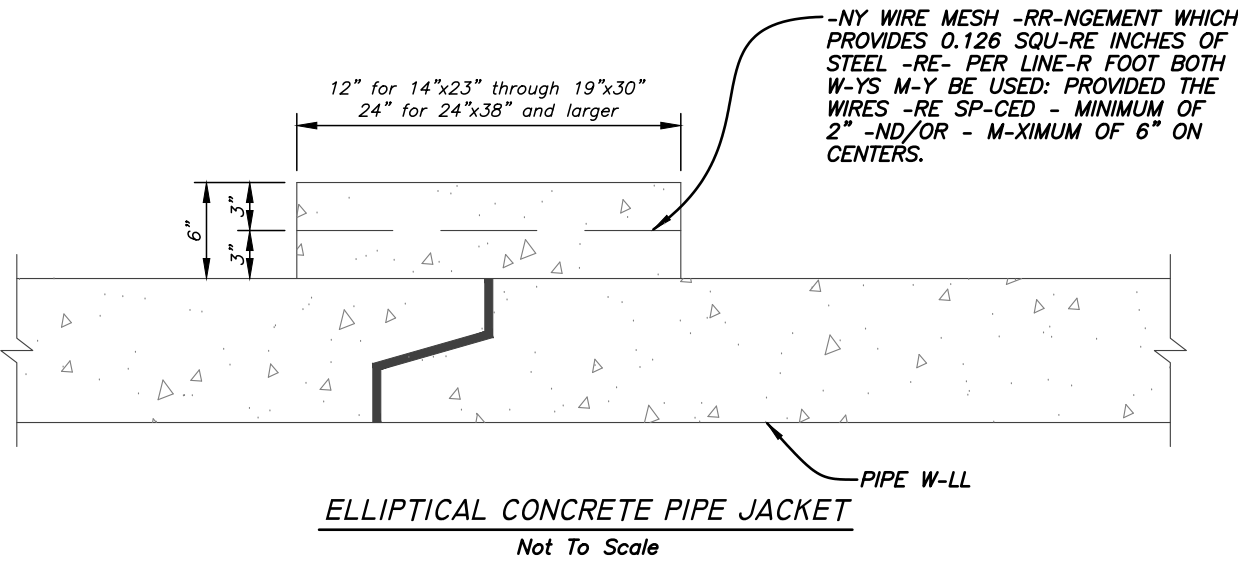
ELLIPTICAL CONCRETE PIPE JOINTS
Not To Scale

concrete jacket shall be provided at any

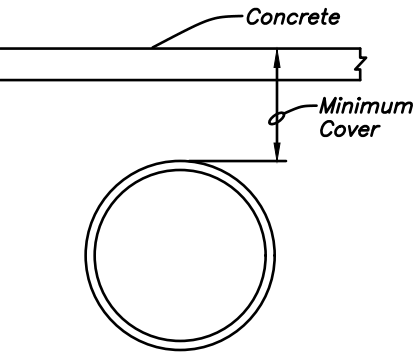
be provided at least at the last two joints
if the pipe is not secured by an end
ecify concrete jacket at other joints.

et and filter fabric jacket are to be included
il pipe culverts.

t FDOT Standard Specification 441-2.3.



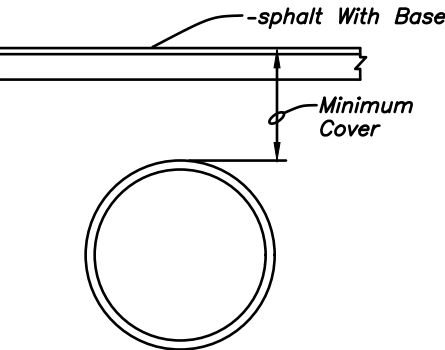
No.	DATE	REVISIONS	DES: STORM	CITY of TAMPA Mobility Department Stormwater Engineering Division	MISCELLANEOUS DETAILS	SHEET 35 OF 40
6			DRN: STORM			
5			CKD:			
4			DATE: 7/03			



CONCRETE APRON *

CULVERT PIPE	MINIMUM COVER
Class III RCP	12"
Class IV RCP	9"
Corrugated HDPE	12"
C-900 PVC	12"

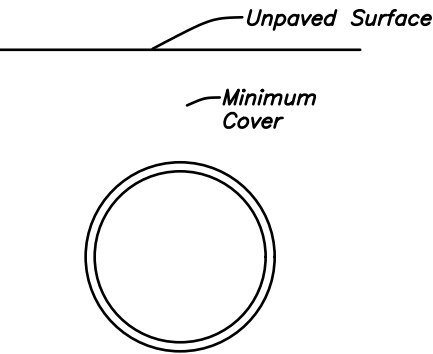
ROUND PIPE TO ELLIPTICAL PIPE CONVERSION	
ROUND PIPE	ELLIPTICAL PIPE (Concrete Only)
15"	12" x 18"
18"	14" x 23"
24"	19" x 30"
30"	24" x 38"



ASPHALT APRON *

CULVERT PIPE	MINIMUM COVER
Class III RCP	15"
Class IV RCP	12"
Corrugated HDPE	15"
C-900 PVC	15"

ROUND PIPE TO TRENCH DRAIN CONVERSION	
ROUND PIPE	CROSS-SECTIONAL AREA (For Trench Drain Conversions)
15"	1.2 S.F.
18"	1.8 S.F.
24"	3.1 S.F.
30"	4.9 S.F.



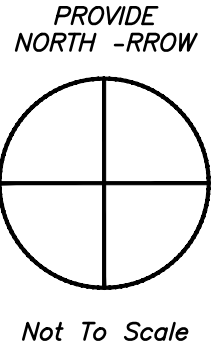
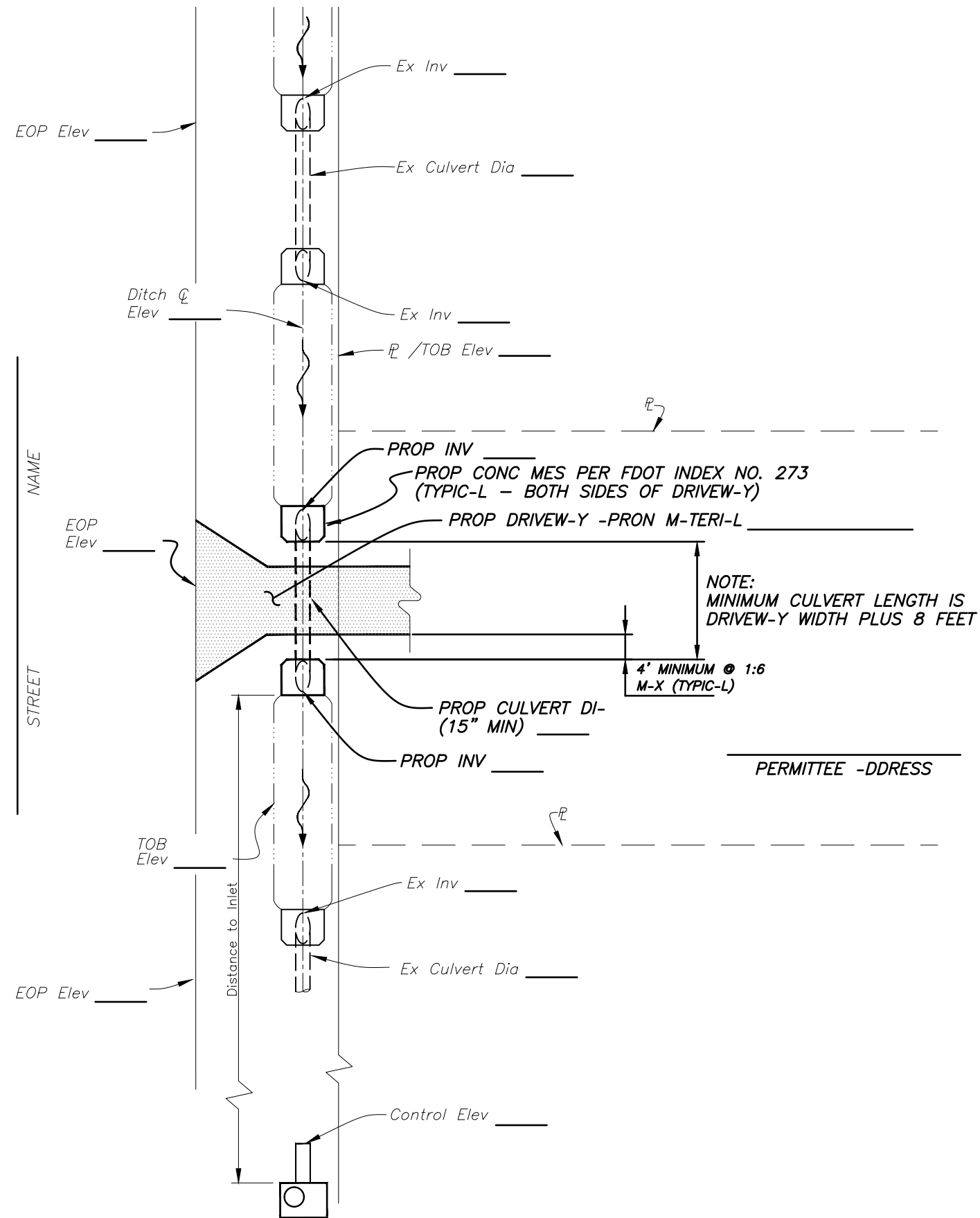
UNPAVED APRON *

CULVERT PIPE	MINIMUM COVER
Class III RCP	15"
Class IV RCP	12"
Corrugated HDPE	15"
C-900 PVC	15"

* WHEN MINIMUM COVER COULD NOT BE ACHIEVED; TRENCH DRAIN MUST BE USED.(NO SWALED D/W'S)

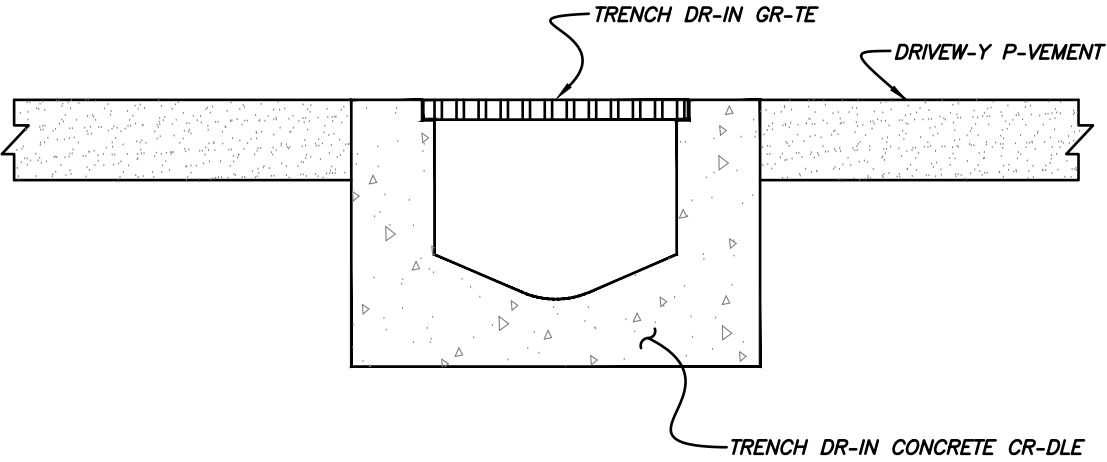
MINIMUM COVER FOR CULVERT SIZES UP TO 30" ROUND AND 24" X 38" ELLIPTICAL PIPE
(Larger Sizes Require Stormwater Department Approval)

SW

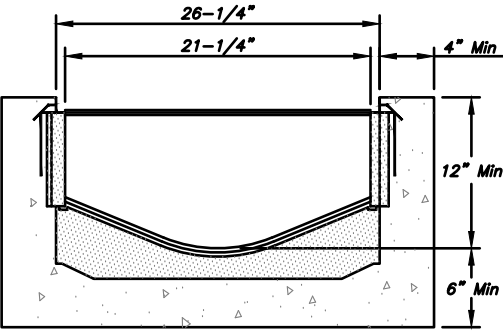


PROP - PROPOSED
EX - EXISTING
EOP - EDGE OF P-VEMENT
PL - PROPERTY LINE
CL - CENTERLINE
TOB - TOP OF BANK
INV - INVERT ELEV-TION
ELEV - ELEV-TION
DI- - DI-METER OF PIPE/CULVERT
DIRECTION OF DRAINAGE FLOW

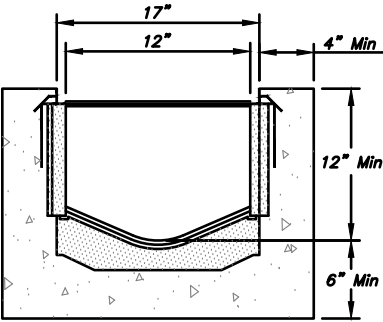
	No.	DATE	REVISIONS	DES: STORM	CITY of TAMPA Mobility Department Stormwater Engineering Division	RESIDENTIAL DRIVEWAY CULVERT STANDARDS	SHEET 37 OF 40
	6			DRN: STORM			
	5			CKD:			
	4			DATE:			



TYPICAL TRENCH DRAIN
Not to Scale



LARGER THROAT EXAMPLE
Not to Scale

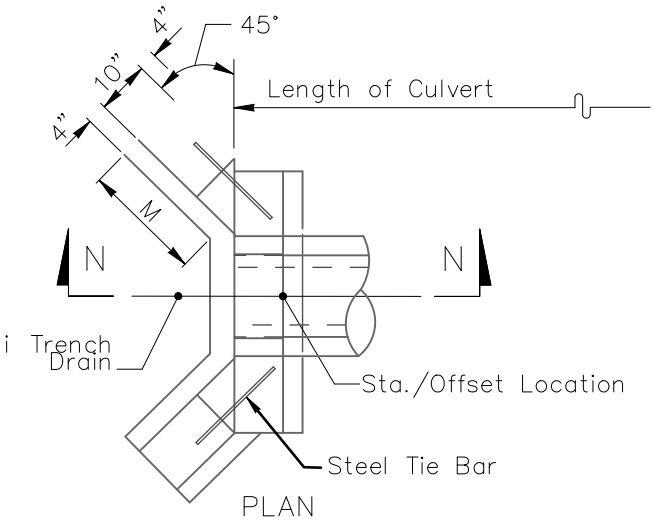
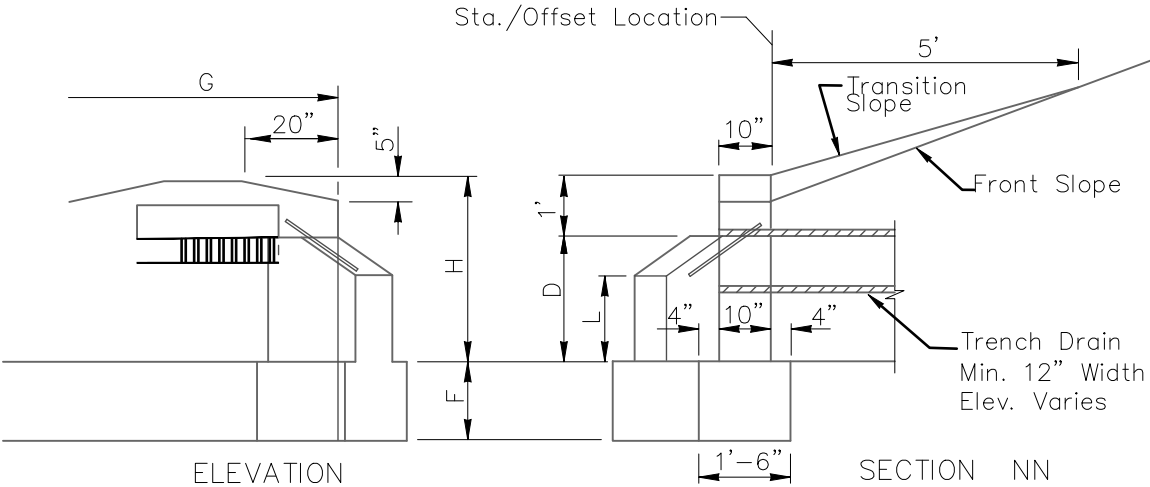


12" MIN THROAT EXAMPLE
Not to Scale

TRENCH DRAIN SUBSTITUTION FOR
CULVERT IN LOW-COVER CONDITIONS

Use Cross-Sectional Area Chart to convert from pipe size
Swaled driveways are not permitted – use trench drains

	No.	DATE	REVISIONS	DES: STORM	CITY of TAMPA Mobility Department Stormwater Engineering Division	RESIDENTIAL DRIVEWAY TRENCH DRAIN EXAMPLES	SHEET 38 OF 40
	6			DRN: STORM			
	5			CKD:			
	4			DATE:			

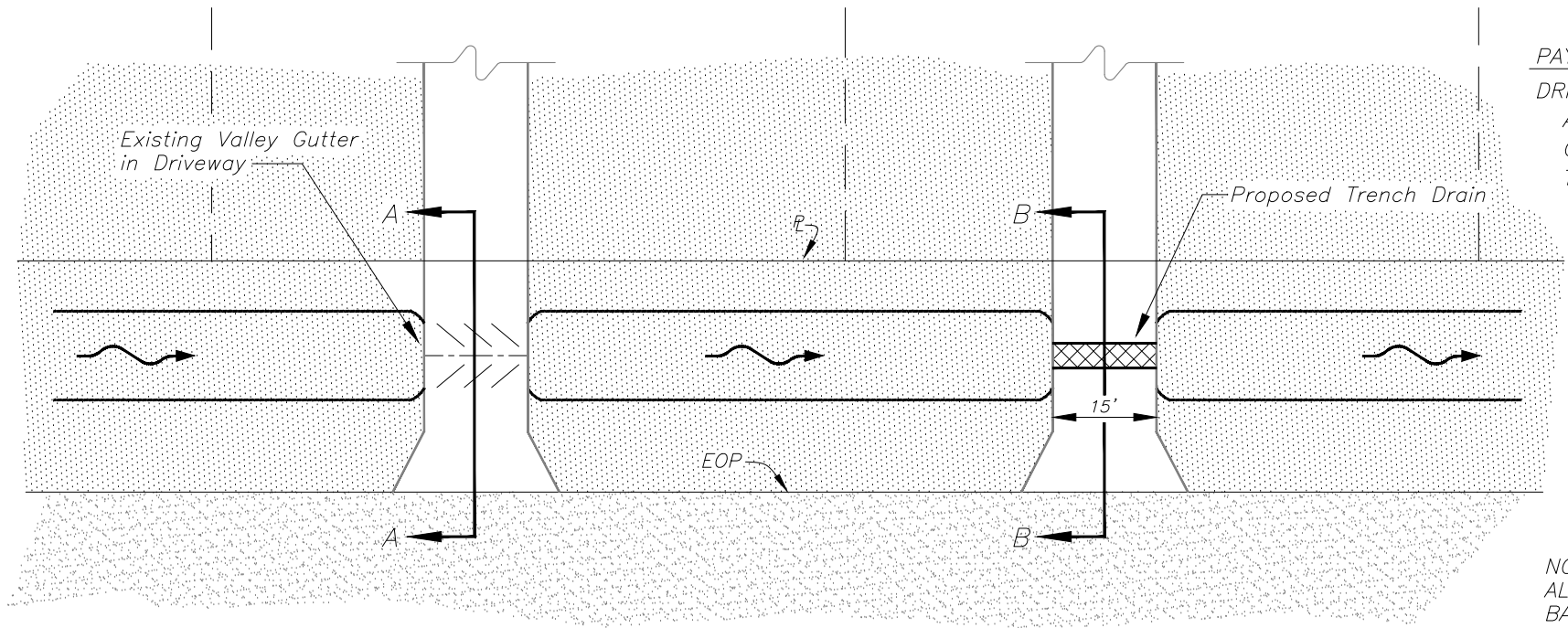


CONCRETE ENDWALL WITH 45° WINGS FOR TRENCH DRAINS

GENERAL NOTES

1. Winged concrete endwalls are intended for use outside the clear zone.
2. Chamfer all exposed edges $\frac{3}{4}$ ".
3. Concrete shall be Class I, except ASTM C478 (4000 psi) Concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.
4. Endwall to be paid for under the contract unit price for Class I Concrete.
5. Sodding to be in accordance with Index No. 281, and paid for under the contract unit price for Performance Turf, SY.
6. Refer to FDOT Index 430-040 for specifications.

	No.	DATE	REVISIONS	DES: STORM DRN: STORM CKD: DATE: 05/18	CITY of TAMPA Mobility Department Stormwater Engineering Division	MODIFIED HEADWALL FDOT INDEX 430-040	SHEET 39 OF 40
	6						
	5						
	4						



PAY ITEMS
DRIVEWAY RESORATION:
ASPHALT
CONCRETE
TRENCH DRAIN

