OVERVIEW

Storm runoff accumulates pollutants, sediment, and debris as it flows over the landscape until it reaches a receiving waterway - the Lake of the Ozarks. These pollutants, sediments, and debris include oils and petroleum residues, animal refuse, garbage, organic debris from vegetation, silts, sands, and other objectionable materials. The U.S. Environmental Protection Agency (EPA) and the Missouri Department of Natural Resources, Water Pollution Control Division, considers these pollutants to have adverse effects upon the human and aquatic life that uses the lake for habitat or recreational needs. The water quality of the Lake of the Ozarks is vital to the health and economic well being of our residents, visitors, and community.

Storm drainage within the City of Osage Beach falls under regulatory authority of the U.S. Environmental Protection Agency (EPA) and the Missouri Department of Natural Resources (MDNR). The provisions of the U.S. Clean Water Act of 1978, Section 402 mandates the National Pollutant Discharge Elimination System (NPDES) and requires permitting for specific types of non-point pollutant sources under Phase II (Final Rule dated December, 1999) for areas where more than one acre of natural ground cover is disturbed. In addition, it mandates other control measures for designated cities, industries, and locations. The City of Osage Beach is not currently designated as a small city with a separate storm water system (MS4) or required to have a NPDES Permit. Several of the Phase II requirements do apply to the city. It is the policy of the City to reduce the contamination of the Lake of the Ozarks to comply with NPDES Phase II to the extent practicable for the city

The City of Osage Beach complies with these requirements through City Code, Title IV Land Use, Section 410.340, 410.350, 410.360, and 410.370 and the applicable portions of the Osage Beach Design Guidelines.

GOALS AND OBJECTIVES

The goal and objective of the City of Osage Beach's Storm Water Management Plan is to manage storm water drainage within the city limits so as to minimize the pollution of the Lake of the Ozarks and to prevent storm water run-off damage to the maximum extent practicable.

The primary source of visible pollutants during storm runoff is through sediment and debris picked up on construction sites or locations where the natural vegetation has been removed. The major secondary source is through volatile fuels, oils, animal wastes, and refuse picked up by storm runoff as it flows off large parking areas, roofs and over the terrain in route to the lake. These sources of contamination will be addressed separately through the application of a Sediment Control Plan and/or a Storm Drainage Plan.

Recent developments in the Storm Drainage Compliance area have lead to the development of "Best Management Practices" (BMP's) and less emphasis on retention facilities. Also the trend is toward reduction of contamination by: 1) reducing the quantity of storm water runoff, 2) reducing or removing the contamination of the runoff, and 3) by conveying the storm run-off without further contamination.

Our goal is to reduce the pollution of the lake through public education, awareness, and the application of MDNR Best Management Practices (BMP's). Our immediate objective is to manage the storm drainage system such that no collectable sediment or pollutants reach the lake and/or causes damage to adjacent or downstream properties.

The following design guidelines will establish the minimum steps or procedures required to reach these goals and objectives.

SEDIMENT CONTROL PLAN

A. The Sediment Control Plan shall be submitted as a part of the building permit process and shall be reviewed and approved by the City Engineer prior to the start of any onsite work for any and all projects involving two or more lots or ½ acre, whichever shall be the smaller.
Note: The MDNR requires a Sediment Control Permit for all construction projects of one acre or more in area.

1. The Sediment Control Plan must be prepared by a Registered Professional Engineer stating the goals of the plan and depicting the locations and details of the construction of all sediment control devices to be utilized on the project.
2. The plan shall clearly set out the contractor's schedule and requirements for maintaining the integrity of the plan.
3. The primary goal of the plan is to assure that no visible or measurable sediment or debris is allowed to leave the developed area.
4. The devices and measures utilized shall follow the recommended "Best Management Practices" as described in the publication "Protecting Water Quality" by MDNR and as directed herein. At the minimum the following shall be required:

    a. Silt fencing shall be installed around the downhill edges of the disturbed area.
    b. Earth berms and swales shall be used to reduce sheet flow volumes and velocities.
    c. Straw bale check dams, earth berms and other BMP's shall be utilized as necessary to prevent run-off from carrying sediment and debris off site.
    d. Check dams or other BMP's shall be used to assure velocities do not exceed 5 fps.

e. Approved engineering fabric or erosion control matting shall be used in all drainage courses or ditches where flow velocities exceed 5 fps.

f. All denuded slopes or embankments shall be protected from erosion by the installation of earthen berms, straw bale dikes, or other appropriate BMP.

g. Temporary catch basins, drop inlets and/or storm drains (culverts) shall be utilized as necessary.

h. All denuded slopes or areas shall be reseeded with appropriate seed, fertilized and mulched within four weeks of the time the original ground cover was removed. Jute mesh, "Petro-mat" or other approved slope stabilization fabric shall be installed on all slopes steeper than 3:1.

5. In the event that the plan is deficient or inadequate to prevent sediment escaping the jobsite, the Owner/Developer shall immediately take any and all measures necessary to stop and prevent further contamination, and to clean up contaminated areas.

STORM DRAINAGE PLAN

A. A Storm Drainage Plan is required for all new construction sites within the jurisdictional boundaries of the City of Osage Beach in which the construction or clearing for construction disturbs an area exceeding two lots or one half acre, whichever shall be the smaller.

1. The Storm Drainage Plan shall be prepared by a Registered Professional Engineer stating the goals of the plan and depicting the locations and details of construction of all sediment and drainage control devices, and BMP's, to be utilized in the plan.
2. The plan shall clearly state owners schedule and requirements for maintaining the components of the system.
3. The devices and measures utilized shall follow the recommended "Best Management Practices" as described in the publication "Protecting Water Quality" by and available through MDNR, the City of Osage Beach City Code and the City of Osage Beach Design Guidelines
4. At the minimum the Storm Drainage Plan shall provide the following technical data:

   a. Clearly depict the entire drainage area effecting the development site including downstream areas that will be effected by storm water run-off or drainage.
   b. Accurately calculate the anticipated storm run-off from a theoretical twenty (20) year storm event.
   c. Establish the percolation rates for all infiltration, percolation, and filtration devises.

d. Determine the anticipated flows and capacities of all channels, culverts and conveyance devices.
e. Clearly identify and provide flow data for all velocity control and/or energy dissipation devices.

5. At the minimum the Storm Drainage Plan shall provide the following sediment and drainage controls:

a. Provide removal or containment of all silt, sediment, and debris carried onto or across the development so as to assure that no silt, sediment, or debris is allowed off the developed area.
b. Assure that all storm run-off is controlled such that no damage will occur to adjacent downstream properties or facilities.
c. Where parking areas for more than twenty cars exist provide for removal of oils, grease and volatile wastes to the maximum practicable extent by the use of BMP's.
d. Assure that conveyance discharges into the Lake of the Ozarks will have a velocity of less than 5 fps.

This can be accomplished by the use of BMP's, infiltration, percolation, filtration devices, retainage and sedimentation collection basins, filtered curb inlets/manholes or other devices as approved by the City Engineer.

STORM DRAINAGE COMPUTATIONS

A. The methodology used by the City of Osage Beach for computation of storm run-off shall be similar to that discussed in Chapter IX of the Missouri Department of Transportation (MoDOT) Project Development Manual and as modified herein.

1. The base storm event for computation of run-off volumes shall be a twenty-year (20) storm event.
2. The Rational Method of computation shall be used as herein modified.

$$Q=CIA$$

Where:

Q = Peak runoff in cubic feet per second (cfs)
I = 2.5 inches per hour shall be used as the Rainfall Intensity.[1]
A = Area of watershed in acres. This area includes the actual area drained through or in addition to the developed area.
C = An adjustment coefficient used to account for soil and terrain absorption as established herein.[2]

[1] Normally the Time of Concentration (t_s) would be computed and the value for "I" taken from the appropriate table dependant upon the MoDOT District involved. Due to the short travel distances for run-off on most of our projects that procedure would give an unrealistically high value. We have selected the 2.5 inches per hour as a valid value for our use.

[2]Osage Beach Values of C for use on City Projects:

Type or Location of Project	Value of C
Single family residential lots	0.4
Multi-unit Residential (less than 20 units)	0.5
Condominium Developments where parking areas and building foot print occupy less than 50% of the development site	0.6
Commercial or condominium sites where parking areas and building or developed space covers more than 50% of the developed area	0.7

DESIGN OF DRAINAGE STRUCTURES AND DEVICES

A. Culverts and Storm Drainage Piping Systems shall be designed using the Manning equation for open channel flow. Inlet conditions should be investigated and openings designed to handle the peak runoff condition. In addition the following conditions shall be met:

1. The minimum pipe size shall be 18-inch diameter.
2. Bedding shall be installed around the pipe from 4 inches below to 12 inches above the pipe. Bedding shall be nominal ½ inch minus crushed rock conforming to MDOT Section 1004, Grade D, Chat, or pea-gravel, or Osage River Sand. Any material used shall have a PI of six or less.
3. The minimum grade shall guarantee a minimum velocity of 2.0 fps.
4. Manholes shall be constructed at not more than 350-foot intervals and at all bends and changes of grade.
5. Pipe may be run on the curve so long as the manufacture's maximum deflection at each joint is not exceeded. All other pipe shall be run true to line and grade between manholes or inlets.
6. Outlets shall have intrusion gates to prevent entry by children or animals.
7. Outlets shall end in an energy-dissipating device that will reduce the outlet flow velocity to less than 5 fps.
8. Piping shall be designed to sustain any anticipated loading conditions

B. Curb Inlets of the "Kansas City Type" are preferred. See Drawing No. IV-11

1. The length of Curb Inlet opening shall be determined as in Chapter IX of the MoDOT Project Development Manual.
2. Floor of Inlet shall be shaped with invert to provide smooth flow.
3. Locate manhole ring and cover over outlet.
4. Each Inlet shall have cast iron steps spaced at 1'-4" centers vertically.
5. Bevel all exposed edges with ¾" chamfer or ½" tooled edge.
6. On grade Inlets shall conform to the street grade and sump Inlets shall be level.
7. The length plus the width shall not exceed 15' without special design.
8. Each Inlet shall be placed on a 4" compacted aggregate base.
9. Each Inlet shall have a steel inlet frame.
10. Each Inlet shall be designed to sustain any anticipated loading conditions. In no case shall materials and design not be sufficient to support an ASHTO H-44-20 loading.
11. Transition curb in 10' on upstream side of inlet and in 5' on the downstream side. 10' transition on both sides for sump inlet. See detail.

OVERLAND FLOW OR SHEET FLOW CONTROL

A. Reduce available sediment and debris (Land Form Controls)

1. Insure that no areas are left denuded. Prepare seed bed, fertilize, mulch, and install erosion mat or fabric within 30 days of clearing operations.
2. Provide vegetation belts of shrubbery, small trees, etc. to retard sheet flow.
3. Provide erosion mat or fabric at all areas where erosion is apparent.

B. Reduce quantity of overland or sheet flow by utilizing the following methods:

1. Flow control swales to reduce down hill sheet flow velocities and promote short-term ponding and infiltration. See Drawing No. IV-3 & 9.
2. Vegetation belts. Plant a band of shrubbery, flowers, and etc. transverse to the slope to reduce sheet flows. See Drawing No. IV-4 & 10.
3. Infiltration trenches to infiltrate a portion of the sheet flow into the ground water. Infiltration rates should be tested for and volumes computed as a part of the overall Storm Water Management Plan. Design infiltration rate will generally be less than 1.0 gal/sf/hr and will tend to decrease over time. See Drawing No. IV-5.

C. Velocity Control – reduce pick up of sediment and debris (Land Form and Site Grading)

1. Grass Drainage Swales control direction and velocity of sheet or small rivulets flows by keeping flow velocities under 5 fps. See Drawing No. IV-6.

2. Riprap Drainage Swales control larger volumes of sheet flow and rivulets by keeping flow velocities under two fps. See Drawing No. IV-7.
3. Open Channel Drainage Channels shall be designed using the manning equation for open channel flow. The channel shape maybe trapezoidal, rectangular or circular at the designer's discretion.

   a. The channel depth shall be designed so that the peak runoff flow will be accommodated at 2/3rd of the channel depth.
   b. Where channel depth will exceed one foot, a trapezoidal section with a maximum of 1:1 side slopes shall be used.
   c. Where flow velocity will exceed 2 fps engineering fabric or erosion mat shall be utilized.
   d. Where velocity will exceed 5 fps riprap shall be installed to eliminate scouring. See Drawing No. IV-7.

D. Silt, Sediment, and Debris Control – Filtering Systems

1. In order to avoid the use of sedimentation basins or retention ponds it shall be required that appropriate filtration methods are used in order to assure that silt, sediment, and debris do not get into the conveyed storm drainage flow. The above measures will control sediment for sheet or cross-country flows. However, construction parking areas and other manmade surfaces will require the collection and isolation of silts, sediments, debris, oils, and volatile materials. One method of accomplishing this is by construction filtering systems. There are several commercial products available to accomplish this goal. Grasspave, Gravelpave, and Grasscrete are patented soil stabilization products that are designed to serve as a paving or traffic-bearing surface. Approved filtering systems are as follows:

   a. Constructed Filter Strip. In large parking areas, or relatively flat open areas, a cut-off curb can be constructed with a filtration strip of variable width constructed in front of it. Such strip would have a traffic bearing infiltratable surface such as Gravelpave underlain by a clean open graded gravel medium around a perforated collection pipe laid to grade to drain to a central or periphery drainage system. The medium would be enclosed in an engineering fabric envelope. Design infiltration rates would vary with materials and should be designed in accordance with the manufacture of the traffic bearing media recommendation. Flow in the neighborhood of 0.25 gpm can be anticipated. It will be necessary to remove the accumulated sediment and debris and very top portion of the gravel or replace the grass layer as appropriate in order to maintain adequate infiltration. The required maintenance interval will depend upon the rate of collection of sediment. See Drawing No. IV-8.

b. Porous Pavement. The use of porous pavements for large parking areas is a viable alternative method of providing filtered run-off from the parking areas. Cross country run-off should be diverted from the paved area and treated separately in order to avoid rapid plugging and increased maintenance costs. In the general application in Osage Beach the preferred methodology would be to drain the porous pavement to a clean aggregate percolation bed that drained to collection piping manifolded into the overall storm drainage system and discharged to the Lake or other approved surface system. In isolated cases it may be preferable to discharge to the ground water table with a surface overflow for over design storm peak flows. Each porous pavement application must be approved by the City Engineer prior to use.

2. Fabricated Filtration Manholes or Curb Inlets

a. Several patented filtration devices are now available that can effectively reduce sediment discharges such as:

1) Treatment systems such as Stormceptor
2) Catch Basin or Curb Inlet inserts such as Flowgard Plus manufactured by Hancor, Inc. or Hydro-Kleen manufactured by ACF Environmental.
3) Surface drainage systems such as Drain-rite manufactured by Hancor Inc.
4) Or several non-patented devices by various highway departments, etc.

RETENTION FACILITIES

A. In the event that the developer prefers to construct a retention facility the following shall be complied with:

1. The maximum allowable flow velocity through the basin shall be 0.3 fps.
2. The inlet should be designed to prevent short-circuiting between entrance and discharge to the maximum extent practicable. This can be accomplished by providing baffles in the channel, turns in the channel, etc.
3. The shape of the storage basin should allow for easy cleanout of sediment and debris. Terrain and other site conditions will tend to dictate the shape of the facility. Deep, steep sided ponds should be avoided or covered for safety of children and animals.
4. Outlet or Discharge Facility shall allow the slow discharge of retained flow over time so that a stagnant pool is not created.

The details of the design are at the discretion of the designer subject to approval of the City Engineer.

CONSTRUCTION MATERIALS

A. Drainage ditches maybe stabilized earth, riprap, concrete, or other durable material.

B. Retention basin inlets, basin, and outlet structures maybe of any durable material subject to the approval of the City Engineer.

C. Storm drainage pipe and culvert pipe may be concrete, Corrugated Metal Pipe (CMP), or reinforced plastic subject to approval.

1. All pipes at a minimum must be capable of sustaining an ASHTO - H 44-20 loading.
2. The use of reinforced plastic pipe for storm drainage at drop inlets or in areas where leaf burning is allowed is prohibited.

D. Curb Inlets

1. Shall be prefabricated or cast-in-place.

   a. Shall be place on a 4" compacted aggregate base.
   b. Reinforcement in footing shall be #4 bars on 6" centers both ways.
   c. Reinforcement in walls shall be #4 bars on 12" centers both ways.
   d. Reinforcement in lid shall be a minimum of six #4 bars placed at 45 degree angle. See detail.

2. Shall have a 10" throat galvanized steel inlet frame.
3. Cast iron manhole ring and cover, Neenah R-1537 or approved equal.
4. Cast iron step, Clay & Bailey No. 2101 or approved equal.

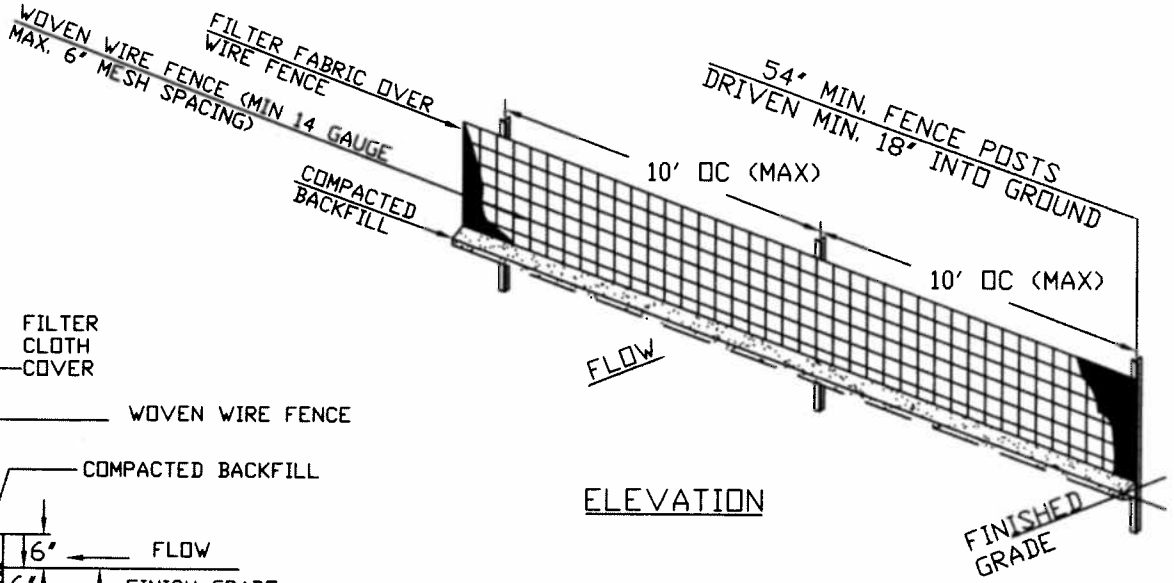
STORM DRAINAGE CONSTRUCTION DETAIL DRAWINGS

Construction details and sketches are attached.

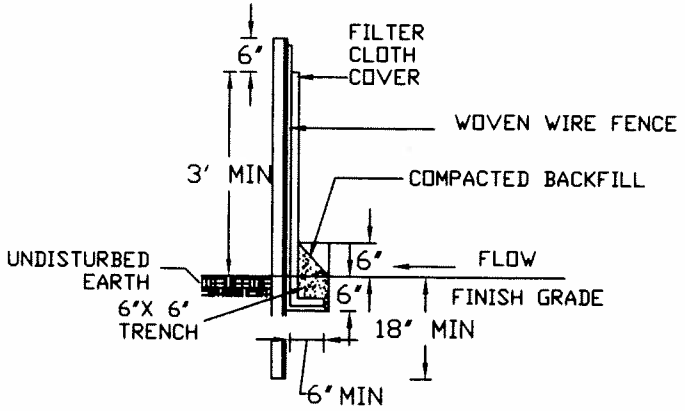
END

NOTES:

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES.
2. FILTER CLOTH TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER, THEY SHALL BE OVERLAPPED BY 6" AND FOLDED.
4. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.



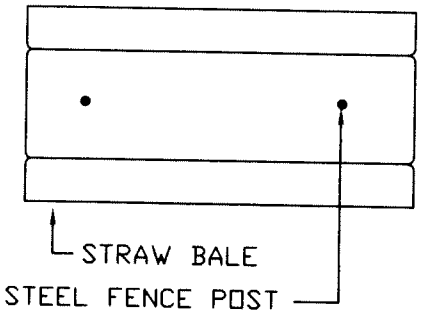
ELEVATION



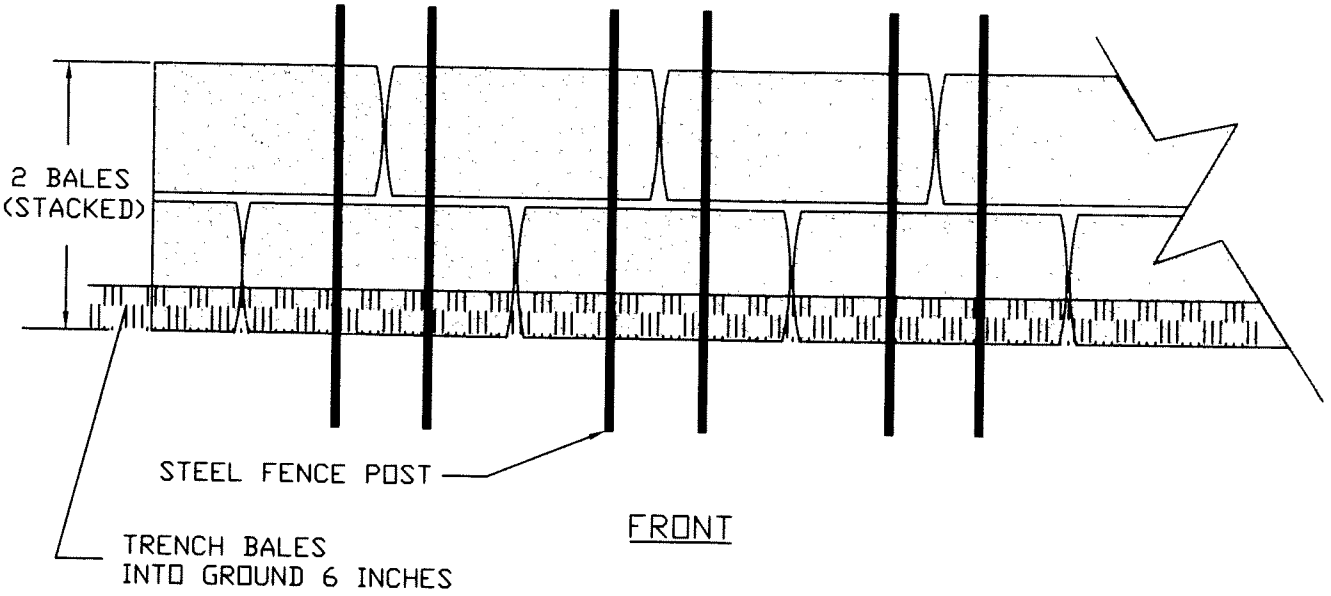
CROSS-SECTION

POSTS: STEEL EITHER T OR U TYPE OR 2"X2" HARDWOOD
FENCE: WOVEN WIRE, 14 GA. 6" MAX. MESH OPENING
FILTER CLOTH: FILTER X, MIRAFI 100X, STABILINKA T140N OR APPROVED EQUAL
PREFABRICATION UNIT: GEOFAB, ENVIROFENCE, OR APPROVED EQUAL

Date Revised: July, 2002	CITY OF OSAGE BEACH TYPICAL DETAIL SILT FENCE	Design Guideline: Section 4
By: sh		STORM DRAINAGE
Checked By: jb		Drawing No. IV-1

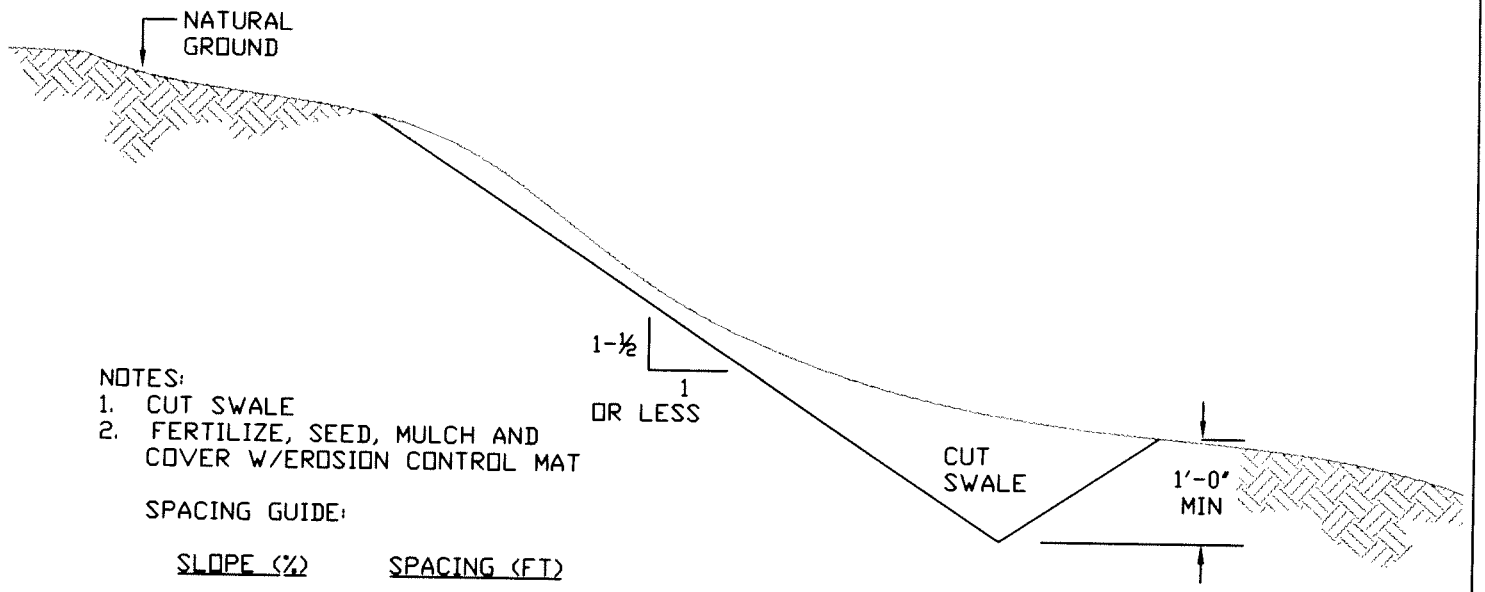


PLAN



FRONT

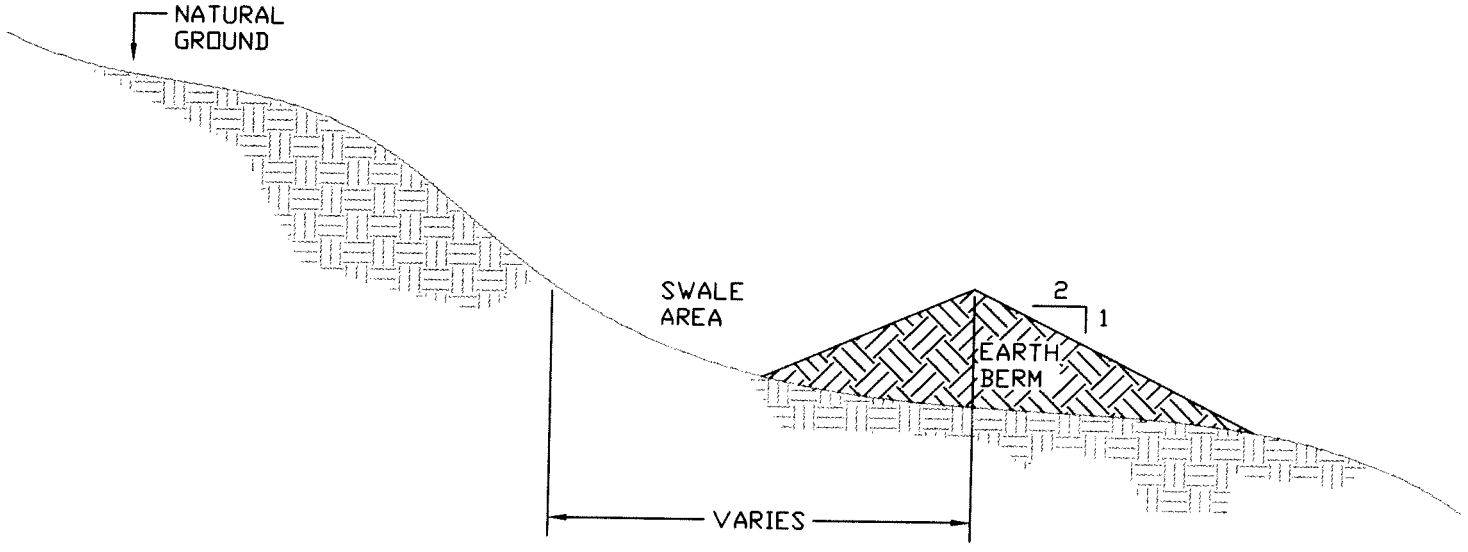
Date Revised: July, 2002	CITY OF OSAGE BEACH TYPICAL DETAIL STRAW BALE CHECK FENCE	Design Guideline: Section 4
By: sh		STORM DRAINAGE
Checked By: jb		Drawing No. IV-2



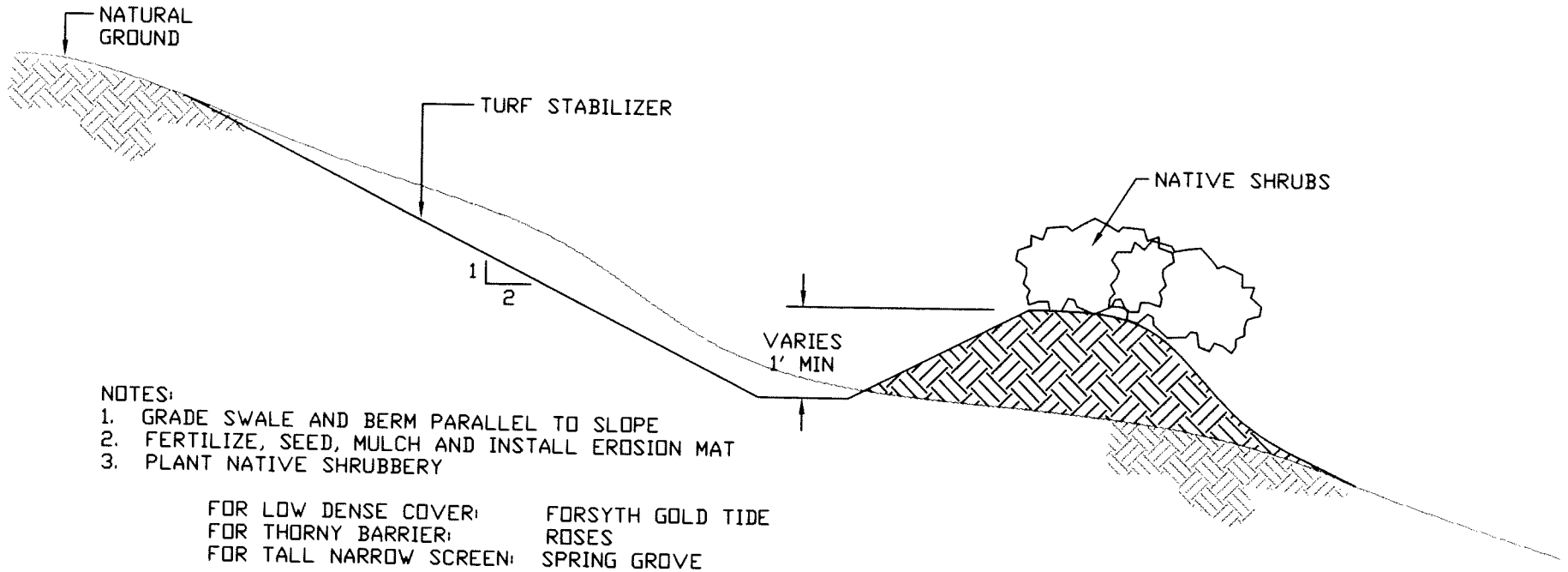
NOTES:
1. CUT SWALE
2. FERTILIZE, SEED, MULCH AND COVER W/EROSION CONTROL MAT

SPACING GUIDE:

SLOPE (%)	SPACING (FT)
33-50	20
25-33	40
15-25	60
10-15	80
6-10	120
3-6	200



Date Revised: March, 2003	CITY OF OSAGE BEACH TYPICAL DETAIL SWALE	Design Guideline: SECTION 4
By: sh		STORM DRAINAGE
Checked By: jb		Drawing No: IV-3

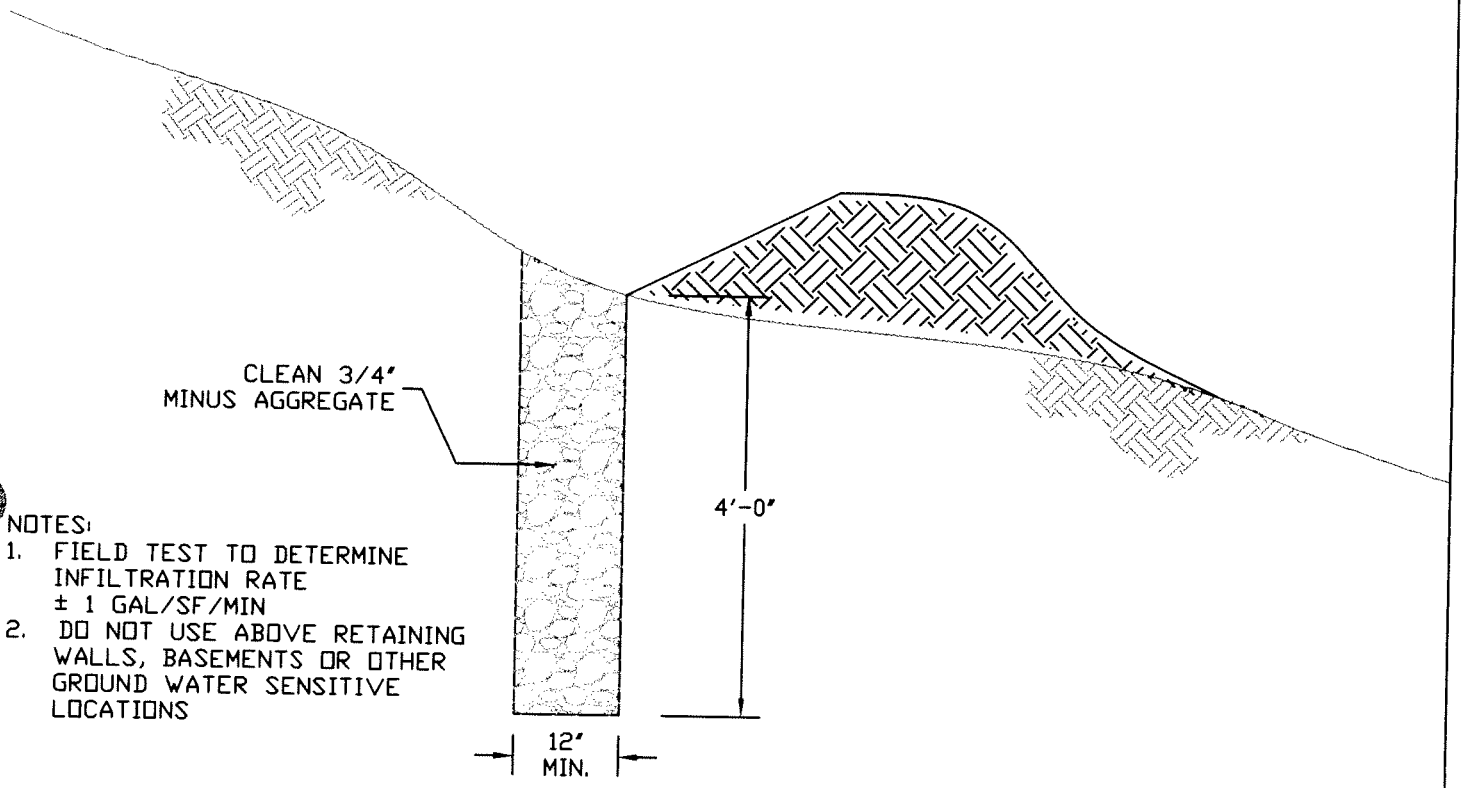


NOTES:
1. GRADE SWALE AND BERM PARALLEL TO SLOPE
2. FERTILIZE, SEED, MULCH AND INSTALL EROSION MAT
3. PLANT NATIVE SHRUBBERY

FOR LOW DENSE COVER: FORSYTH GOLD TIDE
FOR THORNY BARRIER: ROSES
FOR TALL NARROW SCREEN: SPRING GROVE

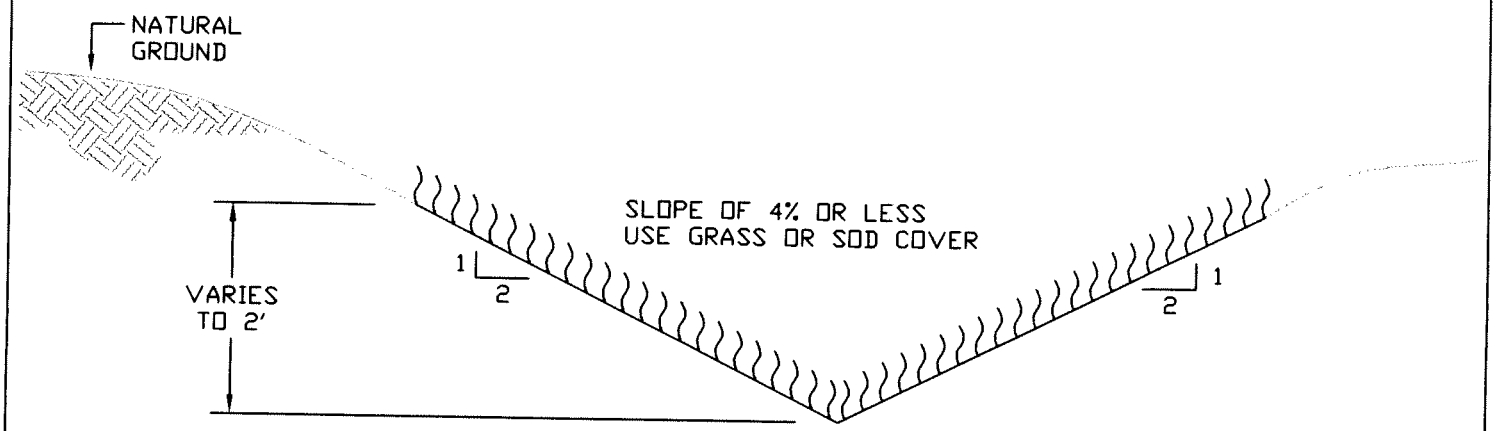
SLOPE (%)	GRASS AREA	SHRUBS/TREES
0-5	10'	15'
OVER 5	20'	40'

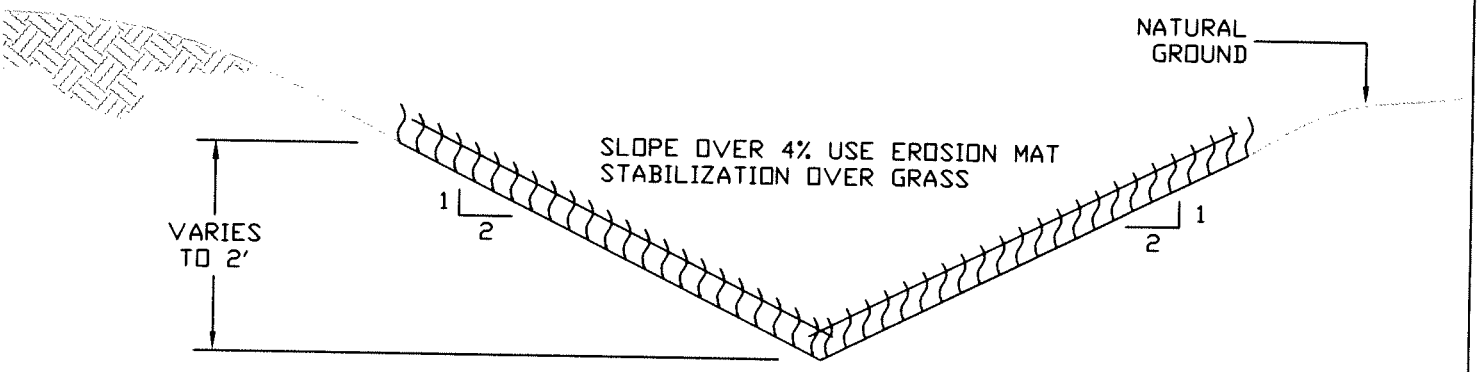
Date Revised: March, 2003	CITY OF OSAGE BEACH TYPICAL DETAIL VEGETATION BARRIER & SWALE	Design Guideline: SECTION 4
By: sh		STORM DRAINAGE
Checked By: jb		Drawing No: IV-4



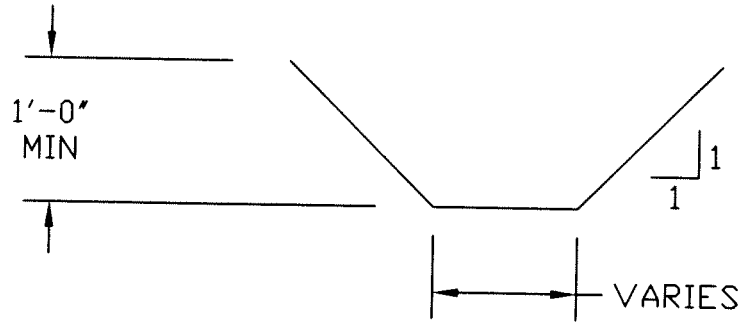
NOTES:
1. FIELD TEST TO DETERMINE INFILTRATION RATE ± 1 GAL/SF/MIN
2. DO NOT USE ABOVE RETAINING WALLS, BASEMENTS OR OTHER GROUND WATER SENSITIVE LOCATIONS

Date Revised: March, 2003	CITY OF OSAGE BEACH TYPICAL DETAIL INFILTRATION TRENCH	Design Guideline: SECTION 4
By: sh		STORM DRAINAGE
Checked By: jb		Drawing No: IV-5



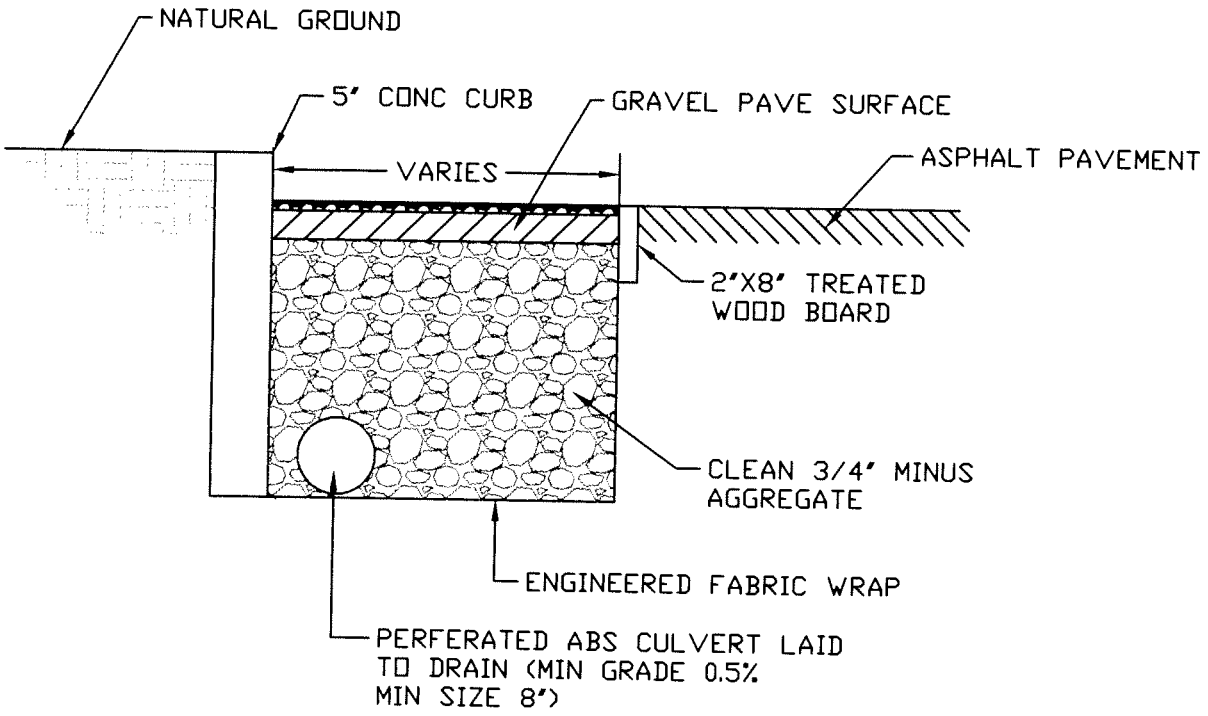


Date Revised: March, 2003	CITY OF OSAGE BEACH TYPICAL DETAIL DRAINAGE SWALE-GRASS OR TURF	Design Guideline: SECTION 4
By: sh		STORM DRAINAGE
Checked By: jb		Drawing No: IV-6



NOTES:
1. VELOCITY LESS THAN 2 FPS-GRASS OR TURF
2. VELOCITY 2-5 FPS-TURF AND EROSION MAT
3. VELOCITY OVER 5 FPS-RIP RAP MIN SIZE 3" SMALLEST DIMENSION.

Date Revised: March, 2003	CITY OF OSAGE BEACH TYPICAL DETAIL OPEN DRAINAGE CHANNEL	Design Guideline: SECTION 4
By: sh		STORM DRAINAGE
Checked By: jb		Drawing No: IV-7

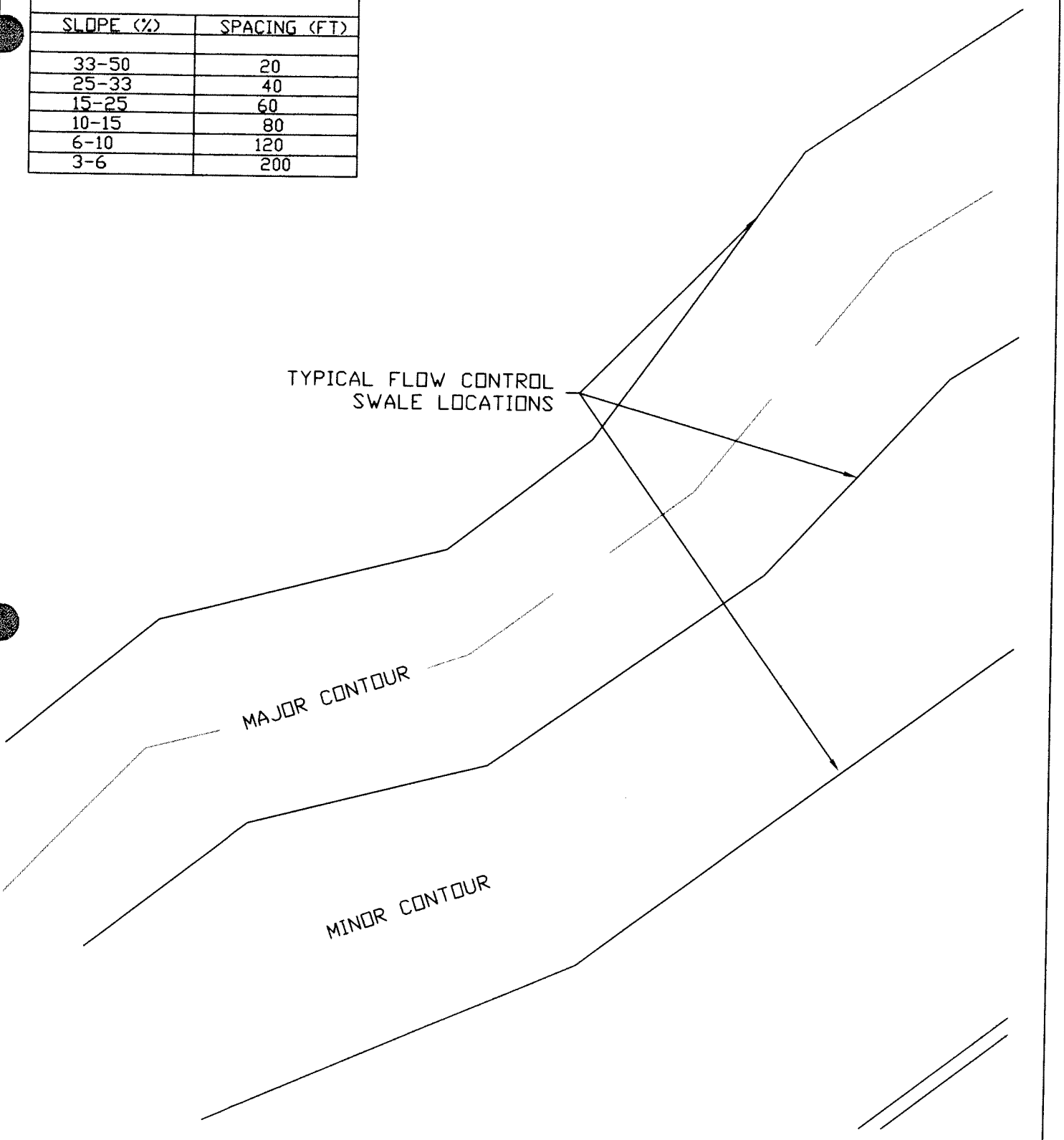


NOTES:

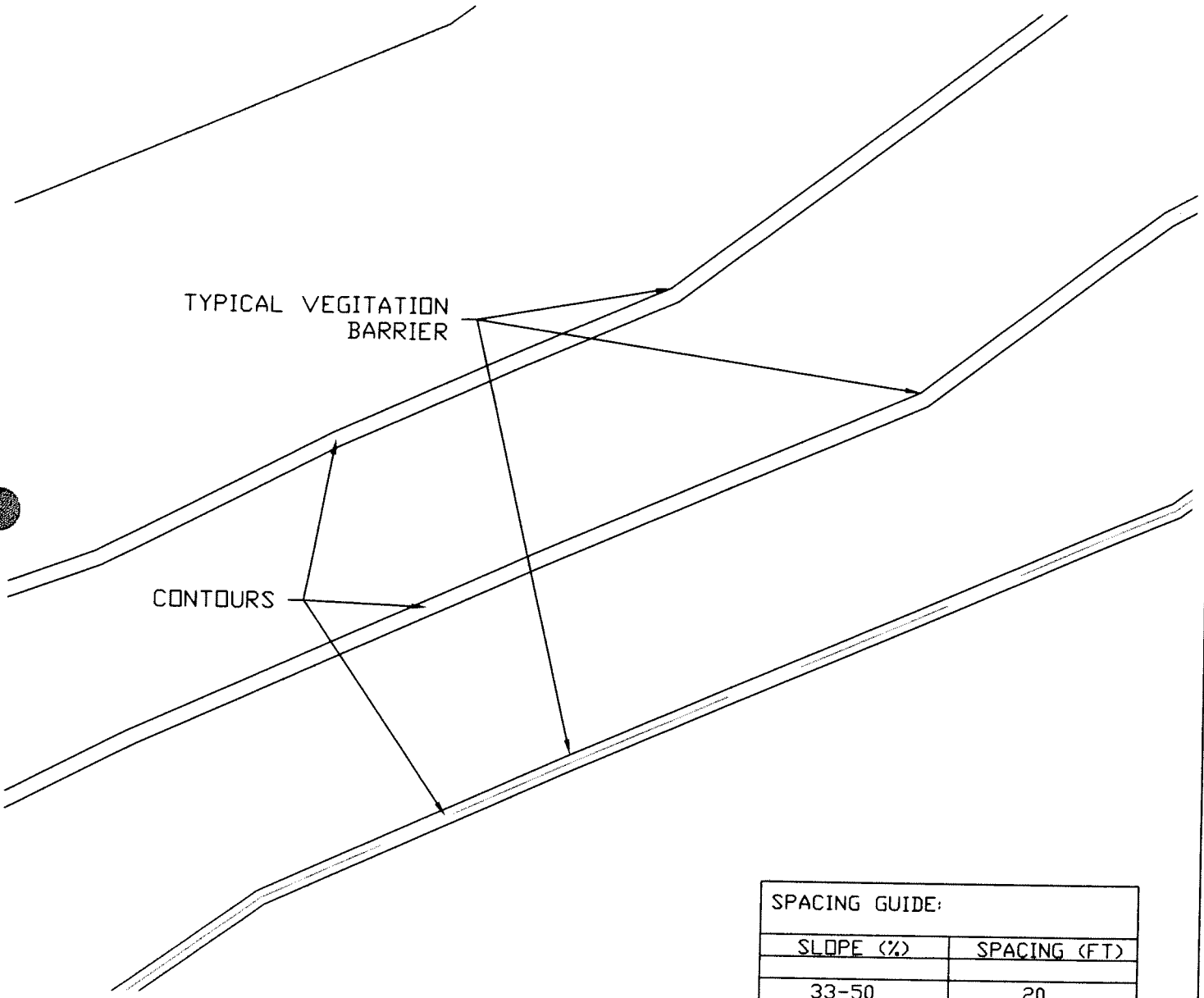
1. WIDTH VARIES DEPENDENT UPON DRAINAGE AREA (PER MANUFACTURES RECOMENDATIONS-0.25 GPM/SF TARGET VALUE)
2. DIAMETER OF DRAIN DPENDS ON FLOW
3. DEPTH DEPENDS ON SIZE OF DRAIN-MIN 16"

Date Revised: March, 2003	CITY OF OSAGE BEACH TYPICAL DETAIL FILTER STRIP	Design Guideline: SECTION 4
By: sh		STORM DRAINAGE
Checked By: jb		Drawing No: IV-8

SPACING GUIDE:	
SLOPE (%)	SPACING (FT)
33-50	20
25-33	40
15-25	60
10-15	80
6-10	120
3-6	200

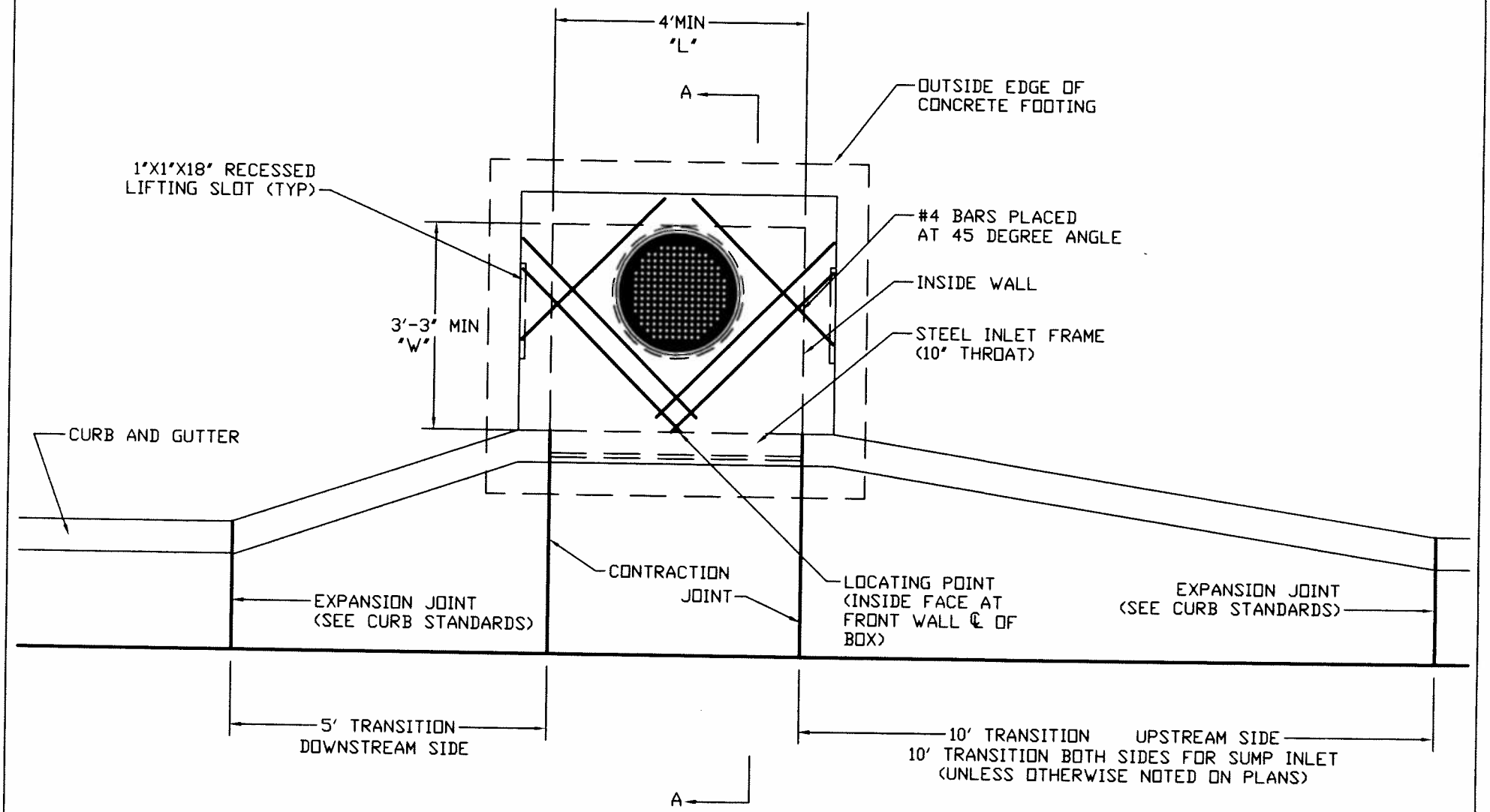


Date Revised: March, 2003	CITY OF OSAGE BEACH TYPICAL DETAIL SWALE LOCATION	Design Guideline: SECTION 4
By: sh		STORM DRAINAGE
Checked By: jb		Drawing No: IV-9

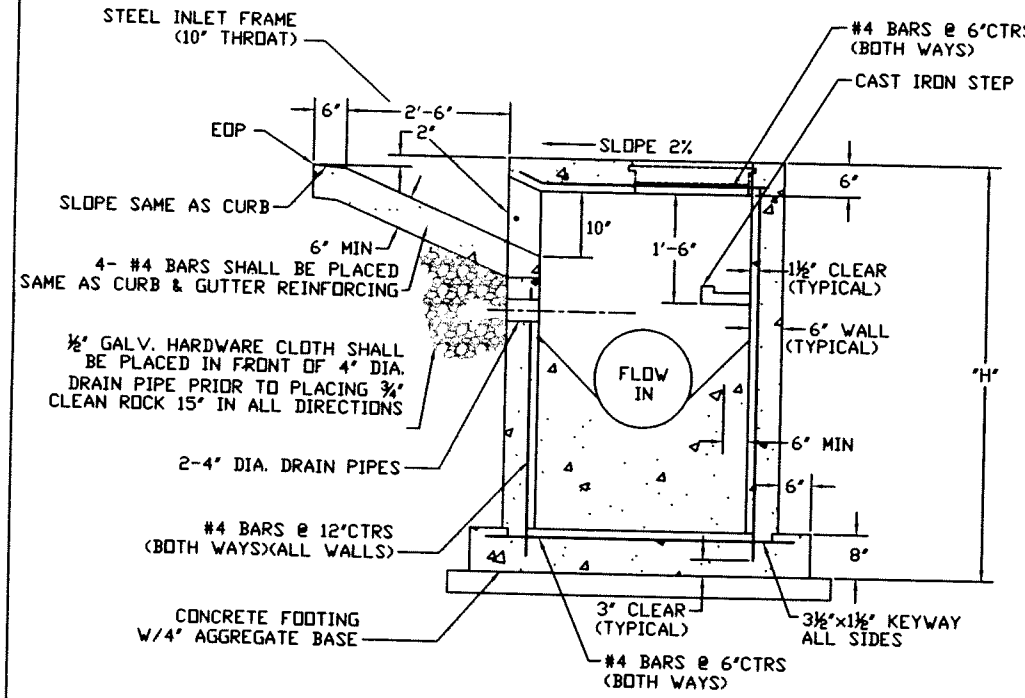


SPACING GUIDE:	
SLOPE (%)	SPACING (FT)
33-50	20
25-33	40
15-25	60
10-15	80
6-10	120
3-6	200

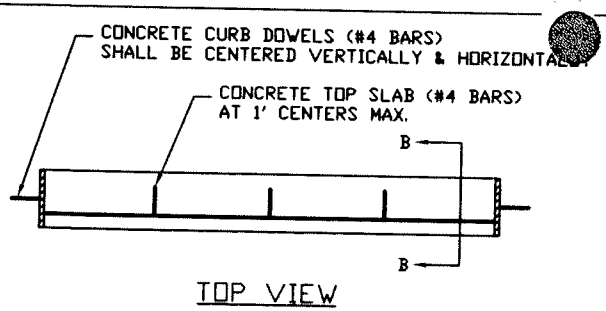
Date Revised: March, 2003	CITY OF OSAGE BEACH TYPICAL DETAIL VEGETATION BARRIER LOCATION	Design Guideline: SECTION 4
By: sh		STORM DRAINAGE
Checked By: jb		Drawing No: IV-10



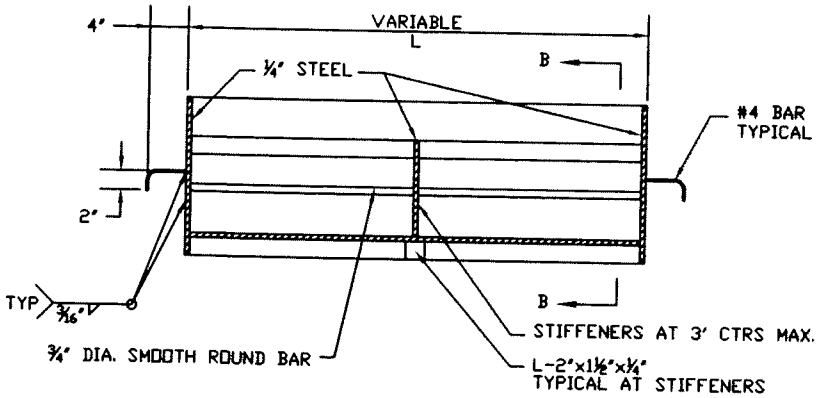
Date Revised: OCT., 2004 By: sh Checked By: jb	CITY OF OSAGE BEACH TYPICAL DETAIL CURB INLET	Design Guideline: SECTION 4 STORM DRAINAGE Drawing No: IV-11



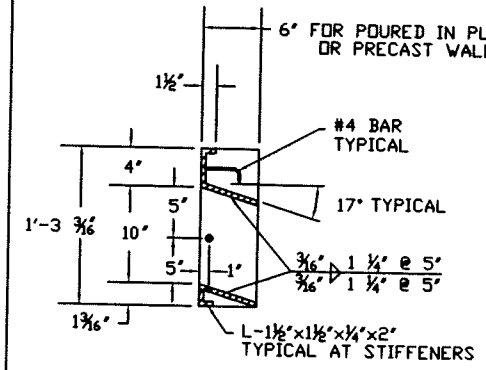
SECTIN A-A



TOP VIEW



FRONT VIEW

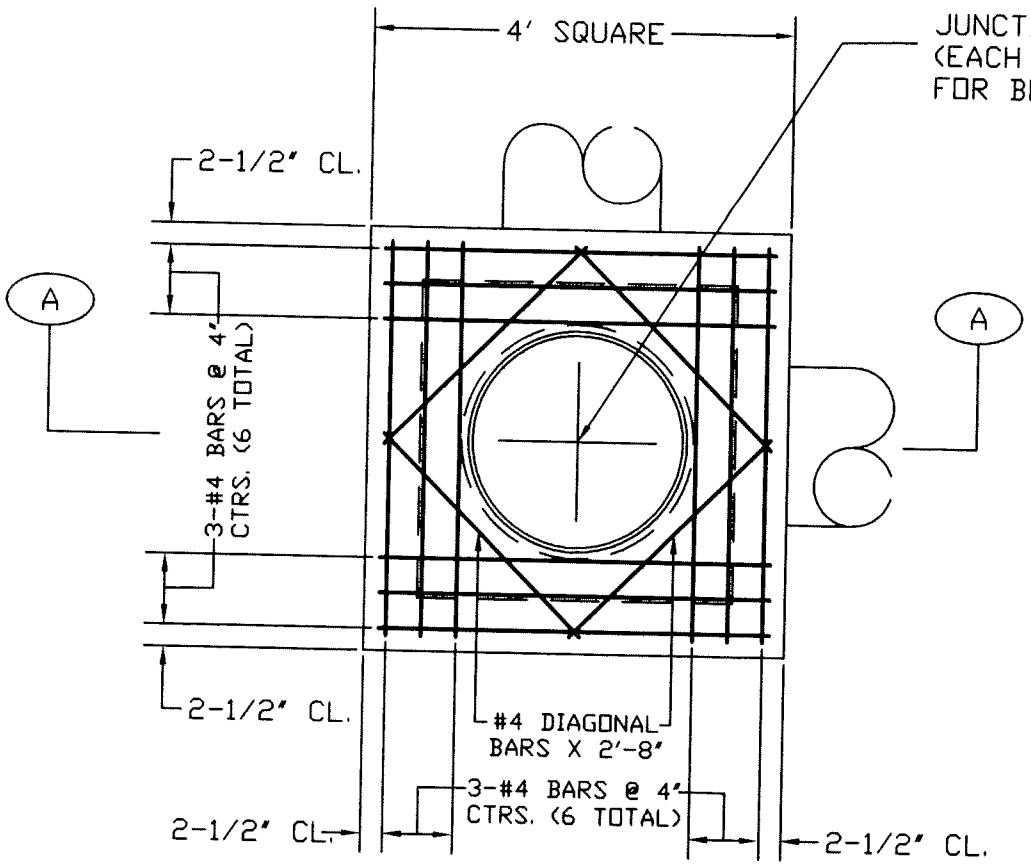


SECTION B-B

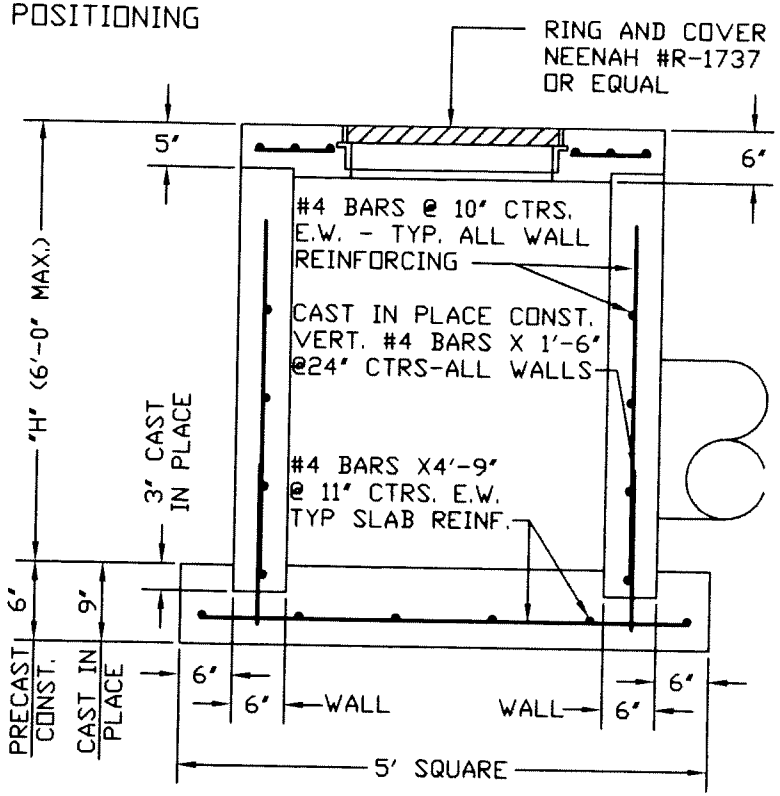
NOTES

1. **ALL WELDS SHALL BE PREFORMED IN ACCORDANCE WITH APPROPRIATE AWS SPECIFICATIONS & PROCEDURES.**
2. **ALL WELDS ON EXPOSED SURFAES SHALL BE DRESSED SO AS TO PROVIDE A PLEASING FINISHED APPEARANCE.**
3. **THE ENTIRE FRAME SHALL BE GALVANIZED.**

Date Revised: OCTOBER 2004	CITY OF OSAGE BEACH TYPICAL DETAIL CURB INLET DETAILS	Design Guideline: SECTION 4
By: sh		STORM DRAINAGE
Checked By: jb		Drawing No: IV-12

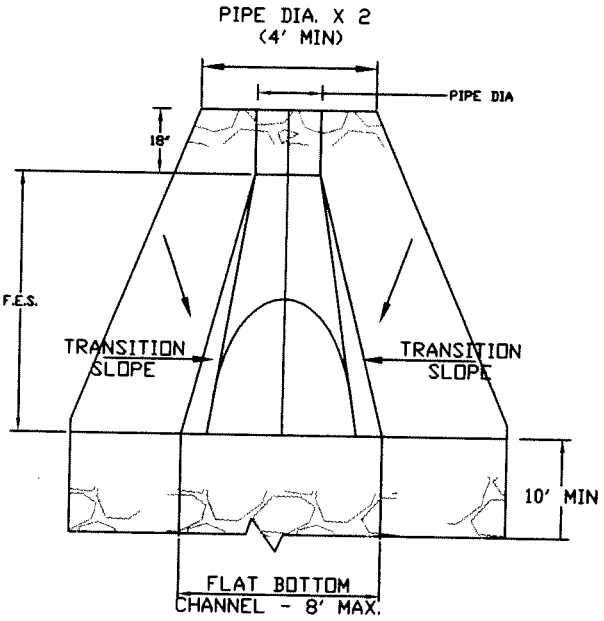


TOP - PLAN

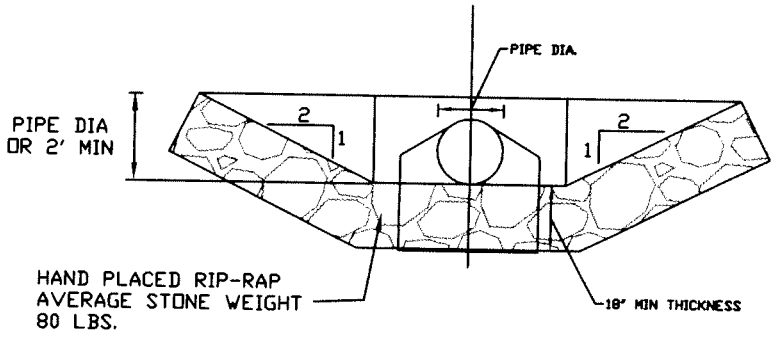


SECTION A-A

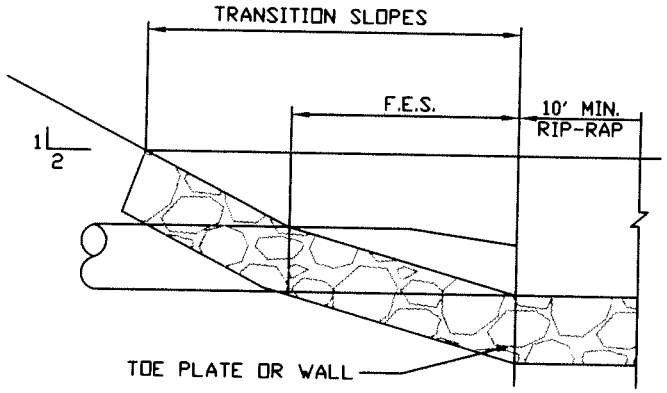
Date Revised: August, 2002 By: sh Checked By: jb	CITY OF OSAGE BEACH TYPICAL DETAIL JUNCTION BOX	Design Guideline: SECTION 4 STORM DRAINAGE Drawing No: IV-13



PLAN

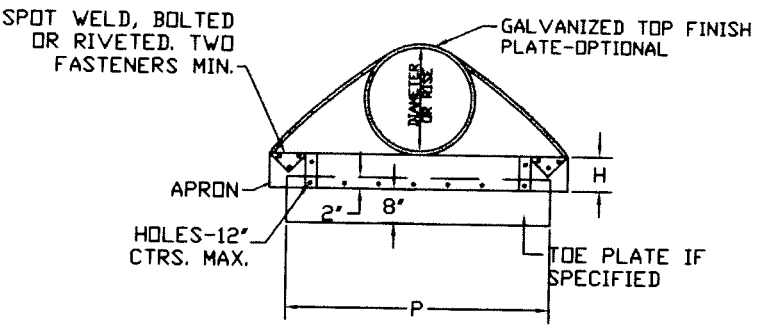


END

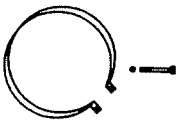


SECTION

Date Revised: March, 2003	CITY OF OSAGE BEACH TYPICAL DETAIL FLARED END SECTION W/RIP RAP	Design Guideline: SECTION 4
By: sh		STORM DRAINAGE
Checked By: jb		Drawing No: IV-14

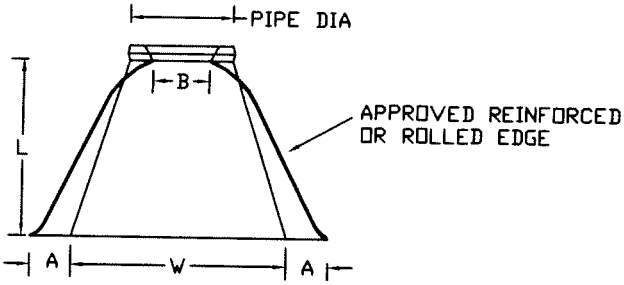


ELEVATION

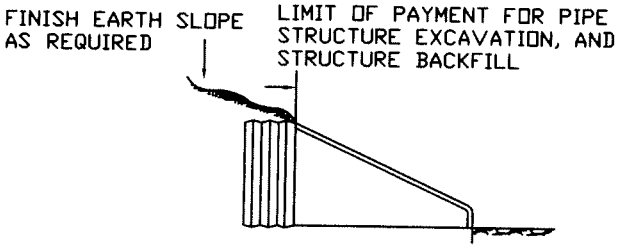


1 INCH WIDE 0.109" THICK CONNECTOR STRAP OF COMMERCIAL QUALITY STEEL. GALVANIZED WITH SAME WEIGHT COATING AS PIPE, AND 6" X 1/2" GALVANIZED BAND BOLT AND NUT. USE AS ALTERNATE ON CONNECTION.

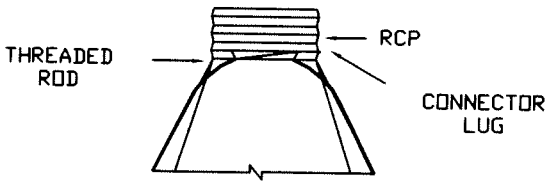
CONNECTOR STRAP



PLAN



TYPICAL CROSS-SECTION

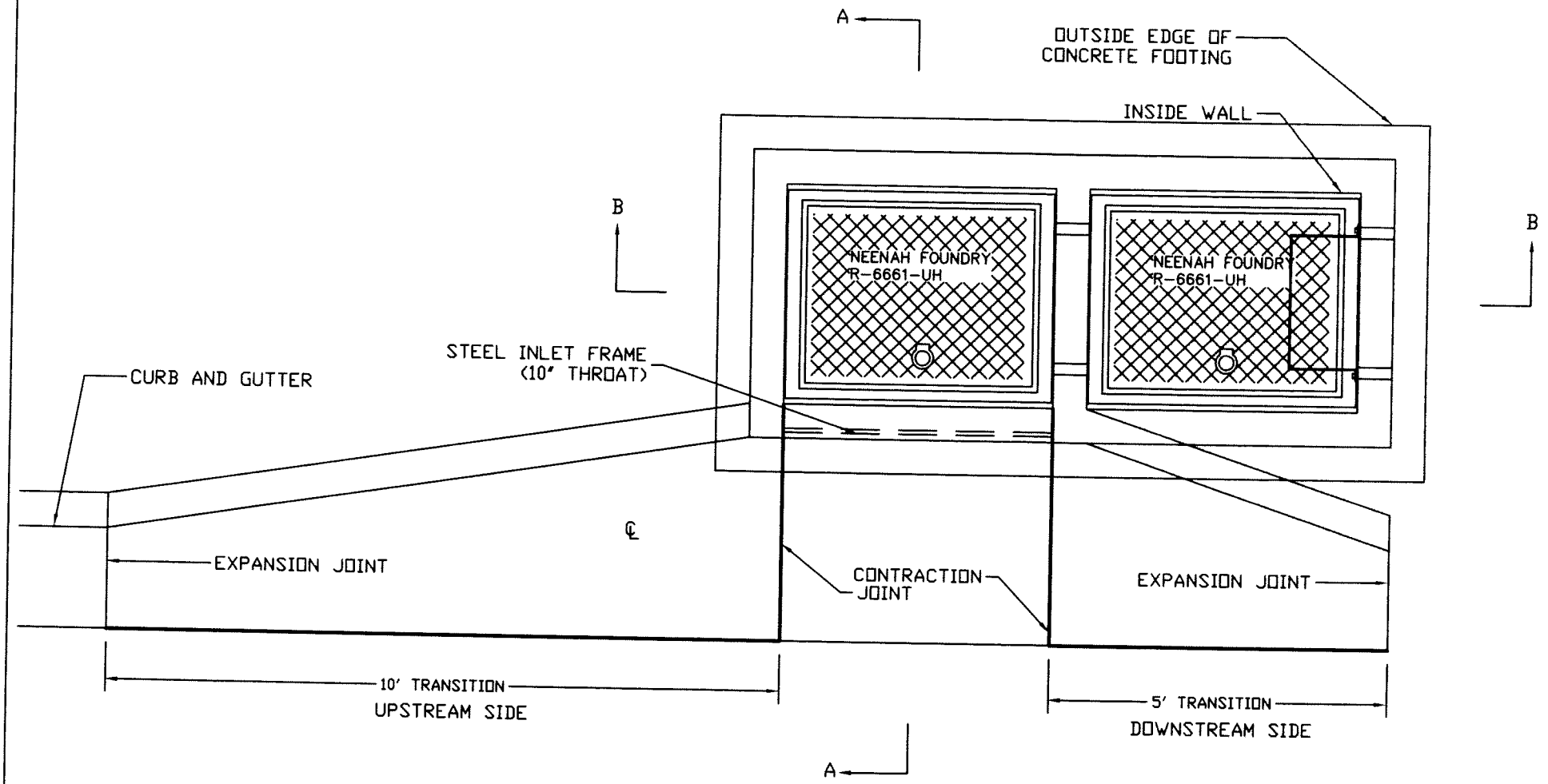


FOR 12" THRU 24" ROUND PIPE ONLY

CONNECTION

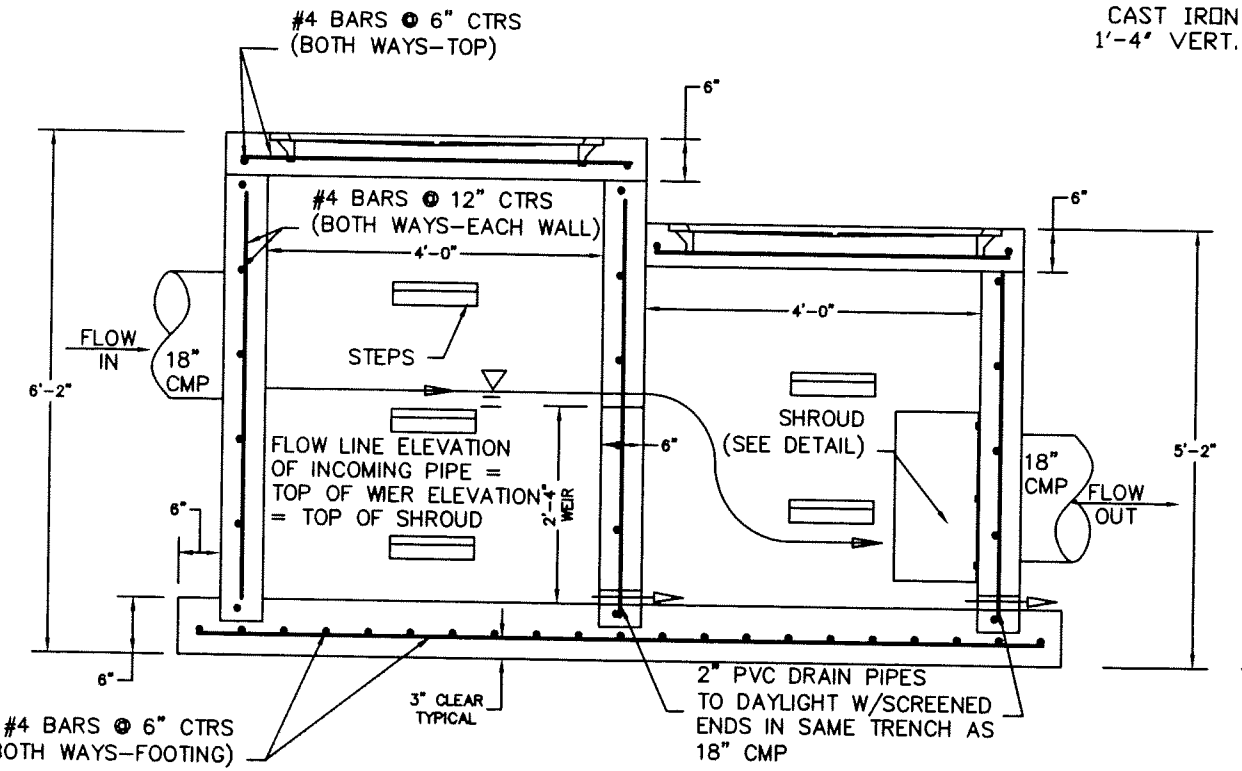
END SECTION FOR ROUND PIPE								
PIPE DIA. (IN)	GALV. SHEET THICK (IN)	DIMENSIONS (IN) A 1" TOL.	B MAX.	H 1" TOL.	L 1-½" TOL.	W 2" TOL.	APPROXIMATE SLOPE (V:H) (1:SLOPE)	TOE PLATE IF SPECIFIED P (IN)
18	0.064	8	10	6	31	36	2-½	46
21	0.064	9	12	6	36	42	2-½	52
24	0.064	10	13	6	41	48	2-½	58

Date Revised: October 2004	CITY OF OSAGE BEACH TYPICAL DETAIL CMP FLARED END SECTION	Design Guideline: SECTION 4
By: sh		STORM DRAINAGE
Checked By: jb		Drawing No: IV-15

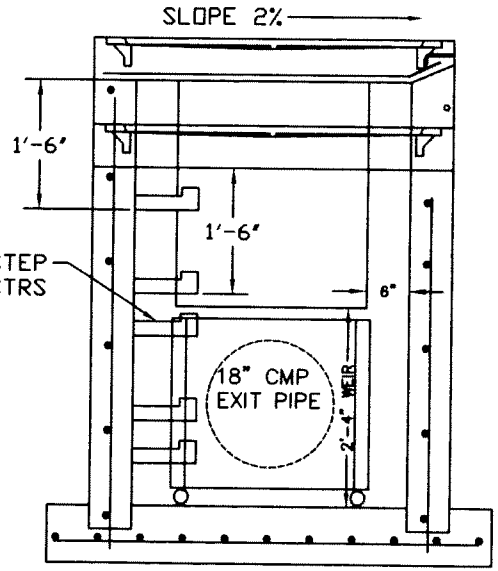


Date Revised: OCTOBER 2004	CITY OF OSAGE BEACH TYPICAL DETAIL DISSIPATION BOX	Design Guideline: SECTION 4
By: sh		STORM DRAINAGE
Checked By: jb		Drawing No: IV-16

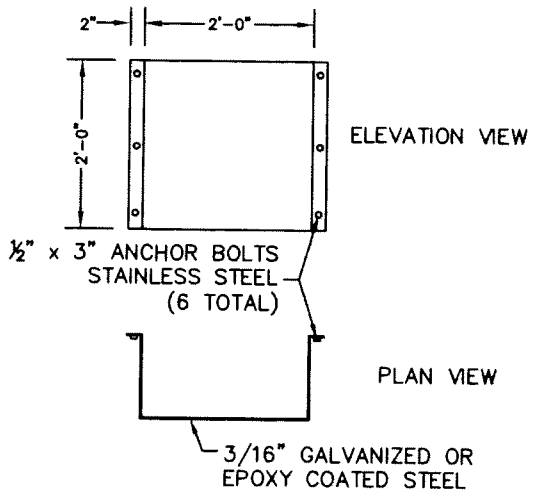
NOTE:
1. BEVEL ALL EXPOSED EDGES WITH ¾" CHAMFER OR ½" TOOLED EDGE.



SECTION B-B



SECTION A-A



SHROUD DETAIL

Date Revised: OCTOBER 2004	CITY OF OSAGE BEACH TYPICAL DETAIL DISSIPATION BOX	Design Guideline: SECTION 4
By: sh		STORM DRAINAGE
Checked By: jb		Drawing No: IV-17