

SECTION 7

STORM DRAINS

7.1 GENERAL

All drainage designs shall be in accordance with the accepted principles of Civil Engineering, the City Storm Water Master Plan and these Improvement Standards.

Public rights of way for residential, commercial and industrial developments will have surface drainage disposal accommodated in one of the following ways:

Method A. Positive drainage directly to an existing storm drain system available to area proposed for development.

Method B. Drainage to a detention facility that can be in turn drained to other drainage systems in a controlled manner. Design calculations and plans prepared by the Design Engineer showing adequacy of the proposed system and how the design will integrate into future stormwater facilities.

Onsite drainage for commercial, industrial and residential projects not covered by the above shall be contained within the property unless offsite disposal is approved by the City and the Developer participates in the costs of an approved drainage system that is sized to accommodate said on-site drainage.

7.1.1 STORMWATER QUALITY

Stormdrain discharges for all projects, commercial, industrial, or residential, regardless of the project size, shall include stormwater quality control measures. All stormwater generated from a site must be adequately treated before discharge. Stormwater management systems, which can include both structural and non-structural controls and best management practices, shall be designed to remove 80% of the average annual (post-development) total suspended solids (TSS) load, as well as any additional watershed or site-specific stormwater quality requirements, as determined by the City.

To the maximum extent possible; the development project shall implement pollution prevention practices during and after development of the site. Plans to control construction site wastes shall be included in an "Erosion Prevention and Sediment Control Plan" developed for the site in a Stormwater Pollution Prevention Plan.

7.1.2 STORMWATER MANAGEMENT PLAN

New developments and redevelopments shall prepare a Stormwater Management Plan for the City's review. Approval of this plan will shall be obtained, prior to the start of the development.

Stormwater management plans shall include the design calculations for any new subdivision or development. Submittals shall include the following:

- A Topographic map showing the relationship between the proposed development and the remainder of the watershed, including acreage of all sub-areas.
- Hydrology calculations for 10-year, 24-hour duration storm with the design basin at capacity and hydrology calculations a 100-year storm.
- A 1"=100' scale plan, showing the proposed street system, existing and proposed drainage system, tributary sub-areas, off-site drainage, the flow and flow direction in each pipe and flow to each structure contributed by its tributary area. All flows shall be noted in cfs.
- The hydraulic calculations shall show as a minimum the HGL, the proposed storm drain, including slopes and sizes, the flow in the pipes, the velocities in the pipes, elevations of pipe inverts at structures, top of structure elevations, and top of curb elevations.
- Stormwater shall be modeled on a system wide basis that includes all tributary flows and all downstream areas up to the final point of system discharge (e.g. TID Canal) Modeling shall use a Dynamic Model such as the EPA SWMM version 5 or approved alternate.

7.2 FLOW VOLUMES

The 100-year storm is to be contained within the top of curb grade. The hydraulic grade line for a 10-year 24-hour duration storm shall be below the gutter pan (flowline). The engineer shall assume that the storm basins are full when modeling these criteria.

In establishing the layout of stormwater networks, it is essential to ensure that flows will not discharge onto private property during times when stormwater flows are equal or exceed the major system design capacity.

7.3 DETENTION BASINS

Detention basins when proposed for individual development shall conform to the minimum standards outlined below:

- A. Capacity shall be large enough to entrap the total runoff from a 10 year frequency - 24 hour duration storm.
- B. Basins to be designed in such a manner that the highest design water elevation will be 6 inches below the lowest gutter elevation.
- C. Maximum allowable depth of basin to be ten feet below the lowest gutter flow line with the bottom shaped to concentrate the water at the outlet.
- D. Basin will be fenced using six (6) foot chain link fence with plastic or redwood slats or other approved material, a twelve (12) foot gate, and the fence may be located on the property line on all but exterior lots.
- E. There will be a 5 foot wide (min) unimproved walkway adjacent to the inside of the fence around the top of the basin.
- F. There will be a 10 foot wide unimproved ramp to the bottom of the basin with a max slope of 6 to 1.
- G. Other requirements for safety, aesthetics, maintenance and special conditions may be imposed by the City.
- H. Alternative basin design may be allowed upon approval by the City.

The design of all culverts, levees, detention basins, spillways, and other applicable structures shall comply with the latest FEMA and DWR Division of Safety of Dam regulations.

7.4 PIPE MATERIALS

Storm drain pipe may be reinforced concrete pipe, cast-in-place concrete pipe or PVC (SDR 35) or H.D.P.E.

The used must conform to the minimum standard requirements for the type of pipe use by accepted engineering practice and must be approved by the City. The class of pipe to be used shall be shown on the plans or specified in the special provisions.

Reinforced concrete pipe shall conform to Sections. 65 of the Standard Specifications.

Cast-in-place concrete pipe shall conform to Sections 63 of the Standard Specifications and these Improvement Standards. Use of cast-in-place pipe shall be only as approved by the City.

Polyvinyl Chloride Gravity Sewer Pipe (SDR 35) and fittings shall meet or exceed the requirements of ASTM D 3034 (SDR 35). The installation of all PVC pipe shall conform to ASTM D2321. The maximum deflection shall not exceed 5% of the inside diameter of the pipe. If deflection exceeds 5% the pipe shall be removed and replaced by the Developer or City Contractor at his expense.

High Density Polyethylene (HDPE) profile wall sewer pipe 18" and larger shall conform to ASTM F 894-85 and shall have gasketed or welded joints. Pipe fittings shall also conform to ASTM F 894-85 and have a hydrostatic design basis (HOB) of not less than 1250 psi for water at 73.4° per ASTM D 2837. Installation of HDPE pipe shall conform to ASTM D 2321.

Under special conditions and as approved by the City and Director of Public Works, Poly-Vinyl Chloride Pipe may be used for stormwater mains.

PIPELINE SIZING - At intersection of pipes, the downstream pipe shall have a crown elevation which is less than or equal to the crowns of all upstream connecting pipes. Pipe diameters shall not decrease in the downstream direction.

The minimum allowable inside diameter of any storm drain pipe shall be 12 inches and designed to flow with a minimum velocity of 2 feet per second when flowing full.

7.5 DRAIN INLETS

Drain inlets shall be constructed as shown on Drawing No. SD.5 and SD.6.

The structural channel iron shall be galvanized to conform to the requirements of Section 75-1.05 of the State Standards.

All storm drain inlets shall be protected from surface water contamination in conformance with the City of Hughson Storm Water Management Plan S.W.M.P. and the required project Storm Water Pollution Prevention Plan (SWPPP). In conformance with the State General Permit Requirements.

Catch Basins - Catch basins shall be designed according to the specifications listed in City Standard Drawing No. SD-3 and SD-4. Catch basins shall be designed and spaced such that they intercept and fully contain the 10-year storm. Under no circumstances shall the spacing of catch basins exceed 500 feet.

7.6 MANHOLES

Storm drain manholes shall be constructed on storm drain trunk lines and lateral lines as shown on Drawing No. SD.1. Manholes on cast-in-place pipe shall be constructed as shown on Drawing No. SD.2.

The manhole castings shall be raised to finish street grade by the Developer or City Contractor. In easement areas, the casting grade shall conform to the surrounding surface unless special elevations are required because of irrigation or future street grades.

Manholes shall be constructed at changes in horizontal alignment or slope, at intersections of trunks or laterals, at drain inlet connections, at 400 foot maximum spacing unless greater spacing is approved by the City and at all storm drain ends.

7.7 EXCAVATION

Excavation shall include the removal of all materials encountered. All trenches shall be excavated in open cut following neat parallel lines equidistant from the centerline as staked.

Maximum width of the trench at the level of the top of pipe shall not exceed the outside diameter of the pipe barrel plus 24 inches, unless otherwise approved by the City.

Excavation shall be carried at least 4 inches below the grade of the bottom of the pipe in areas where the material is too hard to permit proper bedding. This over-excavation shall be brought to grade with approved material compacted in place. Any areas which do not provide a sound foundation shall be over-excavated as directed by the City and filled to grade with approved materials compacted in place. Excess and/or rejected material shall be disposed of by the Contractor at his/her expense.

Erosion prevention and sediment control practices shall be utilized during the construction phase or during any land disturbing activities.

7.8 LAYING

The pipe shall be laid in conformity with the prescribed lines and grades. All adjustments of pipe to line and grade shall be made by scraping away of, filling in, and tamping under the body of pipe and not by blocking or wedging. All pipe shall be laid with bell end and upstream and shall be laid upstream from structure to structure.

All stormdrain pipe alignments shall be designed to allow a minimum of 36 inches of cover as measured from finished grade to top of pipe or 1 foot below subgrade, whichever is greatest. If, for sound engineering reasons, 3 feet of cover can not be obtained, the pipe shall either be encased in concrete or provided with a concrete cover as specified by the City Engineer.

7.9 INSPECTION

All storm drain lines shall be inspected for proper installation by the City prior to backfilling of trenches.

7.10 BACKFILL

After the drain pipe and appurtenances have been properly constructed and inspected and the joints have set, the trench shall be backfilled and compacted until the relative compaction is not less than 90% to within 24 inches to finish grade or to finish grade in an area outside the roadway. All material in the remaining 24 inches shall be compacted to 95% relative compaction (in maximum lifts of 8") as shown on Drawing No, SS.7 and shall conform to Section 193.06 of the State Standards.

Ponding or jetting may be permitted when specifically approved by the City, if this method does not hinder subsequent operations.

7.11 TESTING

Testing for proper compaction and for control of the concrete shall be performed by the City unless otherwise specified on the plans.

Certificates of compliance, weighmaster tags or other standard design data may be required by the City.

On subdivision projects the cost of the above testing shall be added to the inspection costs which are paid by the Developer.

7.12 DRAINAGE PUMPS

Drainage pumps shall be of the non-clog type and each installation shall have two pumps that automatically operate regularly on an alternating basis with both pumps operating together during times of heavy flow. The capacity of the system shall be such that each individual pump can efficiently handle 100% of the design storm runoff for they are being drained.

Each pumping plant installation shall be designed for the purpose intended and shall be approved by the City.

Storm Drain Lift Station shall be a Storm Drain Duplex Pump Station. The System shall include two submersible pumps, and a quick disconnect system which permits installation and removal of each pump without the need for personnel to enter the Wet Well. All components of the pumping system must be listed and labeled by Underwriter's Laboratory for Operation in a Class I, Group D, Division 1 location as defined in the National Electric Code.

OPERATING CONDITIONS: Pump shall be designed so that the motor will not overload at a minimum static head of zero (0) feet. Pumps shall be designed to pass a three (3) inch diameter solid. For maximum system efficiency, each pump impeller shall be trimmed to meet the specified system flow and head conditions.

PUMP CONSTRUCTION: The volute casing, impeller and motor enclosure shall be cast iron. The motor shaft on which the impeller is mounted shall be stainless steel. The impeller shall be slip-fit to the shaft, key driven, and attached with stainless fasteners.

All electrical parts shall be housed in an air-filled watertight enclosure. Tandem lapped-face seals shall be provided on the rotating motor shaft. The inner seal shall operate in a sealed, chamber containing two moisture sensing-probes, capable of detecting any influx of conductive liquid past the outer seal. The probes shall be connected to a relay and signal device in the pump control panel, providing the operator with an indication of impending seal failure.

Automatic Reset, normally closed thermostats shall be provided in two adjacent phases of the motor winding. The thermal protection system shall limit motor skin temperatures to 80% of Group D gas ignition temperatures under all electrical conditions, including single

phasing or locked rotor. The motor enclosure shall be listed and labeled by Underwriter's Laboratory as suitable for use in Class I, Group D, Division 1, hazardous location.

The pump and motor assembly shall be listed by Underwriter's Laboratory as "portable utilization equipment," permitting the use of flexible power and control cable in the wet well. The cable entry point at the top of the pump motor shall be epoxy sealed to prevent entrance of moisture into the motor enclosure.

Pump Station access doors shall be of ¼" diamond plate aluminum able to withstand a live load of 300 lbs. per square foot and have a lifting handle and locking post. The cover shall open to 90° and lock automatically in that position. The lid shall be Bilco, type J-AL, USEMCO or approved equal. Doors may be hydraulically assisted when approved by the City. In areas of exposure to traffic, lids shall withstand an H20 load rating.

DISCONNECT SYSTEM: The design of the Disconnect System shall permit easy removal of each pumping unit for inspection or service. The pumps, when lowered into place, shall be automatically connected to the discharge piping there shall be no need for personnel to enter the Wet Well to inspect or service the pumps.

Each pump shall be securely attached to a sliding guide bracket designed for use with at least two guide rails. Guide rails shall be stainless steel, schedule 40. Each sliding Guide bracket shall have non-sparking material at the point of contact with the guide rails to prevent spark ignition of explosive wet well gases during pump installation and removal.

A cast iron discharge elbow, located on the floor of the wet well, will receive the pump discharge when the pump is lowered into place. The receiving edge of the discharge elbow shall be fitted with a non-sparking material to prevent spark ignition and removal. The pump discharge shall be fitted with a resilient seal which provides a positive hydraulic seal for maximum pump system efficiency. The lower guide rail brackets for each pump shall be mounted by the pump manufacturer on a steel base plate. The base plate shall be aligned to allow for proper operation of the disconnect system. The base assembly shall provide stable, three-point support of the pumping unit during pump operation.

The entire quick disconnect pumping system must be listed and labeled by Underwriter's Laboratory (UL) as suitable for operation in Class I, Group D, Division I location as defined in the National Electric Code.

ELECTRICAL CONTROLS - DUPLEX SYSTEM: All controls shall be mounted in a free standing self contained NEMA 3R metal enclosure. The control panel and all electrical components shall bear the Underwriter's Laboratory (UL) label. All electrical work shall comply with the rules and regulations of the National Electrical Code and State of California electrical safety orders. All circuit breakers shall have operators extending through the door of the enclosure. All motor starter overload resets, selector switches, push buttons and pilot lights shall be mounted on the door of the enclosure.

The control for each pump shall include a thermal magnetic circuit breaker, rotary handoff-automatic switch, and magnetic motor starter with ambient compensated overload relays and quicktrip heaters. The pump control circuit shall include a door interlock switch to de-

energize the control circuit when the enclosure door is open, a control circuit transformer with fused 115 volt secondary and grounding type duplex convenience outlet. Pump operation shall be controlled by three (3) bulb type liquid level sensors. An intrinsically safe pilot circuit shall be provided for each level sensor to reduce the power to the sensor to a level incapable of releasing sufficient electrical or thermal energy to ignite explosive gases. All wiring shall be copper.

The controls shall provide for lead/lag sequencing of the pumps. The pumps shall operate singly or in parallel. An automatic alternator shall alternate the lead/standby on each succeeding pump cycle. An outer pump seal leakage detection system shall be included in the control enclosure. When the motor probes sense the presence of moisture in the oil seal chamber, a relay coil will illuminate a panel mounted indicating lamp to indicate possible outer motor seal failure.

A fourth level sensor, with intrinsically safe circuit, shall be furnished for indication of a high water alarm condition. High water alarm shall be indicated by an external red light and, an external audible alarm with silence button.

PIPING AND VALVES: All pump station piping shall be ductile iron with 125 pound flanged connectors. Gate valves in the discharge lines shall be A.W.W.A. approved with 125 pound flanges. Check valves in the discharge lines shall be full opening, with outside lever and spring, stainless steel hinge pins and "0" ring seals.

WARRANTY: All material including pumps, valves, electrical controls, etc. shall be guaranteed for a one-year period from the date of final acceptance by the City.

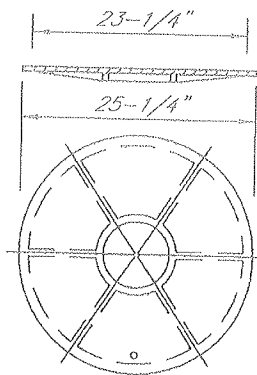
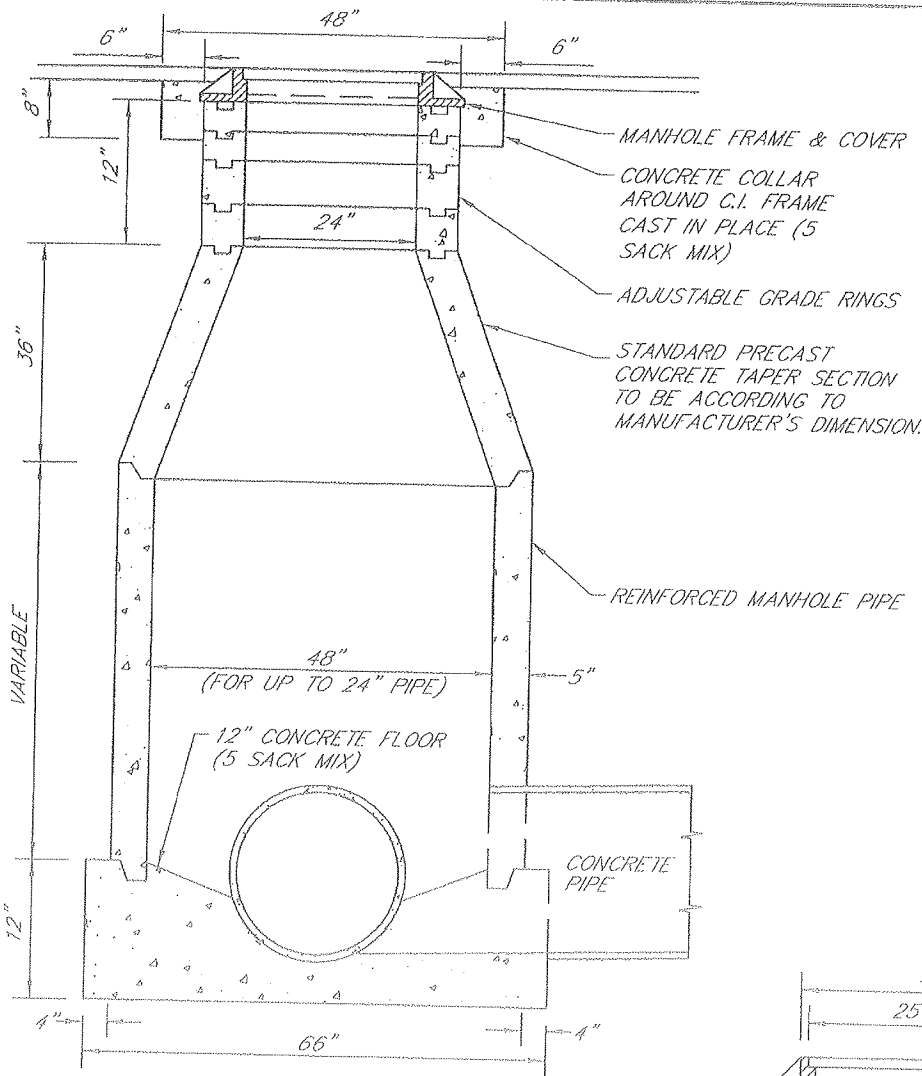
OPERATION AND MAINTENANCE: Prior to installation the Contractor shall furnish the City with a complete set of manufacturer's operation, maintenance, and parts manuals for all equipment installed and provided in a form easily reproducible and understood by Operations & Maintenance staff. He/she shall also provide the City with the name, address and phone number of the nearest local distributors for all parts. A complete wiring diagram shall also be furnished to the City and an additional copy to the Engineer.

TESTING: The entire installation shall be successfully tested at a time acceptable to the City in the presence of the Engineer and City Operations & Maintenance staff. Panel and circuits shall be tested for shorts and grounds with mains and disconnects from feeders. Each individual circuit shall be tested at the panel with all equipment connected for proper operation. Training for operation of the installation shall be provided to Operations & Maintenance personnel.

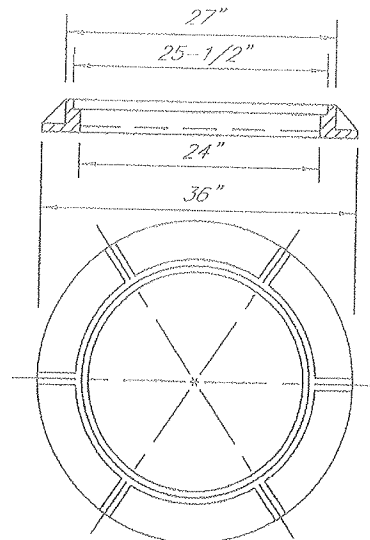
NOTE: All stormwater system design and installation shall be constructed to conform to existing BMP's (Best Management Practices) and the City of Hughson Stormwater Management Plan.

The City shall be notified and contacted by the Contractor at least forty-eight (48) hours prior to beginning or re-starting any of the following stages of work and shall be notified when each of the stages has been completed. Subsequent stages shall not begin without authorization of the City. Should the Contractor fail to so notify and contact the City, the

cost of all subsequent inspection and testing necessary to ascertain that the work has met all the specified requirements shall be born by the Contractor or the work shall not be approved.



COVER



FRAME

FRAME & COVER
SOUTH BAY FOUNDRY
NO. A-25 - LABELED
STORM DRAIN



STORM SEWER MANHOLE

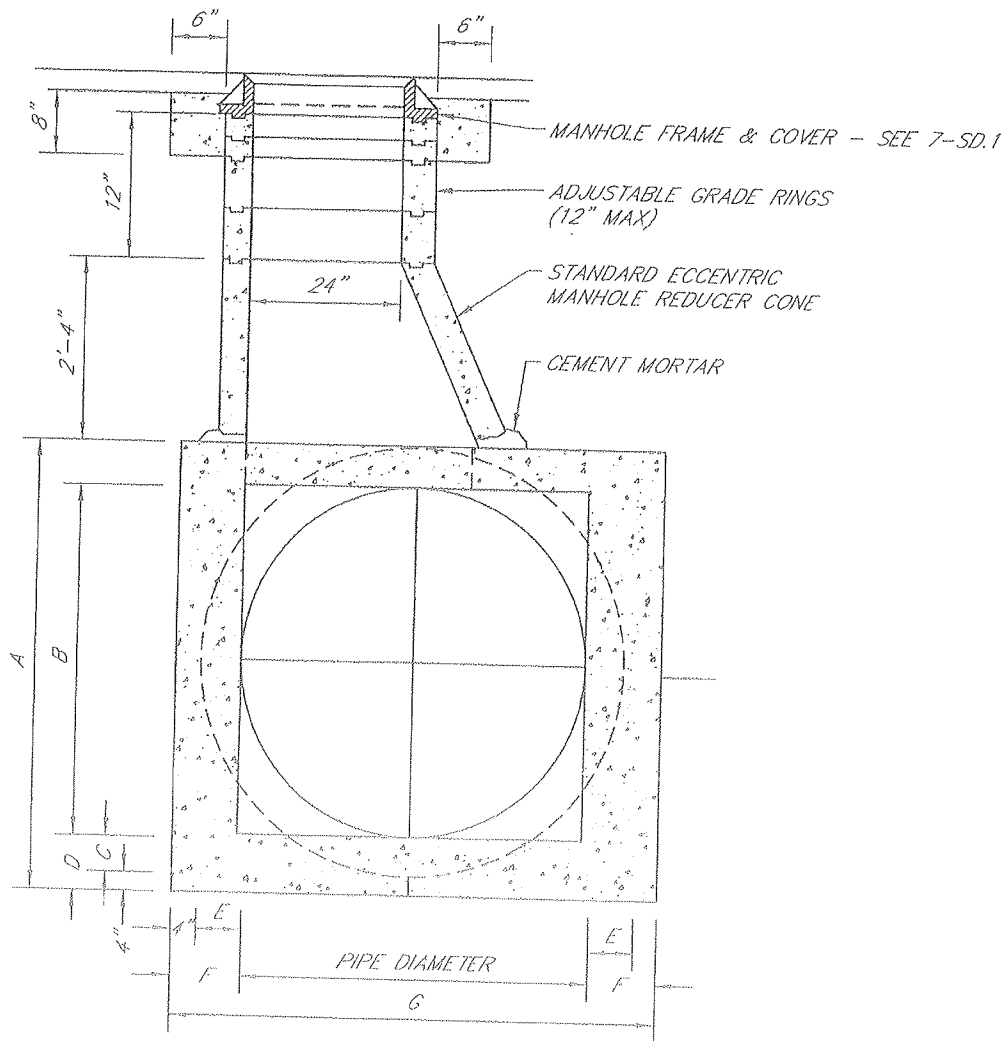
DRAWN BY: A.D.R.
CHECKED BY: R.H.H.
SCALE: NONE
DATE: 1/04

APPROVED BY: *[Signature]*
DATE APPROVED: 1/5/04

CITY OF HUGHSON

STANDARD DETAIL

7-SD.1



PIPE DIA.	A	B	C	D	E	F	G
36	49 1/2	36	3 1/2	7 1/2	4 1/2	8 1/2	53
42	56	42	4	8	5	9	60
48	63	48	5	9	6	10	68
54	69 1/2	54	5	9 1/2	6 1/2	10 1/2	75
60	76	60	6	10	7	11	82
66	83	66	6 1/2	10 1/2	7 1/2	11 1/2	89
72	90	72	7	11	8	12	96

ALL DIMENSIONS ARE IN INCHES



CAST IN PLACE MANHOLE

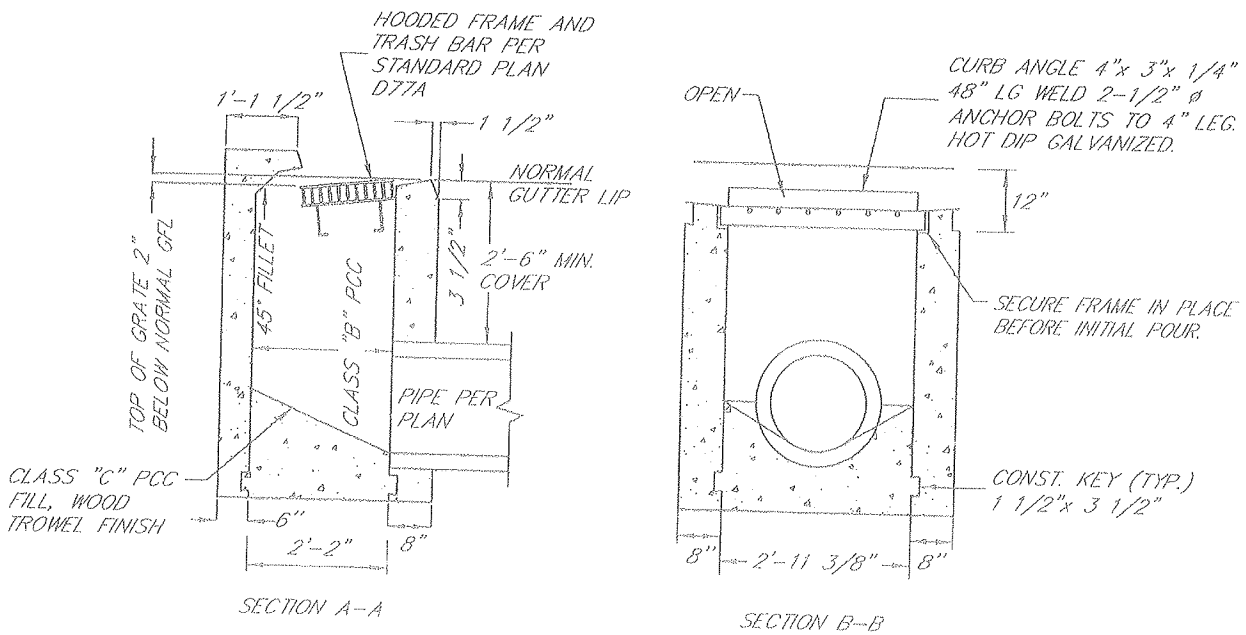
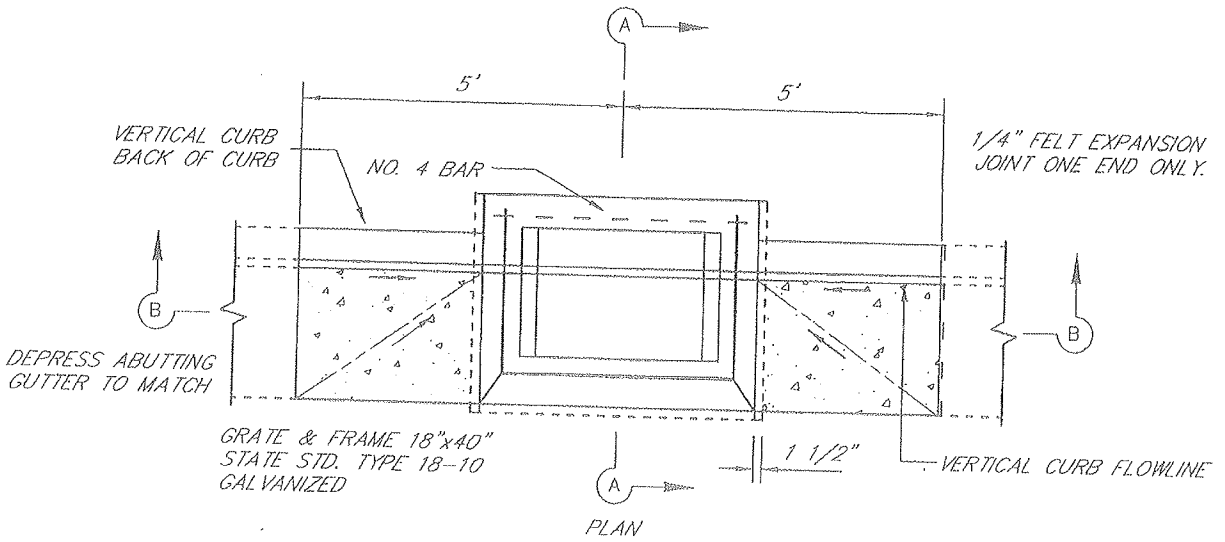
DRAWN BY: A.D.R.
 CHECKED BY: R.H.H.
 SCALE: NONE
 DATE: 1/01

APPROVED BY: *[Signature]*
 DATE APPROVED: 1/31/04

CITY OF HUGHSON

STANDARD DETAIL

7-SD.2



NOTES:

1. REINFORCING NOT REQUIRED IF INVERT IS LESS THAN 8' DEEP, OTHERWISE USE NO.4 BARS @ 18" O.C. BOTH WAYS.
2. IN AREAS OF DRIVEOVER CURBING, A 3' TRANSITION TO VERTICAL CURBING WILL BE NECESSARY ON EACH SIDE OF THE CATCH BASIN.



CATCH BASIN DETAILS

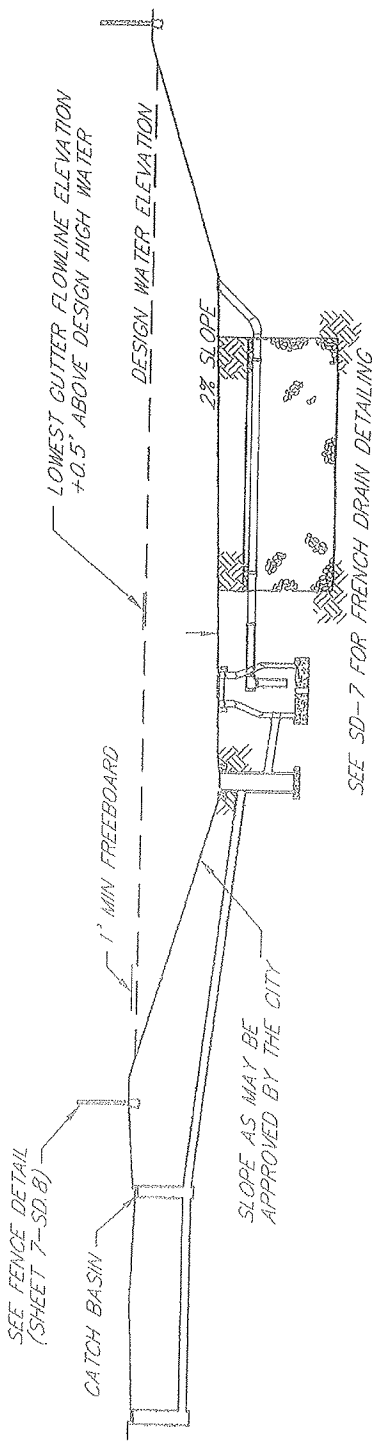
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CHECKED BY: R.H.H.
SCALE: NONE
DATE: 1/04

APPROVED BY: *[Signature]*
DATE APPROVED: 5/1/04

CITY OF HUGHSON

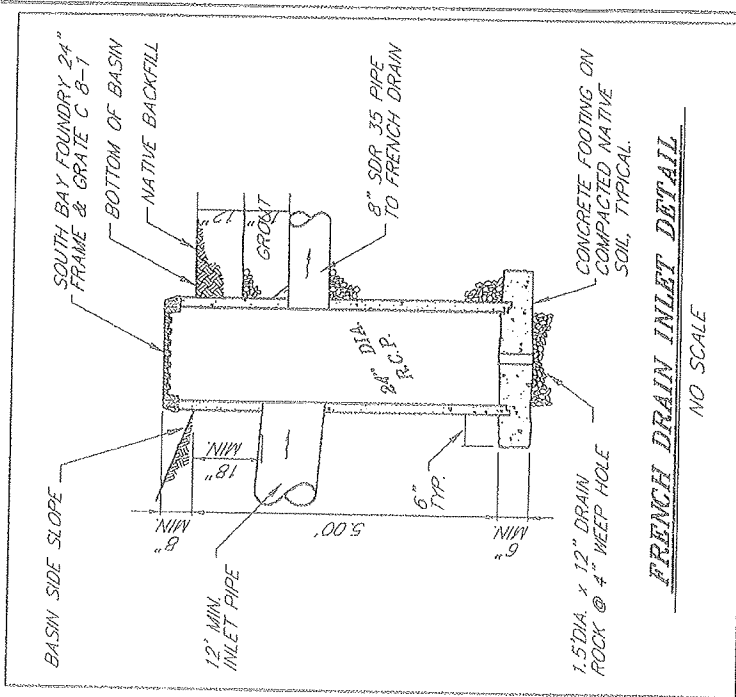
STANDARD DETAIL

7-SD.3



FRENCH DRAIN INLET DETAIL

NO SCALE



FRENCH DRAIN INLET DETAIL

NO SCALE

NOTE: FOR INLET PIPE LARGER THAN 18" IN DIAMETER THE DESIGN ENGINEER SHALL PROVIDE PROPOSED DESIGN DRAWINGS FOR A MODIFIED INLET STRUCTURE TO THE CITY ENGINEER FOR APPROVAL.



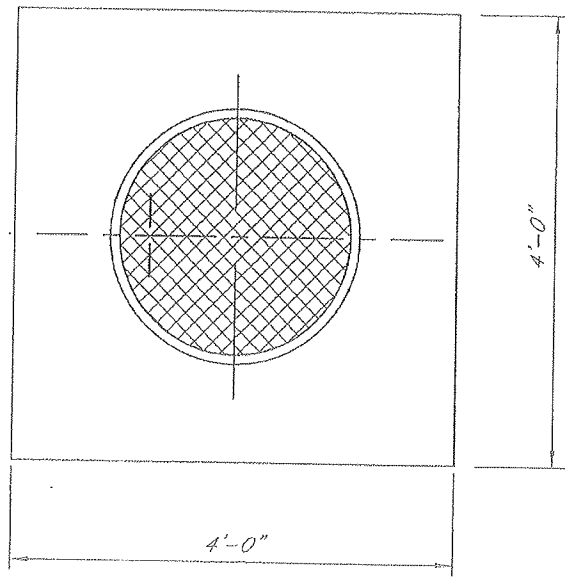
STANDARD DRAINAGE BASIN

DRAWN BY: A.D.R.
 CHECKED BY: R.H.H.
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 DATE: 1/04

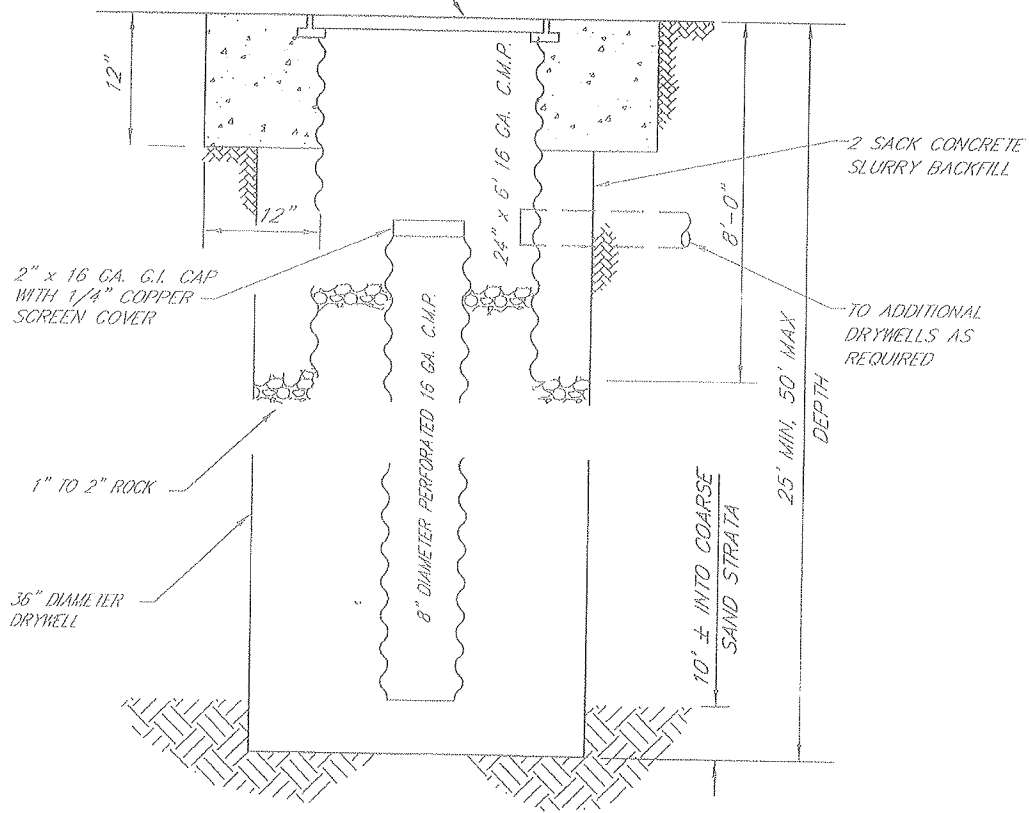
APPROVED BY: _____
 DATE APPROVED: 8/13/07

CITY OF HUGHSON

STANDARD DETAIL
 7-SD.5



SOUTH BAY FOUNDRY FRAME & GRATE
SBF 624 (PLATE C.9)



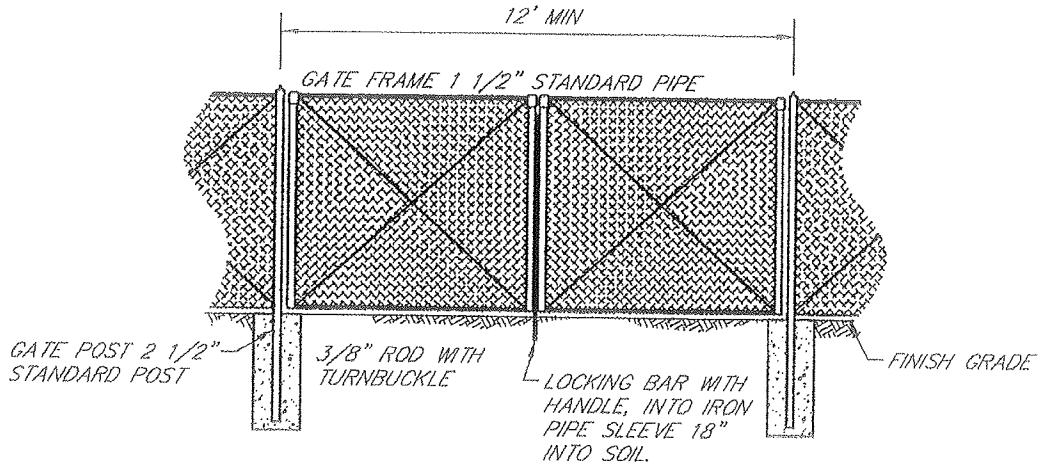
STANDARD DRAINAGE UNIT

DRAWN BY: A.D.R.
CHECKED BY: R.H.H.
SCALE: NONE
DATE: 1/04

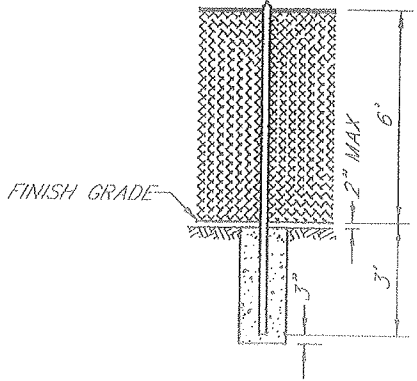
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DATE APPROVED: 8/13/07

CITY OF HUGHSON

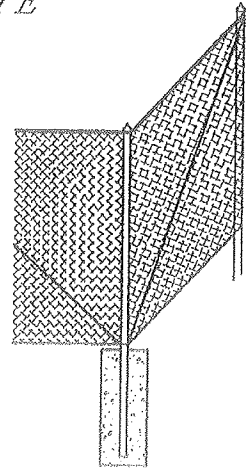
STANDARD DETAIL
7-SD.6



TYPICAL GATE



TYPICAL FENCE POST



TYPICAL CORNER POST

SEE STANDARD SPECIFICATIONS DETAIL A85 FOR MATERIALS SPECS.
 3 STRAND BARBED WIRE ON TOP MAY BE REQUIRED BY CITY.
 SEE CONDITIONS OF APPROVAL.



TYPICAL FENCE FOR DRAINAGE BASIN ENCLOSURE

DRAWN BY: A.D.R.
 CHECKED BY: R.H.H.
 SCALE: NONE
 DATE: 1/04

APPROVED BY: *[Signature]*
 DATE APPROVED: 8/13/07

CITY OF HUGHSON

STANDARD DETAIL
 7-S.D.8