

- L= LENGTH OF TRENCH REQUIRED (FEET)
- V= VOLUME TREATED (ACRE - INCHES)
- W= TRENCH WIDTH (FEET)
- K= HYDRAULIC CONDUCTIVITY (CFS/FT²- FT. HEAD)
- H₂= DEPTH TO WATER TABLE (FEET)
- D_u= NON-SATURATED TRENCH DEPTH (FEET)
- D_s= SATURATED TRENCH DEPTH (FEET)

TYPICAL EXFILTRATION TRENCH

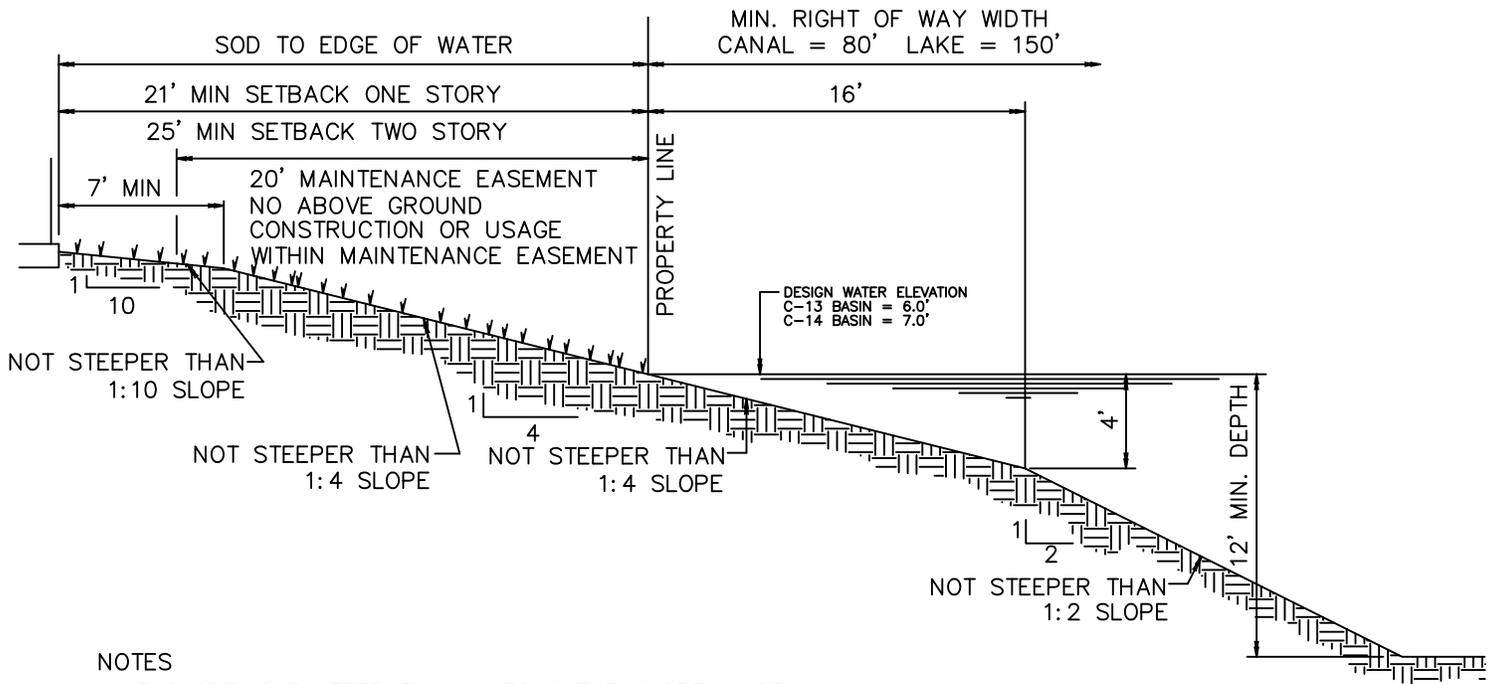


CITY OF TAMARAC
 PUBLIC SERVICES DEPARTMENT
 ENGINEERING DIVISION
 6011 NOB HILL ROAD
 TAMARAC, FL, 33321

STANDARD DETAIL

TYPICAL EXFILTRATION TRENCH FIGURE DR-20

REVISIONS			
No.	Date	Remarks	By
Drawn By:		Date:	Approved By:



NOTES

1. IF SLOPE IS FLATTER THAN 1 TO 4 THE SLOPE MUST BE CONTINUED TO A DEPTH 4' BELOW DESIGN WATER ELEVATION.
2. ALL FILL MATERIAL USED TO CONSTRUCT CANAL/LAKE SLOPES SHALL BE FREE OF DEBRIS.

CANAL AND LAKE SIDE SLOPES



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CANAL AND LAKE SIDE SLOPES
FIGURE DR-23

REVISIONS			
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Roadways and Parking areas

- 1) The project designer shall provide a sufficient combination of lane width and edge of pavement radii to allow all passenger vehicle turning movements (into, out of and within the site) to occur without encroaching into other lanes.
- 2) A minimum backup distance of twenty (20) feet is required between property lines or interior drives and the first parking stall
- 3) Banks, savings and loans, and restaurants having drive-in window facilities are required to provide one-hundred-foot stacking lanes for each window, free of adjacent parking stalls and associated backup lanes
- 4) Each parking space required and provided shall be not less than ten (10) feet in width and eighteen (18) feet in length, with a two (2) feet overhang. This requirement is intended to be the minimum parking space size requirement and is not intended to require existing parking spaces to be decreased in size to meet this minimum requirement. All parking shall conform to this section and the City of Tamarac's standard details.
 - (a) All required parking stalls shall have direct and unobstructed access from a parking aisle
 - (b) All off-street parking areas shall be so arranged and marked as to provide for orderly, safe loading, unloading, parking and storage of vehicles, with individual parking stalls clearly defined with approved pavement markings or curbing and traffic signs provided as necessary for traffic control
 - (c) No driveway shall be constructed in the radius return of an intersection. No driveway shall be constructed closer than twenty-five (25) feet to the intersection of street right-of-way lines. No driveway entrance shall include any public facility such as traffic signal standards, catch basins, crosswalks, loading zones, utility poles, fire alarm supports, meter boxes, sewer cleanouts or other similar-type structures
- 5) Markings and curbing shall be as follows
 - (a) Parking lots shall be marked by painted lines or raised concrete curbs or other means to indicate individual spaces
 - (b) Posted signs and markers shall be used as necessary to ensure sufficient traffic operation of the lot
 - (c) All ingress and egress lanes shall be marked by appropriate painted lines, arrows and stop signs. The arrows shall be painted with plastic silicone reflective paint
 - (d) Each stall shall be marked by a painted four-inch-wide line on each side. The width of the stall shall be measured from centerline to centerline of the painted lines. Each stall shall be provided with wheel stops.
 - (e) All pavement markings located within the public right-of-way or City owned property shall be thermoplastic material, in accordance with FDOT Standard Specifications

Pavement requirements:

1. Vegetation, muck, large roots, stumps or other matter not suitable for inclusion in roadways, parking lots, and within the right-of-way limits of roadways and off-street parking areas shall be removed.
2. Subgrade fill material shall be clean material meeting FDOT Standard Specifications. All Subgrade material shall have a minimum LBR of 40. The top twelve (12) inches of the subgrade material shall meet or exceed 98% modified proctor density per AASHTO T-180 and compacted in maximum six (6) inch lifts. After the subgrade is complete, the Contractor shall obtain from an independent testing laboratory at his expense a minimum of one (1) density test per two thousand five hundred (2,500) square feet.
3. Base course shall consist of an eight (8) inch (compacted thickness) limerock layer. Limerock shall have a minimum percentage of Carbonates of Calcium and Magnesium of 70% and a minimum LBR of 100. The base shall meet or exceed 98% modified proctor density per AASHTO T-180. After the base is complete, the Contractor shall obtain from an independent testing laboratory at his expense a minimum of one (1) density test per two thousand five hundred (2,500) square feet of material.
4. A prime coat shall be used on the finished limerock base and a tack coat shall be used between paving courses. All paved areas shall receive a minimum asphaltic concrete surface course of one and one half (1 1/2) inches, compacted thickness, two (2) 3/4" Lifts.
5. The final layer of asphaltic concrete directly adjacent to on going construction shall not be constructed until such construction is complete. The developer shall place three-fourths inch of asphalt cement surface course and after construction is completed, the final three-fourths inch layer will be constructed
6. All roadways shall have required sodding and landscaping prior to final acceptance by the city.
7. Roadways shall be striped in accordance with the latest Florida Department of Transportation Standards for Pavement Markings, the Manual on Uniform Traffic Control Devices, Broward County Traffic Engineering and the City of Tamarac engineering standard details which can be obtained from the City Engineer's office.
8. The placement and maintenance of shrubbery, aboveground sprinkler systems, mailboxes, signs, tree trimmings, refuse, concrete blocks, coral rock, pyramid-shaped cement curbstones, or any other sharp-edged or pointed organic or nonorganic or poisonous material which could cause a road or traffic hazard, or injury to pedestrians, on the swale area adjacent to the public right-of-way within the ten-foot area measured from the edge of the paved surface of the vehicular right-of-way is prohibited.

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Guardrails.

Guardrails shall be constructed within the right-of-way wherever a canal, lake or ditch lies within twenty-five (25) feet of the pavement or the city engineer determines that guardrails are necessary for the protection of the public.

- (a) Guardrails shall be installed in accordance with the City of Tamarac's standard details and the F.D.O.T. "Roadway and Traffic Design Standards"
- (b) Reflectorized guardrails shall be installed at the end of pavement on all streets or drives which are temporarily dead ended or a "T" turnaround is installed. Proper "Dead End" signs shall be placed at the closest intersection to the dead end.
- (c) A continuous strip of asphalt two (2) inches thick and three (3) feet minimum width, centered on the guardrail shall be placed at all installations in unpaved areas.

Elevations and benchmarks.

A minimum of two (2) bench marks shall be established by a registered land surveyor on or adjacent to any project for which elevations are shown on the submitted drawings, which shall clearly show the following:

- 1. The datum being used.
- 2. The location, description and elevation of the bench marks on or adjacent to the project, to be used for vertical control.
- (a) Bench marks shall be placed on permanent reference monuments or equally stable objects that are easily recognized, easily found and not likely to move.
- (b) Bench marks as described above shall be equivalent to third-order and be established in conformance with the Standards of Practice promulgated by The Florida Society of Professional Land Surveyors.

Engineer final certification

After all required improvements have been installed, the owner shall have the Engineer of record submit certification to the City that the improvements have been constructed according to the City of Tamarac Code and standard details, ADA requirements, approved plans/specifications and all other requirements set forth by agencies having jurisdiction, based on inspections of the site and review of as-built drawings.

As-built record drawings.

The developer shall engage the services of a professional engineer or land surveyor in the State of Florida to prepare record drawings of the improvements. Mylar copies of the as-built project for the site plan and engineering drawings, signed, sealed and dated by the responsible professional. In addition, plans are to be submitted in a digital format in AutoCAD latest version. Digital File to be compatible with the City's GIS system. Record Drawings submitted to the City as part of the project acceptance shall comply with the following requirements:

- a) Storm drainage. Record drawings shall include:
 - 1) Length of pipe runs from center of structure to center of next structure, including the size and type of pipe used;
 - 2) Type and size of each structure and its location with reference to property lines and/or the street centerline;
 - 3) Top of rim elevations, grate elevations, manhole elevations and invert elevations of all pipes;
 - 4) Inverts of swales shown at fifty-foot intervals coinciding with pavement interval elevations;
 - 5) Cross-section drawings of the lakes and canals within and adjacent to the development at two-hundred-foot intervals;

The above-noted record drawings shall be submitted to the city engineer, and his approval thereof must be obtained prior to placement of limerock base course adjacent thereto. If the city engineer finds any or all of the work to be unacceptable, it shall be the responsibility of the developer to correct the unacceptable work and provide new record drawings for that portion of the work as provided above. In any event, approval of the drainage must be obtained from the city engineer prior to the placement of any limerock base course.

- b) Pavement. Record drawings shall include:
 - 1) Finish grades at the edge of finished rock and centerline at longitudinal intervals of not more than fifty (50) feet, street intersections and/or all changes in gradient;
 - 2) Top of rim elevations of all sanitary sewer manholes within areas to be paved.
 - 3) Top and/or Lip of curb elevations and curb flow line elevations if applicable.

The above-noted record drawings shall be provided to the city engineer and his approval must be obtained prior to the placement of the asphaltic surface course. If the city engineer finds any or all of the work to be unacceptable, then it shall be the responsibility of the developer to correct the unacceptable work and provide new record drawings for that portion of the work as provided above. In any event, approval of the base course must be obtained from the city engineer prior to placement of any asphaltic surface course.

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(c) Exfiltration Systems

- a. Exfiltration systems may be used to supplement retention areas for the purpose of water quality, pretreatment, and additional retention storage.
- b. Exfiltration trenches shall be designed in accordance with the South Florida Water Management District's (SFWMD) Permit Information Manual "Management and Storage of Surface Waters", latest edition.
- c. Final calculations for dimensioning exfiltration trenches shall be based on actual soil permeability tests performed on site.
- d. Exfiltration systems shall not be used in public right-of-ways or for any public facility.
- e. Maintenance access shall be provided on both sides of exfiltration trenches in the form of approved manholes or catch basins. The maximum distance between such access structures shall not exceed three hundred (300) feet.
- f. Geotextile materials used in the construction of exfiltration trenches shall be in accordance with the criteria of FDOT "Roadway and Traffic Design Standards", latest edition, Index no. 199.

Flood Protection

(a) Method of Discharge

- a. Connection to Public System
 - i. All development shall drain via positive outlets to a public system of adequate capacity. Such system may consist of an existing pipe of adequate capacity to accept the additional discharge generated from the project, a public canal or lake. If a connection to an existing system is proposed, calculations shall be submitted to prove that it can accept the proposed discharge in addition to existing areas.
 - ii. The connection to a public drainage system shall be at no cost to the City.
- b. Stand-Alone System
 - i. Land locked developments that do not have an adequate discharge point will have the option to build a system connected to an existing lake or canal, or to design a stand alone drainage system by detaining the runoff volume from the 100-Year/3-Day storm event on site with no impact to adjacent roadways or developments.
 - ii. Calculations shall be submitted to show that the proposed development will retain water on site up to the 100-Year/3-Day storm elevation with no impact to adjacent roadways or developments. Such calculations shall also show that the detained water will be drawn down to the design water elevation within 10 days.

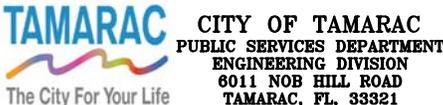
(b) Design Storm Stage Elevations

- a. Drainage calculations shall show that the 10-Year/1-Day storm stage elevation is equal to, or lower than the lowest catch basin rim elevation within the roadway or parking area.
- b. Drainage calculations shall show that the 25-Year/3-Day storm stage elevation is equal to, or lower than the site perimeter elevation.
- c. Drainage calculations shall show that the minimum finished floor elevation is at or above the 100-Year/3-Day storm stage elevation.

Design Parameters

(a) Drainage Pipes and Culverts

- a. Materials
 - 1. All drainage pipe installed within public rights of way shall be reinforced concrete.
 - 2. Acceptable pipe materials for use on private property are: reinforced concrete (RCP) and high density polyethylene (HDPE).
- b. Roughness Coefficients. Manning's "n" values used in all drainage calculations submitted to the City for review shall be as follows:
 - 1. Reinforced concrete: 0.013
 - 2. Corrugated aluminum pipe: 0.024
 - 3. High Density Polyethylene: 0.011
 - 4. Cast Iron: 0.013
- c. Minimum Cover. Minimum cover for all drainage pipes shall be designed in accordance with FDOT "Roadway and Traffic Design Standards", latest edition, Index no. 205, but shall never be less than Thirty (30) inches.
- d. Pipe and Culvert Ends shall have concrete headwalls to protect from undermining and provide a readily maintainable entrance/exit for stormwater flow. Concrete headwalls designed in accordance with FDOT roadway and traffic design standards, latest edition, Index no. 250 through 255 end sections.
- e. Rip-rap is not an acceptable means of end protection or soil stabilization.

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