

CONSTRUCTION STANDARDS
AND
TECHNICAL SPECIFICATIONS

CONSTRUCTION STANDARDS AND TECHNICAL SPECIFICATIONS FOR
For the
LOXAHATCHEE RIVER DISTRICT

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SECTION 1

ADMINISTRATIVE AND GENERAL

1.01 General

The purpose of this manual is to provide the minimum construction standards for design and construction work associated with wastewater systems within the District and is intended to supplement the requirements of other regulatory agencies. The design engineer is to use good engineering judgment in the design of wastewater systems. The design engineer and the contractor are responsible for providing sound, workable, and long lasting systems.

The intent of this section is to provide members of the development community with a brief introduction to the Loxahatchee River Environmental Control District, its function, and procedures.

The Loxahatchee River Environmental Control District is an agency of government which was created in 1971 for the purpose of providing utility and other environmental services within the 72 square mile basin of the Loxahatchee River. Currently, the District owns, operates, and regulates the regional wastewater system serving Tequesta, Jupiter, Juno Beach, Juno, and the unincorporated areas of northern Palm Beach and southern Martin Counties.

The District offices are located at 2500 Jupiter Park Drive, Jupiter, Florida. The offices are open between 8:30 A.M. and 5:00 P.M. weekdays. The telephone number during working hours is 561-747-5700. For emergency situations outside of normal office hours, the telephone number is 561-747-5708.

With specific regard to new development, the District's legislated policy is to provide the required utility services to the area now and as it continues to grow. It is, therefore, the agency's intent to work closely with new development to assure that the utility services can be provided in a manner which is both timely and consistent with the standards and specifications set forth in this manual.

1.02 Procedures Prior to Construction

1.02.1 Introductory Meeting

It is highly recommended that the project representative (s) (owner, engineers) meet with the District's Deputy Director early in the planning stages of the development. At such time a review of the developer agreement and availability of service will be made.

1.02.2 Developer Agreement

The submittal of a properly executed agreement, along with payment for certain charges, is required before the District will review the engineering plans. Copies of the District's standard developer agreement and Chapter 31-10 F.A.C., which addresses the charges, are available at the District offices.

1.02.3 District Installed Facilities

During the introductory meeting the developer may wish to discuss the availability of District installed regional and subregional facilities to serve the proposed project, although, this program is limited to larger developments.

The District currently maintains a program where subregional lift stations may be constructed by and paid for by the District. A subregional facility must be designated and approved by the District Governing Board. Staff will take no action for recommending designation of a facility for installation until a developer agreement is executed and all fees are paid.

Staff reviews and assesses the project based upon economic feasibility, consistency with the District Master Plan and its current and future demand.

In designating a subregional facility, the following items are the responsibility of the owner/developer:

Provide the District with any project information necessary for the design of lift station(s) and force mains(s).

Provide, at his expense, all necessary electrical service to the lift station site in conjunction with construction activities.

Provide adequate access to lift station and force main sites for District and contractor's vehicles and equipment. Paved asphaltic concrete or reinforced concrete access drives will be provided (Min. 12' wide).

Provide appropriately sized sanitary sewer gravity lines that are necessary to serve adjoining properties in conjunction with lift station construction. Sewer lines to adjoining properties must be activated concurrent with lift station, or upon demand from the District.

Provide all clearing, grubbing and rough grading of the lift station and force main sites prior to construction.

Provide survey requirements and staking of the lift station and force main upon request from the District. Staking shall include provision of one stake at center of the proposed wet well, with 50' offsets and bench mark. Force main shall be staked at center line with 10' offsets every 100 feet, with set bench mark. All survey work shall be performed by a professional surveyor licensed in the State of Florida.

Developer shall convey deed to the lift station property prior to construction, and all required easements as follows:

Permanent Easements:

- a. Lift Station - 40' x 40'
- b. Force Mains - 10' wide minimum
- c. Gravity Mains - 12' wide minimum

Temporary Construction Easements:

- a. Lift Station - 100' x 100'
- b. Force Mains - 30' wide minimum
- c. Gravity Mains - 50' wide minimum

Developer's contractor will be responsible to make gravity line connections from the system collection manhole to the lift station after the construction of the wet well has been completed.

District staff will work in conjunction with the developer's project engineer to plan for the service area. Station design will be performed by the District. Construction will be contracted for by the District and inspected by District personnel.

102.4 Developer Installed Facilities - Plan Review and Approval

An initial plan submittal is recommended. Submittal should contain; one (1) complete set of plans including sewer, water and drainage systems, and paving and grading details. Upon review, the design engineer will be notified of acceptance or comments which need to be addressed.

Final submittal for approval will require additional plan sets, to include two (2) sets for District files, four (4) sets for Florida Department of Environmental Protection and Palm Beach County Health Department, plus any additional sets required by the engineer or owner, and , six (6) sets of Florida Department of Environmental Protection applications executed by engineer and owner.

District approval of utility plans and specifications, as well as sign off on the Florida Department of Environmental Protection/Health Department application, is required.

Plan review will be for technical sufficiency of design for incorporation into the District system. This review, as well as plan approval by the District, does not relieve the design engineer of his liabilities or responsibility for a properly detailed design. District engineering staff will be available to work with the design engineer to assure the plans meet the requirements set forth in this manual.

All plan submittals must be signed and sealed by a Professional Engineer, registered in the State of Florida. Plans which are marked "Preliminary" or "Draft" will not be approved.

Supplemental data to be furnished with the final plans submitted for approval includes the following:

- a. Project Summary
 1. Number of Manholes
 2. L.F. of Gravity Main (for each pipe size)
 3. L.F. of Force Main (for each pipe size)
 4. Number of Lift Stations and depth of each
- b. Basis of determination of design capacity and design flow.
- c. Calculations and plot of system head curves.
- d. Calculations of pump cycle times.
- e. Wet well floatation calculations.

1.03 Developer Installed Facilities - Procedures During Construction

1.03.1 Periodic Inspection

Throughout construction, the developer will look to his consulting engineering firm for progress by periodic inspections by our own personnel. If problems are encountered during construction, it will be the developer's responsibility through his engineers, to resolve them to the District's satisfaction. Any revision of substance to the approved plans shall be submitted to the District for approval prior to incorporation into the work.

1.03.2 Pre-Final Inspection Submittals

Upon completion of construction, but before final inspection or acceptance by the District, submittal of certain legal documents (Bill of Sale, Easement Grants, Maintenance Bond, etc.), engineering records (signed and sealed record drawings, and letter of certification, including a statement of infiltration (where applicable), pressure and leakage tests , and pump startup tests), and payment(s) for building(s) connected, are required.

1.04 Developer Installed Facilities - Procedures Following Construction

1.04.1 Project Completion

A project is not considered complete and prepared for District final inspection until such time as:

All sewer system construction is completed in accordance with plans and specifications and inspected and certified by the engineer.

Where sewers are constructed in paved areas, the compacted base material and prime coats must be completed (as a minimum requirement).

Areas over lines and laterals, which are not proposed to be paved, shall be brought to finish compacted grade.

1.04.02 Project Completion Submittals

Upon Completion of Construction, but before District final inspection, certain documents include the following items in forms acceptable to the District:

1. Bill of Sale
2. Grant of Easement
3. Maintenance Bond

From a surety company and executed by an attorney-in-fact for the surety company with a certified copy of his Power-Of Attorney attached to the Bond; or a

Letter of Credit

From a financial institution and in a for acceptable to the District.

4. Record Drawings

One (1) mylar, two (2) prints, signed and sealed by engineer.

5. Department of Environmental Protection Certificate of Completion

Executed by Owner and Engineer

6. Letter of Certification

Including statement of infiltration/exfiltration, and pressure and leakage, and pump start-up test records.

7. Copy of Site Plan and filed Plat

Indicating all building numbers and street names.

8. Payment

For all buildings connected to the system.

1.04.3 Final Inspection

After the owner and project engineer have provided the documents as outlined in Section 1.04.2, the District engineering staff will conduct a final inspection and recommend acceptance or denial. If acceptance is denied, a letter will be sent to the project engineer advising of the denial and reasons for such. Subsequently, the project engineer should address the comments and request scheduling a final reinspection.

1.04.4 One Year Maintenance Bond and Inspection

Prior to acceptance by the District, a maintenance bond which will remain in effect for one year from the date of District acceptance of the system, must be provided to the District. Shortly before the expiration of the one year maintenance bond, the District will reinspect the system in a manner similar to the final inspection (i.e., broken pipes, deflection, infiltration, etc.) The District will advise the developer of any defects found during this inspection and will require correction to be made prior to expiration of the maintenance bond.

Should adequate progress, in the opinion of the District, not be made in correcting the deficiencies, the District will look to the bonding company for corrective action.

A letter of credit drawn upon a financial institution licensed in the State of Florida, and in a form acceptable to the District may be provided in lieu of a maintenance bond.

1.04.5 District Acceptance

Upon satisfactory finding of the final inspection, the Department of Environmental Protection/Health Department Certification of Completion will be executed by the Executive Director, thereby, accepting the system for operation and maintenance.

1.04.6 Operation and Maintenance

With the exception of service laterals which lie beyond right-of-way or easement lines, or in common areas of ownership, the wastewater system serving the development will be operated and maintained by the District's personnel, who are well trained and responsive to the needs of your new residents.

1.04.7 Utility Billing

The District's accounting department will continue to work with the Developer in the collection of connection charges as new buildings are tied into the system, and in the billing of quarterly service charges.

1.05 Definitions and Abbreviations

The term "Owner" or "District" shall mean the Loxahatchee River Environmental Control District.

The term "Director" shall mean the Executive Director of the Loxahatchee River Environmental Control District.

The term "Engineer" or "Design Engineer" shall be the engineer registered in the State of Florida that signs and seals the plans of a developer or other person or entity.

The term "District Engineer" shall be the engineer designated by the District, whether acting directly or as an authorized agent of the District, acting within the scope of duties entrusted to them.

the abbreviation listed below shall have the meaning set forth opposite each:

AASHTO	American Association of State Highway Transportation Officials
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ACI	American Concrete Institute
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Material
AWWA	American Water Works Association
NEC	National Electric Code
NEMA	National Electric Manufacturers Association
AWG	American or Brown and Sharpe Wire Gage
NPT	National Pipe Thread
WOG	Water, Oil, Gas

SECTION 2

DESIGN CRITERIA

2.01 General

The requirements of this section are minimum and nothing herein shall be construed to eliminate consideration of a design based on a rational procedure not covered by such requirements. Standards or minimum requirements set forth in this Manual are not intended to relieve the Developer, Contractor, or Design Engineer from complying with good engineering and construction practices under specific conditions which require a higher degree of procedure, standards, or requirements. Where the Developer, Contractor, or Design Engineer is not capable of following the requirements of the Manual due to certain site conditions, any deviation from the requirements set forth in the Manual shall first be approved by the District. It is intended that the requirements of this section shall be applicable in all cases where the facilities being constructed or to be constructed shall be owned and/or operated and maintained by the District.

2.02 Design Capacity

Gravity sewer systems should be designed for the estimated ultimate tributary population. Parts of the system that can be readily increased in capacity such as lift stations, may be submitted for approval based on phased implementation. The basis of design for all projects shall accompany the plan documents.

2.03 Design Flow

Sewer system designs shall be based on the design flow data contained in this section.

2.03.1 Average Daily Flow

- A. Residential - includes family residences, condominiums, townhouses and mobile homes.

	<u>Gallons Per Day Per Unit</u>
One Toilet	200
Two Toilets	250
Three Toilets	300
Four or More Toilets	350

B. Commercial

	<u>Gallons Per Day</u>
Barber and Beauty Shops (per chair)	85
Bowling Alleys (toilet wastes only per lane)	150
Country Club	
1. per resident member	150
2. per non-resident member	25
Dentist Offices	
1. per dentist	250
2. per wet chair	200
Doctor Offices (per doctor)	250
Food Service Operations	
1. ordinary restaurant (per seat)	50
2. 24-hr. restaurant (per seat)	75
3. bar and cocktail lounge (per seat)	30
4. drive-in restaurant (per car space)	50
Hotels and Motels (per bed)	100
Laundries, Self Service (per machine)	400
Office Building (per worker)	20
Resort Camps, Cottages (per person)	100
Service Stations	
1. for first bay	1000
2. for each additional bay	500
Shopping Centers (without food or laundry) per square foot of floor space	0.6
Stadiums, Race Tracks, Ball Parks (per seat)	3
1. Private toilets, for employees only (per employee)	20
2. public toilets (per toilet room)	400
Theaters	
1. indoor, auditoriums (per seat)	5
2. outdoor, drive-ins (per space)	5
Trailer Parks	
1. travel trailer (overnight) without water and sewer hookup (per trailer space)	50
2. add for water and sewer hookups per trailer space)	100

Kitchen Wastes

Grease can be a serious problem if it is not taken care of properly and adequately. Consideration of frequent and adequate grease removal facilities is important. Extra large grease traps or series installation are recommended to achieve coagulation and eventual settling of grease in trap for removal. Frequent removal of grease is also necessary. Grease traps will be required on all commercial eating establishments where food is prepared on site, or in the opinion of the District Engineer the resultant discharge from such an occupancy will be detrimental to the District facilities. Grease traps will be sized according to the following formula:

$$V = S \times GS \times HR/12 \times LF$$

S = SEATS

GS = 25 GAL/SEAT

LF = ROAD FACTOR = 0.5

FOR TOWN ROADS AND SHOPPING CENTERS

HR = HOURS OF OPERATION

	<u>Gallons Per Day</u>
Kitchen Wastes, Hotels, Camps, Boarding Houses, etc., (serving three meals a day)	7-10
Restaurants (toilet and kitchen wastes per patron)	7-10
Restaurants (kitchen wastes per meal served)	2 1/2 - 3
C. Industrial	
Factories, exclusive of industrial wastes (gallons per person per shift)	
1. no showers provided	15
2. showers provided	35
Work or Construction Camps, semipermanent (per worker)	50
D. Institutional	
Airports	
1. per passenger	5
2. per employee	20

Churches (per seat)	5
Hospitals (per-bed)	250
Nursing, Rest Homes (per person)	100
Parks, Public Picnic	
1. with toilets only (per person)	5
2. with bathhouse, showers and toilets (per person)	10
Public Institutions, other than hospitals (per person)	100
Schools, per student	
1. day type	10
2. add for showers	5
3. add for cafeteria	5
4. add for day school workers	15
5. boarding type	75
Swimming and Bathing Facilities, Public (per person)	10

2.03.2 Peak Design Flow

Sewer systems shall be designed on a peak design flow basis utilizing the average daily flows previously calculated and a 2.5 peak factor.

2.04 Gravity Sewers

The basic design criteria for gravity sewers shall be as follows:

Pipe material - PVC epoxy coated D.I.P. (See detailed specifications or Standard Details)

Minimum diameter - 8 inches.

Minimum depth of cover - 3' for DIP or PVC C-900 and 3'-6" for PVC SDR-26.

Straight alignment and constant slope between manholes.

All manholes shall be precast concrete with monolithic bases and concentric conical cone sections. (See detailed specifications and Standard Details)

Manholes are required at end of each line; at all changes in grade, size or alignment. Stubs eight (8) inches or larger will require a manhole at the terminus point.

Manholes shall be spaced not greater than 375 feet for sewers fifteen (15) inches in diameter or less, 450 feet for sewers eighteen (18) inches in diameter or greater.

Five foot drop manholes (internal type) are to be provided for a sewer entering a manhole at an elevation twenty-four (24) inches or more above the lowest manhole channel invert. (See Standard Details)

A positive 0.1 grade differential shall be provided between the upstream and downstream invert on all manholes.

All sewer shall be designed and constructed to give mean velocities, when flowing full, of not less than 2.0 feet per second, based on Kutter's formula using an "N" value of 0.013. The following are minimum slopes which should be provided:

<u>Sewer Size</u>	<u>Minimum Slope in Fee per 100 Feet</u>
8-inch	0.40
10-inch	0.28
12-inch	0.22
15-inch	0.15
18-inch	0.12
21-inch	0.10
24-inch	0.08
27-inch	0.067
30-inch	0.058
36-inch	0.046

When possible, slopes at least 10% above the minimums shown are preferred. However, in no case will slopes be considered which would provide a mean velocity less than 2.0 feet per second when flowing full, based on Manning's formula using an "N" value of 0.013.

When a smaller sewer joins a larger one, the invert of the larger sewer should be lowered sufficiently to maintain the same energy gradient. An approximate method for securing these results is to place the 0.8 depth point of both sewers at the same elevation.

Intersecting sewers shall not meet at an alignment angle of less than 90 degrees to downstream flow.

Storm and sanitary sewers crossing under water mains shall be laid to

provide a minimum vertical Distance of eighteen (18) inches between the invert of the upper pipe and the crown of the lower pipe. Where this minimum separation cannot be maintained, the crossing shall be arranged so that the sewer pipe joints and water main joints are equidistant from the point of crossing with no less than ten (10) feet between any two joints and both pipes shall be D.I.P. where there is no alternative to sewer pipes crossing over a water main, the criteria for the minimum separation between lines and joints in the above, shall be required and both pipes shall be D.I.P. irrespective of separation. D.I.P. is not required for storm sewers.

Maintain ten (10) feet horizontal distance between water main and storm or sanitary sewer main, as a minimum.

Force main crossing water main shall be laid to provide a minimum vertical Distance of eighteen (18) inches between the outside of the force main and outside of the water main with water main crossing over the force main.

2.05 Pumping Stations

The basic design criteria for pump stations is as follows:

Sized to carry the peak flow from the tributary areas with the largest pumping unit out of service (firm capacity).

Total dynamic head based on static head, lift station friction losses and pipeline friction factor (C) of 120. Pumping units shall be capable of operating based on a C=100 and not "running out" based on a C=140.

Pumping units capable of passing spheres of at least three (3) inches in diameter.

Under normal conditions, pumps operate under a positive suction head.

Controls included to automatically alternate the pumps in use.

Maximum pump speed of submersible pumps shall not be greater than 1800 rpm. the maximum pump speed of other raw wastewater pumps shall be 1150 rpm.

Four types of pump stations are considered for use in the District. The pump station types are as follows:

Level I &	
Level II	Submersible
Level III	Built in place - constant or variable speed pumps
Level IV	Built in place - variable speed pumps.

Typical application of the various pump station types is shown on Figure 2-1, page 2-9.

All electrical and mechanical equipment to be protected from physical damage by a 100 year flood.

Detailed specifications and drawings for Level I pump stations and appurtenances are included elsewhere in this manual. Other levels of pump stations require site specific designs and will be reviewed on a case by case basis. Design criteria for these stations are contained in DER Chapter 16-6, Great Lakes Upper Mississippi River Board Recommended Standards for Sewage Works and WPCF Manual of Practice No. 9.

All wet wells shall be designed to resist flotation at times of the highest groundwater and/or the 100 year flood (whichever is greater) at the site, without consideration of the weight of the pumps, with a safety factory of 1.25. Flotation calculations based on a unit weight of concrete of 130 pounds per cubic foot shall be submitted to the District for review with all pump station plans

Wet well cycle times shall be 5 minutes minimum 30 minutes maximum; based on the formula:

$$T = \frac{V}{Q-S} + \frac{V}{S}$$

Where:

- T = Cycle time (minutes)
- V = Effective volume of wet well (gallons)
- Q = Pumping rate gpm
- S = Average daily flow (gpm)

2.06 Force Main

The basic design criteria for force mains is as follows:

Pipe material - epoxy lined ductile iron pipe or C-900 PVC pipe.

Minimum size - 4 inch diameter.

Minimum velocity - 2 feet per second.

Maximum velocity - 8 feet per second.

Minimum depth of cover - 3 feet.

Branches of intersecting force mains shall be provided with appropriate valves such that one branch may be shut down for maintenance and repair without interrupting the flow of other branches. Stubouts on a force main, placed in anticipation of future connections, shall be equipped with a valve to allow such connections without interruption of service.

An automatic air release valve shall be placed at all high points of all force mains as deemed necessary by the design engineer.

Where required, an automatic air release/air vacuum valve shall be installed at all high points on force mains which are eight (8) inches in diameter and larger.

Force main design drawings are to indicate elevations at all high points and all low points with constant slopes in between such points.

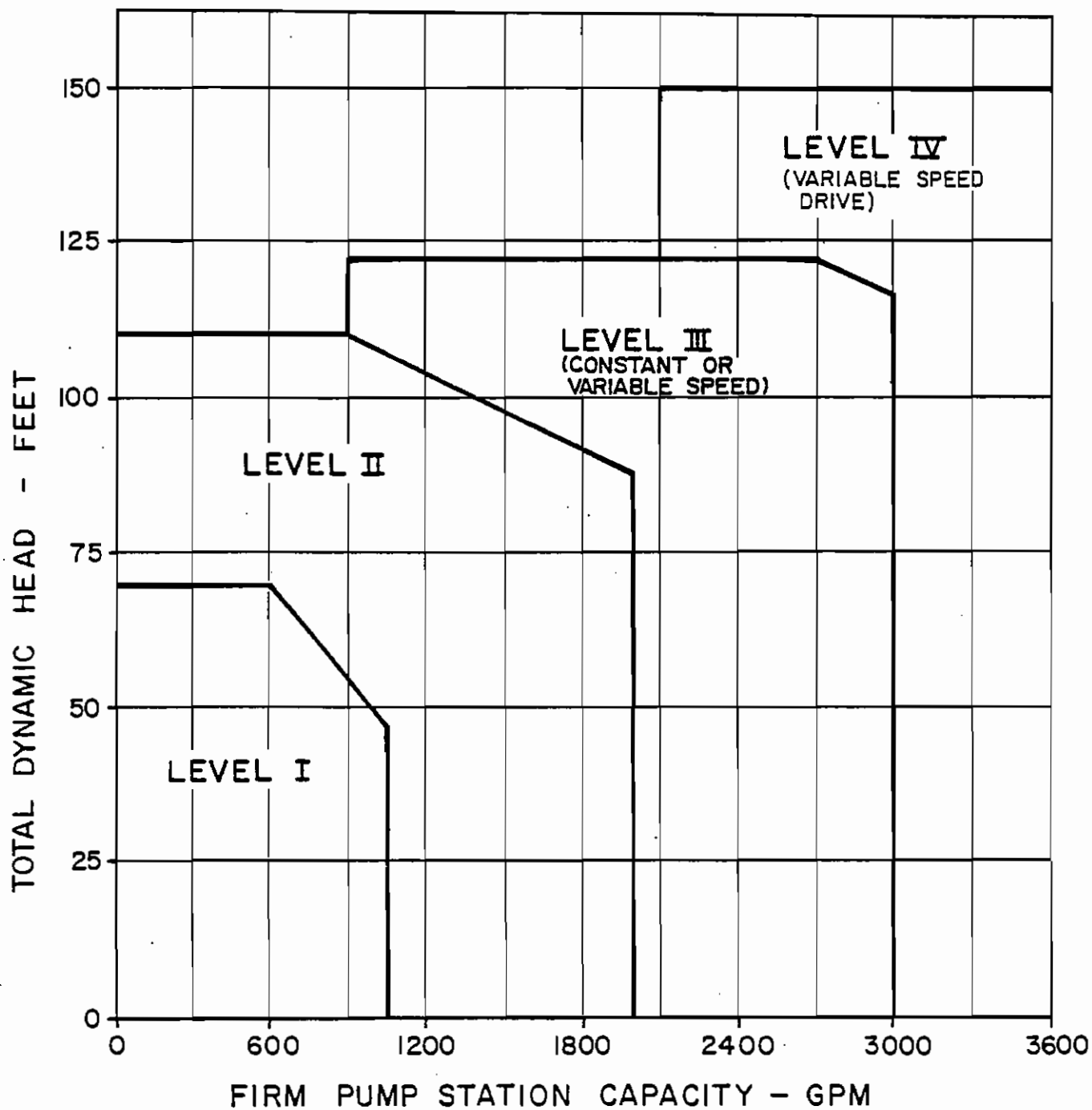
Force main crossing water main shall be laid to provide a minimum vertical distance of eighteen (18) inches between the outside of the force main and the outside of the water main.

Thrust blocks or restrained joints shall be provided at all force main bends (see Standard Details).

Terminal ends of force main (permanent or temporary) shall be as shown on the Standard Details.

2.07 Sewer Use Regulations

The Loxahatchee River Environmental Control District has adopted certain rules and regulations regarding the acceptability and pretreatment requirements for certain types of wastewaters. These rules and regulations are published in Chapter 31 of the Florida Administrative Code and may be amended from time to time. Prospective users of the system should contact the District Director for information regarding the above referenced rules and compatibility of the anticipated wastewater with the District's facilities.



PUMP STATION LEVELS
LOXAHATCHEE RIVER
ENVIRONMENTAL CONTROL DISTRICT
WASTEWATER COLLECTION SYSTEM
MASTER PLAN

SECTION 3

MISCELLANEOUS REQUIREMENTS

3.01 Lines, Grades and Measurements

Alignment and grade of all pipe, tunnels and borings shall be continuously controlled by use of lasers or other acceptable method. Laser alignment and grade through the pipeline is the preferred method. The District Engineer shall be permitted at any time to check the lines, elevations, reference marks, laser, etc., set by the Contractor or the Design Engineer.

3.02 Work to Conform

The maximum allowed vertical deviation of any single gravity pipe, tunnel or boring from plan grade shall be three percent (3%) of inside diameter. No single gravity pipe shall vary in horizontal alignment right or left, from the pipe centerline by more than five percent (5%) of inside diameter. Force main joint deflections shall be limited by AWWA Standards and manufacturer's recommendation.

3.03 Pipeline location

Pipelines shall not be located closer to an existing or proposed structure than the horizontal distance obtained when drawing a 45 degree angle from the proposed invert of the pipeline to bottom outside face of the footing. In no case shall this distance be less than six (6) feet.

Pipelines shall be located as indicated on the drawings, but the right is reserved to the Design Engineer to make such modifications in location as may be found desirable to avoid interference with existing structures or for other reasons, which are not material to the interest of the District and which do not otherwise conflict with any other statement or criteria set forth in this manual. The District should be notified of such changes in a timely fashion and such changes shall be recorded on as-built drawings.

3.04 Pipe Adapters

When joining pipes of different types, District approved transition sleeves, adapters, and couplings shall be used.

3.05 Fittings and Stoppers

Branches, stubouts and fittings shall be laid as indicated in the Standard Details and shown on the approved drawings. Open ends of pipe and branches shall be closed with nonmetallic "wing nut" expansion stoppers secured in place in an acceptable manner. Stoppers shall be designed to remain in place and watertight during infiltration tests. The location of all service lines shall be marked with a District approved electronic marker sensor at the cleanout location.

3.06 Service Lines

a. General

Service lines shall be as shown on the Standard Details. Service lines for a single building structure shall be minimum of 4 inches in diameter; for two building structures, a minimum of 6-inches in diameter. Where three or more building structures are connected to a single service line, the service line shall be considered a gravity sewer, shall be minimum of 8-inches in diameter, and shall be in accordance with the criteria covering District maintained gravity sewers.

b. Maintenance Responsibility

The service line (lateral) cleanout will usually delineate the point of responsibility between the District and the property owner, however, the following variations do exist:

1. Multi-family Units - Public right-of-way - Owner's responsibility to right-of-way line.
2. Multi-family Units - Non Public right-of-way - Owner's responsibility to main line connection.
3. Commercial Buildings - Owner's responsibility to main line.
4. Condominium with Common Areas - Non Public right-of-way
Owner's responsibility to main line connection.
5. Condominium with Common Areas Adjacent to Public
right-of-way - District assumes responsibility to right-of-way
line.

3.07 Service Line Markers

A service line marker shall be installed 12-inches (minimum) above the service wye adjacent to the cleanout of each service line. The service line markers shall be Electronic System, Sanitary Marker, as manufactured by 3M. Test & Measurement Systems, Austin, Texas, Model 1258, or equal product which can be detected by the locator which the District owns.

3.08 Bolts, Anchor Bolts, and Nuts

Anchor bolts shall have suitable washers and, where so required, their nuts shall be hexagonal. All anchor bolts, nuts, washers, plates, and bolt sleeves shall be galvanized unless otherwise indicated or specified.

Expansion bolts shall have malleable iron and lead composition elements or the required number of units and sizes.

Bolts, anchor bolts, nuts and washers, specified to be galvanized shall be zinc coated, after being threaded, by the hot dip process in conformity with the ASTM Standard Specification for Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bars, and Strip, Designation A123, Latest Revision, or the ASTM Standard Specifications for Zinc Coating (Hot Dip) on Iron and Steel Hardware, Designation A153, Latest Revision, as is appropriate.

Bolts, anchor bolts, nuts and washers specified to be stainless steel shall by Type 316 stainless steel.

Anchor bolts and expansion bolts shall be set accurately. If anchor bolts are set before the concrete has been placed, they shall be carefully held in suitable templates of approved design. If anchor or expansion bolts are set after the concrete has been placed, all necessary drilling and grouting or caulking shall be done and care shall be taken not to damage the structure or finish by cracking, chipping, spalling, or otherwise during the drilling and caulking.

3.09 Concrete Inserts

Concrete inserts shall be designed to safely support the maximum load that can be imposed by the bolts used in the inserts. Inserts shall be of a type which will permit locking of the bolt head or nut. All inserts shall be galvanized.

3.10 Protection against Electrolysis

Where dissimilar metals are used in conjunction with each other, suitable insulation shall be provided between adjoining surfaces so as to eliminate direct contact with any resultant electrolysis. The insulation shall be bituminous impregnated felt, heavy bituminous coatings, nonmetallic separators or washers, or other approved materials.

SECTION 100

EXCAVATION, BACKFILL, FILL AND GRADING

100.01 Description

All excavations shall be made in such manner and to such widths as will provide suitable room for building the structures or laying and jointing the piping; and all sheeting, bracing, supports; cofferdamming, pumping and draining; shall be performed to render the bottom of the excavations firm, dry and acceptable in all respects.

100.02 Sheeting and Bracing

Sheeting and bracing shall be furnished as may be necessary to support the sides of the excavation and to prevent any movement of earth which could in any way diminish the width of the excavation to less than that necessary for proper construction, or could otherwise injure or delay the work, or endanger adjacent structures.

All timber sheeting and bracing shall be left in place unless otherwise directed by the Design Engineer to remove same or cut off at a specified elevation.

All sheeting and bracing, including trench boxes not to be left in place, shall be carefully removed in such manner as not to endanger the construction or other structures. All voids left or caused by the withdrawal of sheeting shall be backfilled immediately with approved material and compacted by ramming with tools especially adapted to that purpose, by watering, or by other means as may be directed by the Design Engineer.

100.03 Drainage

100.03.1 General

To ensure proper conditions at all times during construction, all means shall be used to intercept and/or remove promptly and dispose properly of all water entering trenches and other excavations. Such excavations shall be kept dry until the structures, pipes and appurtenances to be built therein have been completed to such extent that they will not be floated or otherwise damaged.

All water pumped or drained from the work shall be disposed of in a suitable manner without undue interference with other work, damage to pavements, other surfaces, or property. Suitable temporary pipes, flumes, or channels shall be provided for water that may flow along or across the site of the work. All

requirements of all regulatory agencies regarding dewatering and the discharge of water from the project shall be complied with.

All labor, materials, tools, and equipment shall be provided, as necessary, to properly control the quality of the discharge from the dewatering operations as described herein. All applicable laws, rules and regulations governing the discharge of water from dewatering operations shall be complied with. All dewatering shall be accomplished by the use of sanded wellpoints and other techniques deemed necessary by the Contractor to properly dewater the trench excavations.

The water discharged from the Contractor's dewatering operation shall not exceed the turbidity limits promulgated by the State of Florida Department of Environmental Protection discharge standards for the Loxahatchee River or its tributaries.

Unless otherwise directed by the Design Engineer, an approved siltation tank shall be installed ahead of dewatering discharge points. In addition, silt screens and other devices and techniques may be required to maintain the discharge quality at turbidity levels below the required limits.

Any and all methods approved by the Design Engineer to control the bacteriological quality of wellpoint discharge into existing drainage ditches and/or canals shall be utilized. Levels for fecal coliform in a discharge which ultimately leads to the Loxahatchee River, shall not exceed those promulgated by the State of Florida Department of Environmental protection discharge standards.

100.03.2 Drainage Wellpoint System

If it is necessary to drain the soil and prevent saturated soil from flowing into the excavation, an efficient drain wellpoint system will be utilized. The wellpoints shall be designed especially for this service. The pumping unit shall be designed for use with the wellpoints and shall be capable of maintaining a high vacuum and of handling large volumes of air and water at the same time.

100.04 Trench Excavation

Where pipe is to be laid in rock bedding or concrete cradle, the trench may be excavated by machinery to, or to just below, the designated subgrade, provided that the material remaining at the bottom of the trench is not disturbed.

If the trench is excavated below the designated subgrade, the undercut shall be backfilled with compacted bedding rock, uniformly graded from 1/4 inch size.

100.05 Depth of Trench

Trenches shall be excavated to such points as will permit the pipe to be laid at the elevations, slopes, or depths of cover indicated and at uniform slopes between indicated elevations.

100.06 Width of Trench

Pipe trenches shall be made as narrow as practicable and shall not be widened by scraping or loosening materials from the sides. Every effort shall be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed and consolidated.

Trenches shall be excavated with approximately vertical sides between the elevation of the center of the pipe and an elevation one (1) foot above the top of the pipe.

100.07 Trench Excavation in Fill

If pipe is to be laid in embankments or other recently filled material, the material shall first be placed to the top of the fill or to go to a height of at least three (3) feet above the top of the pipe, whichever is the lesser. Particular care shall be taken to ensure maximum consolidation of material under the pipe location. The pipe trench shall be excavated as though in undisturbed material.

100.08 Unauthorized Excavation

If bottom of any excavation is taken out or disturbed beyond the limits indicated or prescribed, the resulting void shall be backfilled with embedment material compacted to a minimum of 90% of AASHTO T-180.

100.09 Elimination of Unsuitable Material

Pipe bedding shall extend a minimum of 4 inches below the pipe. The pipe shall be supported on suitable material ascertained by the Design Engineer following good engineering practices.

100.10 Backfilling

As soon as practicable after the pipes have been laid, or the structures have been built and are structurally adequate to support the loads, including construction loads to which they will be subjected, the backfilling shall be started and thereafter it shall proceed until its completion.

100.10.1 Backfill Materials

The nature of the materials will govern both their acceptability for backfill and the methods best suited for their placement and compaction in the backfill. The materials and the methods shall both be subject to the approval and direction of the Design Engineer. No stone or rock fragment larger than 3 inches in greatest dimension shall be placed in the backfill nor shall large masses of backfill material be dropped into the trench in such a manner as to endanger the pipeline. If necessary, a timber grillage shall be used to break the fall of material dropped from a height of more than 5 feet. Pieces of bituminous pavement shall be excluded from the backfill unless their use is expressly permitted, in which case they shall be broken up as directed.

100.10.2 Embedment Materials

These materials are described in subsequent sections of this Manual. The use and placement of these materials are indicated on the Standard Details and specified herein.

100.10.3 Zone Around Pipe

The zone around the pipe shall be backfilled with the materials and to the densities and limits indicated on the details.

100.10.4 Compaction

Compaction shall be accomplished by tamping, or under appropriate construction techniques to achieve the required densities.

100.10.5 Maximum Density

Unless specified otherwise, the percents of maximum density referred to in these specifications refers to the maximum density obtained when the material is laboratory tested in accordance with the procedures outlined in Designation AASHTO T-180, Latest Revision or as otherwise required by the governmental agency having jurisdiction over the finished roadway. Field densities shall be determined by a testing laboratory using accepted methods.

100.10.6 Miscellaneous Requirements

Whatever method of compacting backfill is used, care shall be taken that stones and lumps shall not become nested and that all voids between stones shall be completely filled with fine materials. Only approved quantities of stones and rock fragments shall be used in the backfill.

All voids left by the removal of sheeting shall be completely backfilled with suitable material, thoroughly compacted.

SECTION 101

PIPE EMBEDMENT MATERIALS

101.01 General

Pipe embedment materials, as specified herein, shall be installed as shown on the details and/or as specified.

101.02 Class 1 Materials (Bedding Rock)

The material shall be 3/4 inch to 1/4 inch graded material such as coral, crushed stone, crushed shells or bedding rock, well graded in size, 100% passing a 1 inch sieve opening, and as specified in ASTM 57. The bedding rock shall consist of clean hard and durable particles or fragments, free from dirt, vegetable or other objectionable matter. Samples and gradation analysis shall be approved by the Design Engineer before any material is delivered to the job site.

101.03 Class 2 Material

The material shall be well graded, clean course sand and gravels with a maximum particle size of 3/4 inch, containing a small percentage of fines and free of organic and other deleterious matter.

101.04 Class 3 Material (Select Backfill)

The material shall be fine sand and clayey gravels, including fine sands, sand-clay mixtures and gravel-clay mixtures, free of organic and other deleterious matter.

101.05 Placing and Compacting

The material shall be spread in layers of uniform thickness and installed to the densities and where shown on the Standard Details or as required.

After each pipe has been brought to grade, aligned and placed in final position, the Embedment material shall be deposited and densified under the pipe haunches on each side of the pipe. Following this operation, the remainder of the embedment material shall be installed as shown on the Standard Details and as specified herein.

SECTION 109

LARGE DIAMETER PVC PRESSURE PIPE

109.01 General

It is the intent of this section to provide a uniform standard for all PVC pressure pipe used in force main construction, whose nominal diameter exceeds 12 inches.

109.02 Larger Diameter PVC Pressure Pipe (D.I.O.D.)

All pipe shall meet the requirements for polyvinyl chloride pipe as specified in ASTM D-2241, made from virgin PVC type 1120 compound with cell classification per ASTM D-1784. The pipe shall be supplied in 20 foot lengths with an integral bell on each length and having a groove to retain the rubber sealing gasket. The other end of the pipe shall be cut square, beveled, and indelibly marked to the insertion depth. The pipe shall have a minimum dimension ratio (DR) of 25 with a pressure rating of not less than 150 psi. Outside diameter of the pipe shall be equal to ductile iron pipe. Pipe joints may be deflected up to the maximum deflection as recommended by the pipe manufacturer. Gaskets shall be as recommended by the pipe manufacturer for sewer application and shall comply with the requirements of ASTM F 477.

The pipe manufacturer shall submit an affidavit of compliance that all materials used in the pipe production meet the requirements of Uni-Bell Pipe Association Standard UNI-B-84 and latest AWWA C-905 specifications.

PVC pressure pipe shall be installed with a magnetic tape suitable for locating pipe in the future. The tape shall be laid directly over the pipeline, at a depth (as recommended by the manufacturer) compatible with electronic pipe locators. (Not more than 18" deep from finished grade.)

Electronic markers (EMS) shall be placed over the pipeline at each bend or valve along the length of the line. (See Section 3.07.)

109.03 Fittings

Fittings shall be 40 MIL epoxy lined ductile iron or C-900 as specified in Sections 111 and 112.07.

109.04 Installation

The pipe shall be installed in strict accordance with the manufacturer's recommendations. PVC pipe joints should not be deflected more than that recommended by the manufacturer's specifications.

No defective pipe or fittings shall be laid or placed in the piping, and any piece discovered to be defective after having been laid or placed shall be removed and replaced by a sound and satisfactory piece, at the Contractor's sole expense.

No PVC pipe shall be cut within a three (3) foot distance from the end of the bell end of the pipe.

Each pipe and fitting shall be cleared of all debris, dirt, etc., before being laid and shall be kept clean until accepted in the completed work.

Pipe and fittings shall be laid accurately to the lines and grades indicated on the Drawings. Care shall be taken to ensure a good alignment both horizontally and vertically.

Each length of pipe shall have a firm bearing along its entire length. Bedding as shown on the Standard Details shall be utilized. Compaction along the sides of pipe shall be strictly enforced at a minimum of 90% of AASHTO T-180 to a point one (1) foot above the pipe.

Pipe utilized for sewer force mains shall be colored green. Pipe used for reuse mains shall be colored purple throughout.

109.05 Assembling Push-On-Joints

Push-on joints shall be made up by first inserting the gasket (where applicable) into the groove of the bell and applying a thin film of special nontoxic gasket lubricant uniformly over the spigot end of the pipe. The chamfered end of the plain pipe shall be inserted into the gasket and then forced past it until it seats against the bottom of the socket.

SECTION 111

DUCTILE IRON PIPE AND FITTINGS

All ductile iron pipe shall be designed in accordance with ANSI A21.50, 1976, or latest revision, based on a Type 2 bedding condition and shall be manufactured in accordance with ANSI A21.51. Along with the "as-built" drawings, the Design Engineer shall furnish the District a sworn statement from the manufacturer in accordance with Section 51.4.2 of ANSI A21.51, for truck load quantities of pipe. Each pipe shall be marked with the manufacturer's year of manufacture and the class of pipe. The words "Ductile Iron or D.I." shall be stamped on the pipe.

Ductile iron pipe 12 inches in diameter or less shall be at least Class 50. Larger ductile iron pipe shall be at least Class 51. In no case shall Class 50 pipe be laid where depth of cover exceeds 8'0".

Where ductile iron pipe is used, fittings shall be ductile iron and conform to the requirements of ANSI A.21.10, A21.53, and A21.4., and shall be of a pressure classification at least equal to that of the pipe with which they are used.

111.02 Adapters

Where it is necessary to joint pipe of different type, the necessary adapters shall be utilized. Adapters shall have ends conforming to the above specifications for the appropriate type of joint to receive the adjoining pipe. Adapters joining two classes of pipe may be of the lighter class provided that the annular space in bell and spigot type joints will be sufficient for proper jointing.

111.03 Types of Joints

Joints for ductile iron pipe shall be either push on or mechanical joint for buried piping and flanged joints for exposed or interior piping. Joints for pipe in casings shall be mechanical joint type with retainer glands unless otherwise approved by the District Engineer. Retainer glands shall be equal to those manufactured by EBBA Iron Corp., known as "meg-a-lugs".

Joint for mechanical joint pipe shall conform to ASNI A21.11. Joints for push on joint pipe shall be equal to "Tyton" as manufactured by United States Pipe and Foundry Company, or equal. If the pipe bell is grooved, the minimum thickness at the groove shall be equal to that of the thickness class specified herein.

The plain end of push on pipe shall be manufactured to a true circle and chamfered to facilitate fitting the gasket.

Push on and mechanical joint pipe and fittings shall be provided with sufficient quantities of accessories conforming to ANSI A21.11.

Flanges shall conform to ASNI B16.1, Class 125. All bolts and nuts for flanged pipe shall conform to ANSI B18.2.1. and B18.2.2.

Gaskets shall be of a composition suitable for exposure to the liquid within the pipe.

111.04 Lining and Coating

All ductile iron pipe and fittings used for reuse or other non force main applications shall be furnished with a bituminous seal coated cement mortar lining installed in accordance with ANSI A21.4.

All ductile iron force main pipe and fittings shall be furnished with an epoxy lining. The lining material for pipe and fittings shall be epoxy coatings, 40 mil thick, and shall be "Protecto 401", "Permite 9043 Type II", or "Linerguard".

The District will require that ductile iron pipes used in gravity sewers be lined with epoxy as specified above.

All pipe and fittings shall receive an external bituminous coating in accordance with ANSI 21.10.

111.05 Handling and Cutting Pipe

Every care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe and linings, scratching or marring machined surfaces, and abrasion of the pipe coating or lining.

Any fitting showing a crack shall be marked as rejected and removed at once from the work.

In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portions, if so approved by the Design Engineer, may be cut off before the pipe is laid so that the pipe used is perfectly sound. The cut shall be made in the sound barrel at a point at least 12 inches from the visible limits of the crack.

Except as otherwise approved, all cutting shall be done with knives or saws adapted to the purpose. Hammer and chisel or so-called wheel snap cutters shall not be used to cut pipe. All cut ends shall be examined for possible cracks caused by cutting.

Cut ends to be used with push on joints shall be carefully chamfered to prevent cutting the gasket when the pipe is laid or installed.

Lined and coated pipe and fittings shall be installed as, and assembled as recommended by the pipe manufacturer for the particular lining used.

111.06 Installing Pipe and Fittings

No defective pipe or fittings shall be laid or placed in the piping, and any piece discovered to be defective after having been laid or placed shall be removed and replaced by a sound and satisfactory piece.

Each pipe and fitting shall be cleared of all debris, dirt, etc., before being laid and shall be kept clean until accepted in the complete work.

Pipe and fittings shall be laid accurately to the lines and grades indicated on the Drawings or required. Care shall be taken to ensure a good alignment both horizontally and vertically.

Electronic markers (EMS) shall be placed over the pipeline at each bend or valve along the length of the line and at intervals of not more than 300' on straight runs. (See Section 3.07)

Each length of pipe shall have firm bearing along its entire length. Bedding requirements are shown on the Standard Details.

When mechanical joint, push on joint, or similar pipe is laid, the bell of the pipe shall be cleaned of excess tar or other obstruction and wiped out before the cleaned and prepared spigot of the next pipe is inserted into it. The new pipe shall be shoved firmly into place until properly seated and held securely until the joint has been completed. The ductile iron pipe shall not have a joint deflection greater than that recommended by the manufacturer.

111.07 Temporary Plugs

At all times when pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary watertight plugs. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.

111.08 Assembling Push On Joints

Push on joints shall be made up by first inserting the gasket into the groove of the bell and applying a thin film of special nontoxic gasket lubricant uniformly over the inner surface of the gasket which will be in contact with the spigot end of the pipe. The chamfered end of the plain pipe shall be inserted into the gasket and then forced past it until it seats against the bottom of the socket.

111.09 Bolted Joints

Materials for bolted joints shall be as specified herein.

Before the pieces are assembled, rust preventative coatings shall be removed from machined surfaces. Pipe ends, sockets, sleeves, housings, and gaskets shall be thoroughly cleaned and all burrs and other defects shall be carefully smoothed.

111.10 Assembling Mechanical Joints

Surfaces against which the gasket will come in contact shall be thoroughly brushed with a wire brush prior to assembly of the joint. The gasket shall be cleaned. The gasket, bell, and spigot shall be lubricated by being washed in soapy water. The gland and gasket, in that order, shall be slipped over the spigot and the spigot shall be inserted into the bell until it is correctly seated. The gasket shall then be seated evenly in the bell at all points, centering the spigot, and the gland shall be pressed firmly against the gaskets. After all bolts have been inserted and the nuts have been made up finger tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint to the proper tension, preferably by means of a torque wrench.

The correct range of torque, as indicated by a torque wrench and the length of the wrench (if not a torque wrench), used by an average man to produce such range of torque, shall not exceed ninety foot pounds.

If effective sealing of the joint is not attained at the maximum torque indicated above, the joint shall be disassembled and thoroughly cleaned, then reassembled. Bolts shall not be over stressed to tighten a leaking joint.

111.11 Thrust Blocking

When approved by the District, the Contractor may place reaction and thrust blocking at the back of all fittings, including elbows, tees, tapping sleeves, valves, and other fittings as shown on the Standard Details. Blocking shall be

poured against firm compaction material. The concrete for thrust blocking shall be as specified under Concrete Masonry.

Restrained joints shall be mechanical joint with ductile iron retainer glands, for pipe sizes 3 inches through 16 inches. The mechanical joints including the ductile iron retainer glands shall conform to AWWA C-111 (ANSI A21-11) for Rubber Gasket Joints for Cast IRON AND Ductile Iron Pressure Pipe and Fittings. All mechanical joint pipe and fittings shall be furnished with high strength cast iron tee head bolts and hex nuts with composition, dimensions, and threading in accordance with ANSI A21.11. The retainer glands shall be cast of high strength ductile iron and fitted with cup point, square head, double heat treated special alloy steel set screws. The retainer glands shall be EBBA Iron Corp. "meg-a-lug" or approved equal.

"Field Lok" push on retainer gaskets as manufactured by the U.S. Pipe and Foundry Co., or equal, can be used in lieu of retainer glands for ductile iron pipe sizes 4"-12". Restrained joints for ductile iron pipe and fittings greater than 12 inches may be of the single rubber compression gasket push on or mechanical joint type such as TR-FLEX as manufactured by U.S. Pipe and Foundry, Lok-Fast by the American Cast Iron Pipe Co., Locked Mechanical Joint F-217-D or Super-Lock Joint by the Clow Corporation, or approved equal.

SECTION 112

POLYVINYL CHLORIDE GRAVITY SEWER PIPE

112.01 General

This standard designates general requirements for unplasticized polyvinyl chloride (PVC) plastic class pipe with integral bell and spigot joints for the conveyance of sewage. This class of pipe shall not be used where the depth of invert is greater than 14'-0" from finished grade. In this case, approved pressure pipe shall be utilized.

112.02 Materials

Unplasticized polyvinyl chloride pipe (PVC) shall be integral wall bell and spigot joints which meets the requirements of ASTM Specifications D-3034 for SDR 26 or up to 15 inch diameter pipe. The pipe shall meet the following ASTM Standards: D-3212 (Joint), F-477 (Gasket) and D-1784 (PVC Compound).

Gravity sewer pipe and fittings from 18 inches through 27 inches shall meet ASTM F-679.

112.03 Stiffness

The pipe stiffness for gravity sewer pipe shall have a minimum pipe stiffness of 115 psi when measured at 5% vertical deflection and tested in accordance with ASTM 2412.

112.04 Pipe Bell

The bell of the pipe shall be designed to use a rubber ring gasket to allow for contraction and expansion. The bell shall consist of an integral wall section designed to be at least as strong as the pipe wall or an integral sleeve reinforced bell.

112.05 Tests

112.05.1 Acetone Test

A two inch long sample ring shall not flake or disintegrate when immersed for 20 minutes in a sealed container of acetone when conducted in accordance with ASTM D-2152. (Swelling or softening is not considered a failure.)

112.05.2 Flattening

A six inch long sample ring shall be compressed between parallel plates to 40% of the outside diameter of the pipe without evidence of splitting, cracking or breaking.

112.05.3 Impact Test

The pipe shall be tested at 73 degrees F and not fail an impact of a falling twelve (12) pound missile with a two inch radius at the levels prescribed by ASTM D-2444. Sizes four inches through 12 inches shall pass an impact of 120 ft./lbs.

112.05.4 Marking

All PVC pipe shall be marked in accordance with Section 12.1 of ASTM D-3034.

112.06 Standard Laying Lengths

All pipe shall be furnished in standard laying lengths provided by the pipe manufacturer.

112.07 Fittings

PVC sewer fittings shall conform to the requirements of ASTM D-3034 specification with minimum wall thickness of SDR 26 as defined in section 7.4.1. Fittings in sizes through 8" shall be molded in one piece with elastomeric joints and minimum socket depths as specified in sections 6.2 and 7.3.2. Gaskets shall have a minimum cross sectional area of 0.20 sq. in. and conform to ASTM F-477 specification. Fittings in sizes not available in injection molded form shall be fabricated from SDR-26 thickness pipe and in accordance with section 7.11 of the specification with manufacturers standard pipe bells and gaskets.

112.08 Adapters

Where necessary to join pipe of different types, approved transition joints, as shown in the details, are acceptable. When joining sewer pipe to ductile iron or C-900 pipe an adapter equal to Harco 300 series shall be used.

112.09 Handling and Cutting Pipe

The pipe manufacturer's recommendation for handling, storing, unloading and cutting pipe shall be followed. Individual pipes shall not be allowed to drop from the truck when unloading. Pipe units shall not be handled with chains or single cables. Pipe shall not be stored more than two units high. Every care shall be

taken in handling and laying pipe and fittings to avoid damaging the pipe or scratching or marring machined or finished surfaces.

Any fitting showing a crack shall be marked as rejected and removed at once from the work.

In any pipe showing a distinct crack and in which it is believed there is not incipient fracture beyond the limits of the visible crack, the cracked portions, if so approved by the Design Engineer, may be cut off before the pipe is laid so that the pipe used is perfectly sound. The cut shall be made in the sound barrel at a point at least 12-inches from the visible limits of the crack.

Except as otherwise approved, all cutting shall be done with knives or saws adapted to the purpose. All cut ends shall be examined for possible cracks caused by cutting.

Cut ends to be used with push on joints shall be carefully chamfered and the reference mark located in accordance with the manufacturer's recommendation to prevent cutting the gasket when the pipe is laid or installed.

112.10 Installing Pipe and Fittings

No defective pipe or fittings shall be laid or placed in the piping, and any piece discovered to be defective after having been laid or placed shall be removed and replaced by a sound and satisfactory piece.

Each pipe and fitting shall be cleared of all debris, dirt, etc., before being laid and shall be kept clean until accepted in the complete work.

Pipe and fittings shall be laid accurately to the lines and grades indicated on the drawings or required. Care shall be taken to ensure a good alignment both horizontally and vertically.

Each length of pipe shall have a firm bearing along its entire length. Embedment requirements are shown on the Standard Details.

The bell of the pipe shall be cleaned of dirt or other obstruction and wiped out before the cleaned and prepared spigot of the next pipe is inserted into it. Only lubricants made by the pipe manufacturer may be used on the spigot. The new pipe shall be shoved firmly into place until properly seated and held securely until the joint has been completed.

112.11 Temporary Plugs

At all times when pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary watertight plugs. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.

112.12 Preparation of Trench Bottom

The trench bottom shall be constructed to provide a firm, stable and uniform support for the full length of the pipe. Unsuitable foundation material shall be removed as required by the Engineer and refilled with Class 1, 2, or 3 material. Class 2 or 3 material shall be compacted to a minimum of 90% standard proctor density.

112.13 Backfill Materials for PVC Gravity Lines

Three broad classes of material shall be used for bedding, haunching, and pipe side support.

CLASS 1 - Angular, 1/4 to 3/4 inch graded stone, of which 100% passes a 1 inch sieve such as coral, slag, cinders, crushed stone, crushed shells, or bedding rock.

CLASS 2 - Coarse sands and gravels with maximum particle size 3/4 inch including variously graded sands and gravels containing small percentages of fines, generally granular and noncohesive, either wet or dry. Soil Types GW, GP, SW, and SP are included in this class.

CLASS 3 - Fine sand and clayey gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures. Soil Types GM, GC, SM, and SC are included in this class. Included in Class 3 are existing soil types classified as select backfill.

Class 1, Class 2, or Class 3 material shall be used for bedding material to the top of the pipe. Special care must be taken to insure that Class 1, 2, or 3 material is worked under the pipe haunch. Class 2 or 3 material shall be compacted to a minimum of 90% AASHTO T-180. The District has the option at any time to take density tests to confirm the 90% compaction. Precautions shall be taken to prevent movement of the pipe when placing and compacting material under the pipe haunches.

If Class 2 or 3 material is used for bedding and haunching, a dry trench shall be maintained.

Under certain conditions, the Engineer may be faced with an unusual amount of water running in the trench which he may find necessary to remove in order to properly install and compact the embedment material. The Engineer may elect to remove the water with trench side pumps through the use of Class 1 material for bedding. The depth of Class 1 material will depend upon the amount of water, but take care to ensure that the trench wall soil material is such that it will not be removed from the area adjacent to the bedding as a result of the running water. The Engineer may also elect to utilize well points or under drain to control excessive ground water. If Class 1 material is used as bedding and under drain, it must be utilized at least up to the top of the pipe.

112.14 Manhole Connections

Where PVC gravity or force main pipe enters the manhole, approved sealing adapters as manufactured by "Harco", Fernco or equal, shall be used. Any coupling used shall be coated with an epoxy coated sand finish approved by the District.

112.15 Bell Holes for Elastomeric Seal Joints

When the pipe being installed is provided with elastomeric seal joints, bell holes shall be excavated in the bedding material to allow for unobstructed assembly of the joint. Care should be taken that the bell hole is not larger than necessary to accomplish proper joint assembly. When the joint has been made, the bell hole should be carefully filled with bedding or haunching material to provide for adequate support of the pipe throughout the entire length.

112.16 Testing

Pipe deflection shall not exceed 5% measured by a go/no-go gauge or mandrel. The District may confirm the pipe deflection at the end of the job prior to acceptance. Additionally, the District may confirm the pipe deflection just prior to end of the one year guarantee period. Pipe sections exceeding 5% long term deflection will be relaid by the Contractor or the Developer at his own cost and expense and retested until the District's go/no-go gauge passes through the pipe section.

The District's mandrel will be considered the "official" gauge used for deflection testing. The standard District gauge is manufactured by "HURCO" Enterprises, Inc., Sioux Falls, S.D. The outside diameter of the District's mandrel is as follows:

Pipe Diameter (Inches)	Mandrel Diameter (Inches)
8	7.28
10	9.08
12	10.79

SECTION 113

4"-12" DIAMETER POLYVINYL CHLORIDE FORCE MAIN PIPE

AWWA DESIGNATION C-900

113.01 General

This standard designates general requirements for unplasticized Polyvinyl Chloride (PVC) plastic class pipe with integral bell and spigots joints for the conveyance of sewage. All pipe shall be marked as indicated in Section 2.5 of AWWA C-900, Latest Revision.

113.02 Materials

All pipe shall meet the requirements of AWWA-C-900 "Polyvinyl Chloride (PVC) Pressure Pipe". The DR of the pipe shall be calculated based on Appendix A of AWWA C-900, using a Class C bedding. The minimum pipe stiffness is DR 18. The pipe shall be extruded in sizes 4-inches through 12 inches cast iron pipe equivalent outside diameter. All Class 150 pipe shall meet the requirements of DR-18. The pipe shall meet the following ASTM Standards:

D-1784 (PVC Compound), D-3139 (Joint), and F-477 (Gasket).

113.03 Stiffness

The pipe stiffness using $F/\Delta Y$ for PVC class pressure pipe is contained in the table below:

<u>CLASS</u>	<u>DR</u>	<u>F/ΔY</u>
150	18	375
200	14	914

113.04 Pipe Bell

The bell of the pipe shall be designed to use a rubber ring gasket to allow for contraction and expansion. The bell shall consist of an integral wall section designed to be at least as strong as the pipe wall or an integral sleeve reinforced bell. The gasket shall be secured in the race by means of a nonmetallic polypropylene retainer ring or snugly seated in deep grooves to protect gasket roll-out upon assembly.

113.05 Tests

113.05.1 Factory Test

Each joint of pipe shall pass a factory hydrostatic test at four (4) times the pressure class of the pipe for five seconds.

113.05.2 Quick Burst Test

The pipe shall be designed to pass, without failure, the burst test for each rated class as follows:

DR 18 (755 psi) and
DR 14 (985 psi)

113.05.4 Acetone Test

A 2-inch long sample ring shall not flake or disintegrate when immersed for 20 minutes in a sealed container of acetone when conducted in accordance with ASTM D-2152. (Swelling or softening is not considered a failure).

113.05.5 Flattening

A 2-inch long sample ring shall be compressed between parallel plates to 40% of the outside diameter of the pipe without evidence of splitting, cracking, or breaking.

113.05.6 Impact Test

The pipe shall be tested at 73 degrees F and not fail an impact of a falling twelve (12) pound missile with a 2-inch radius at the levels prescribed by ASTM D-2444. Sizes 4-inches through 12-inches shall pass an impact of 120 ft./lbs.

113.06 Fittings

Fittings shall be ductile iron conforming to AWWA Standard C-153 or approved PVC fittings, conforming to AWWA Standard C-907.

113.07 Adapters

Where it is necessary to joint pipe of different type, the necessary adapters shall be utilized. In the case of gravity sewers and service connections, transition joints as shown on the Details are acceptable. Adapters shall have ends conforming to the above specifications for the appropriate type of joint to receive

the adjoining pipe. Adapters joining two classes of pipe may be of the lighter class provided that the annular space in bell and spigot type joints will be sufficient for proper jointing.

113.08 Handling and Cutting Pipe

The pipe manufacturer's recommendation for handling, storing, unloading, and cutting pipe shall be followed. Individual pipes shall not be allowed to drop from the truck when unloading. Pipe units shall not be handled with chains or single cables. Pipe shall not be stored more than two units high. Every care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe or scratching or marring machined or finished surfaces.

Any fitting showing a crack shall be marked as rejected and removed at once from the work.

In any pipe showing a distinct crack and in which it is believed there is not incipient fracture beyond the limits of the visible crack, the cracked portions, if so approved by the Design Engineer, may be cut off before the pipe is laid so that the pipe used is perfectly sound. The cut shall be made in the sound barrel at a point at least 12-inches from the visible limits of the crack.

Except as otherwise approved, all cutting shall be done with knives or saws adapted to the purpose. All cut ends shall be examined for possible cracks caused by cutting.

Cut ends to be used with push-on joints shall be carefully chamfered and the reference mark located in accordance with the manufacturer's recommendation to prevent cutting the gasket when the pipe is laid or installed.

113.09 Installing Pipe and Fittings

No defective pipe or fittings shall be laid or placed in the piping, and any piece discovered to be defective after having been laid or placed shall be removed and replaced by a sound and satisfactory piece.

Each pipe and fitting shall be cleared of all debris, dirt, etc., before being laid and shall be kept clean until accepted in the complete work.

Pipe and fittings shall be laid accurately to the lines and grades indicated on the Drawings or required. Care shall be taken to ensure a good alignment both horizontally and vertically.

Each length of pipe shall have a firm bearing along its entire length. Embedment requirements are shown on the Standard Details.

The bell of the pipe shall be cleaned of dirt or other obstruction and wiped out before the cleaned and prepared spigot of the next pipe is inserted into it. Only lubricants made by the pipe manufacturer may be used on the spigot. The new pipe shall be shoved firmly into place until properly seated and held securely until the joint has been completed. The ductile iron pipe shall not have a joint deflection greater than that recommended by the manufacturer.

113.10 Temporary Plugs

At all times when pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary watertight plugs. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.

113.11 Restraint

Approved retainer glands equal to "Meg-a-lug" as Manufactured by Ebba Iron Manufacturing Company made specifically for restraining PVC (C-900) force mains will be used.

SECTION 120

CONCRETE MASONRY

120.01 Materials

120.01.1 Concrete

Ready-mixed concrete shall be used. It shall comply with the Standard Specifications for Ready-Mixed Concrete, ASTM Designation C94 for the strengths specified herein. Alternate No. 2, under Paragraph 4 - Quality of Concrete ASTM C94 shall govern for the design of the concrete mixture.

120.01.2 Cement

Type I cement shall be used in concrete for general purposes. Type II cement shall be used for sewer manholes, wet wells, and all other applications where the concrete may be exposed to a wastewater atmosphere.

120.01.3 Reinforcing Steel

Reinforcing bars and mesh shall be sizes and shapes as indicated on the drawings. Bars shall be deformed bars of intermediate grade, new billet steel conforming with ASTM Designation A-615, Grade 60. Wire mesh shall conform with ASTM Designation A-185.

120.01.4 Water Stops

Water stops shall be molded PVC, hollow center bulb, multiple ribbed as manufactured by W.R. Meadows, Inc., Electrovert, Inc. or Serviced Products Corporation, or approved equal.

120.02 Concrete

120.02.1 Mix

Concrete shall be composed of Portland cement, coarse aggregate, fine aggregate and water. The concrete mix shall be designed to produce the quality specified, proportioned and mixed in accordance with the requirements set forth herein and shall in all cases meet the following requirements:

<u>Class</u>	<u>Location</u>	<u>28 Day Compressive Strength</u>
A	Specifically Required on Plans	4,000 psi
B	General Structural Concrete	3,000 psi
C	Non-structural Applications	2,500 psi

120.02.2 Slump

The concrete, when placed, shall show slumps within the following limits when tested in accordance with the Method of Test for Slump of Portland Cement Concrete, ASTM Standard Specification C-143.

<u>Type of Concrete</u>	<u>Min. Slump</u>	<u>Max. Slump</u>
Mass Concrete	1 Inch	3 Inches
Reinforced Concrete:		
Thin vertical sections and thin columns, 7 inches or less in thickness	3 Inches	6 Inches
Heavy vertical sections more than 7 inches in thickness	3 Inches	5 Inches
Structural Slabs	1 Inch	4 Inches

120.02.3 Air Entraining

Air entrained concrete shall conform with the following requirements:

	<u>Maximum Aggregate Size (Inches)</u>				
	<u>3/8</u>	<u>1/2</u>	<u>3/4</u>	<u>1-1/2</u>	
Average total air content, percent (plus or minus 1%)	5	5	4	4	3

120.03 Placing Concrete

Concrete shall be placed before the initial set has occurred and in no event after it has contained its water for more than 30 minutes.

The concrete shall be compacted and worked in an approved manner into all corners and angles of the forms and around reinforcement and embedded fixtures in such a manner to prevent segregation of the coarse aggregate.

All concrete shall be placed with an aid of mechanical vibrating equipment supplemented by hand forking or spading. Vibration shall be transmitted directly to the concrete and not through the forms. The duration of vibration at any location in the forms shall be held to a minimum necessary to produce thorough compaction.

The concrete shall be placed by suitable equipment as nearly as possible to its final location and without any segregation of the aggregate. Any free vertical drop shall not exceed 4 1/2 feet.

Expansion joints shall be placed as indicated on the plans. Joint material shall be installed as indicated and as approved by the Design Engineer. Construction joints shall be made only at locations indicated on the plans or approved by the Design Engineer, and in such manner as not to impair the strength, watertightness or appearance of the structure.

120.04 Finishing

All top surfaces which are not covered by forms and which are not to be covered by additional concrete or backfill, shall be carried slightly above grade and struck off by board finish. All edges shall be provided with a 3/4 inch chamfer.

All exposed surfaces which show board marks, joint marks or other irregularities after the forms are removed shall, at the discretion of the Design Engineer, be rubbed with carborundum brick, filled or otherwise dressed to produce a smooth, true surface.

No special concrete or cement mortar topping course shall be used for slab finish unless shown on the drawings. The slab shall be brought to a true and even finish by power or hand floating. Unless otherwise specified, the surface shall be steel troweled to a smooth finish. Troweling shall be the minimum to obtain a smooth, dense surface and shall not be done until the mortar has hardened sufficiently to prevent excess fine material from being worked to the surface. The top surface of the wet well shall immediately after troweling, be brushed lightly with a soft bristle janitor's push broom to produce a non-slip

surface. The brushing shall be sufficient to mark the surface only without appreciably disturbing the troweled finish.

120.05 Curing

All concrete shall be kept wet by covering with water and approved water saturated covering, or other approved method which will keep all surfaces continuously wet for a period of seven (7) days, unless otherwise specified by the Design Engineer. All concrete shall be adequately protected from injurious action by the sun. Fresh concrete shall be protected from heavy rains, flowing water and mechanical injury. All concrete shall be kept damp for at least seven (7) days by covering with an approved saturated covering, by a system of perforated pipes or mechanical sprinklers, or by any other approved method which will keep all surfaces continuously damp.

Where wood forms are left in place during curing, they shall be kept wet at all times to prevent opening at the joints and drying out of the concrete. Water for curing shall be clean and entirely free from any elements which might cause staining or discoloration of the concrete.

120.06 Forms

Forms shall be of wood, metal, or other approved material shall be built true to line and grade, mortar tight, adequately braced and supported, and sufficiently rigid to prevent displacement or sagging.

Forms, except those lined with absorptive form lining, shall be coated with a nonstaining mineral oil applied shortly before placing the concrete. In lieu of oiling, forms for unexposed surfaces may be thoroughly wetted immediately before placing the concrete.

Forms ties shall be of a design such that when forms are removed no metal shall be within 1 inch of the finished surface. Holes remaining from withdrawn tie rods or bolts shall be filled solid with cement mortar.

Under normal conditions, the minimum waiting period after placing concrete for stripping forms shall be as follows:

<u>Where Used</u>	<u>Time</u>
1. Bottom forms of girders and beams, floor slabs, and other concrete.	5 days
1. Walls, piers, columns, sides of beams, and other vertical surfaces.	24-48 hours

The use of this schedule shall not operate to relieve the Contractor or the Design Engineer of responsibility for the safety of the structure.

120.07 Embedded Items

In addition to steel reinforcement, pipes, and other metal objects, as shown on the plans or ordered to be built into, or set in, or attached to the concrete, all necessary precautions shall be taken to prevent these objects being displaced, broken, or deformed. Before concrete is placed, care shall be taken to determine that any embedded or wood parts are firmly and securely fastened in place as indicated. They shall be thoroughly cleaned and free of paint or other coating, rust, scale, oil, or any foreign matter. The embedding of wood in concrete shall be avoided whenever possible, metal being used instead. The concrete shall be packed tightly around the pipes and other metal work to prevent leakage and to secure perfect adhesion. Drains shall be adequately protected from intrusion of concrete.

Concrete placing operations shall not begin until the reinforcing steel, utilities, anchor bolts, etc., to be embedded in concrete have been inspected and approved by the Design Engineer.

120.08 Laboratory Services

Laboratory Services shall be performed by an independent commercial testing laboratory approved by the District. The Design Engineer shall furnish the District with copies of compression and slump test reports for every thirty (30) cubic yards or portion thereof of concrete placed. It shall be the responsibility of the Design Engineer to produce concrete of the strength, durability, workability and finish specified, furnish representative material for specimens in quantities required by the testing laboratory, and cooperate and assist in taking samples of materials for testing. The District reserves the right to take and test additional concrete samples.

SECTION 121

MANHOLES AND STRUCTURES

121.01 General

Manholes and structures shall conform in shape, size, dimensions, materials and other respects to the Standard Details or as directed by the District's Engineer.

All manholes shall be precast concrete with monolithic base sections. Invert channels may be formed in the concrete of the base or may be formed of brick and mortar upon the base.

When approved by the District, manholes which will receive direct force main discharges will be constructed of monolithic fiberglass resin equal to those as manufactured by L & F Manufacturing, Inc., or equal.

The inverts shall conform accurately to the size of the adjoining pipes. Sides inverts shall be curved and main inverts (where direction changes) shall be laid out in smooth curves of the longest possible radius which is tangent to the centerlines of adjoining sewers.

Connections to existing structures shall be made only by mechanically coring a hole through the structure. Jackhammer and other methods of cutting a hole through an existing structure are not acceptable.

Rubber "boots" subject to District approval, will be allowed for making pipe connections to structures provided that a layer of nonshrink grout be applied to seal the annular space on the inside of the manhole for the full wall thickness. The boots shall be cast in the precast structure and shall utilize stainless steel bands and screws which shall be given a bituminous coating in the field.

The frames and covers shall be set to conform accurately to the grade of the finished pavement or roadway surface; in unsurfaced areas, the frames and covers shall be set 3-inches higher than the surrounding ground surface.

Concrete shall conform to the requirements specified under Concrete Masonry.

121.02 Precast Concrete Sections

Precast concrete sections, if used, shall conform to the ASTM Specifications for Precast Reinforced Concrete Manhole Risers and Tops, Designation C-478 - Latest Revision, with the following exceptions and additional requirements:

Type II cement shall be used.

Sections shall be steam cured and shall not be shipped until at least five (5) days after having cast.

Acceptance of the sections will be on the basis of material tests, finished quality, and inspection of the completed product.

Cones shall be 30" - concentric type

Joint material in riser sections shall be of the bitumastic type as manufactured by RAM-NEK or equal.

No more than two (2) lift holes may be cast or drilled in each section.

121.03 Shallow Manhole

When the depth from the deepest invert to the top of the cone section is 4'-0" or less, an approved shallow cone section with a 30" opening shall be used. In no case shall a flat slab top section be used.

121.04 Setting Precast Sections

Precast reinforced concrete sections shall be set so as to be vertical with sections in true alignment.

All holes in sections, used for their handling, shall be thoroughly plugged with mortar. The mortar shall be one part cement and 1-1/2 parts sand; mixed slightly damp to the touch (just short of "balling"); hammered into the holes until it is dense and an excess of paste appears on the surface; and then finished smooth and flush with the adjoining surfaces.

Anti-hydro grout shall be used to fill all voids around sanitary sewer pipe and manhole sections.

121.05 Mortar for Brick and Concrete Block Work

The mortar shall be composed of Portland cement, hydrated lime, and sand, in which the volume of sand shall not exceed three (3) times the sum of the volumes of cement and lime. The proportions of cement and lime shall be as directed and may vary from 1:1/4 for dense, hard burned brick to 1:3/4 for softer

brick. In general, mortar for Grade SA brick shall be mixed in the proportions of 1:1/2:4-1/2.

Cement shall be Type II Portland cement as specified for under Concrete Masonry.

Hydrated lime shall be Type "S" conforming to the ASTM Standard Specification for Hydrated Lime for Masonry Purposes, Designation C207 - Latest Revision.

The sand shall be well graded clean, durable particles all of which shall pass a No. 8 sieve.

121.06 Laying Brick

Only clean, red, fire cured brick shall be used. The brick or block shall be moistened by suitable means, as directed, until they are neither so dry as to absorb water from the mortar, nor so wet as to be slippery when laid.

Each brick or block shall be laid in a full bed and joint of mortar without repairing subsequent grouting, flushing, or filling, and shall be thoroughly bonded as directed.

121.07 Plastering and Curing Brick

Outside faces of brick shall be plastered with mortar from 1/4 inch to 3/8 inch thick. If required, the brick shall be properly moistened prior to application of the mortar. The plaster shall be carefully spread and troweled so that all cracks are thoroughly worked out. After hardening, the plaster shall be carefully checked by being tapped for bond and soundness. Unbonded or unsound plaster shall be removed and replaced.

Brick and plaster shall be protected from too rapid drying by the use of burlaps kept moist, or by other approved means and shall be protected from the weather, all as required.

121.08 Frames and Covers

The castings for the frames and covers shall be of good quality, strong, tough, even grained cast iron, smooth, free from scale, lumps, blisters, sandholes and defects of every nature which render them unfit for the service for which they are intended.

All castings shall be thoroughly cleaned and subject to a careful hammer inspection.

Casting shall be at least Class 30 conforming to the ASTM Standard Specification for Gray Iron Castings, Designation A48- Latest Revision, and conform to the standard details.

The contact surface of the frame and cover seat shall be a machine fit and the cover surface shall be "knobbed".

Before being shipped from the foundry, castings shall be given one coat of coat tar pitch varnish, applied in a satisfactory manner so as to make a uniform coating which does not tend to scale off.

121.09 Setting Frames and Covers

Frames shall be set with the tops conforming accurately to the grade of the pavement or finished roadway surface, in unsurfaced areas the frames and covers shall be set 3 inches higher than the surrounding ground. Frames shall be set concentric with the top of the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the masonry shall be placed around the bottom flange. The mortar shall be smoothly finished to be flush with the top of the flange and have a slight slope to shed water away from the frame.

Cover shall be left in place in the frames on completion of other work at the manholes.

121.10 Adjustment of Existing Manhole Frames

When it is necessary to raise existing manhole frames due to repaving of roads or other reasons, the frames shall be shimmed with masonry, brick and Type II cement mortar to the new finished grade, or in the case of sodded areas, 2" above finished grade. In no case shall adjustment rings or adapters be used, unless specifically authorized by the District.

When new paving operations cause the manhole frame to be adjusted upwards, manholes will be raised using conventional shimming methods under the frame. The use of adapter rings in the existing frame will not be permitted.

SECTION 130

VALVES AND APPURTENANCES

130.01 General

All buried valves and appurtenances including exposed nuts, bolts, and retainer glands shall be given and exterior approved bitumastic coating.

All valves shall open counterclockwise. All valves shall have extension stems pinned to the operating nut with a stainless steel pin extension. Stems will not be required where the valve operation nut is less than 30" from finished grade.

130.02 Plug Valves

All plug valves shall be of the nonlubricated eccentric type. Valves shall be rated for not less than 150 pounds WOG and shall be of corrosion resistant construction. Valve flanges shall be ANS 125 pound with a full round or other acceptable type port to assure minimum turbulence and minimum pressure drop. Valve bodies shall be of cast iron or semisteel construction and seats shall be of nickel-alloy. Valves are to have a balance plug, coated with a resilient material solidly bonded to a cast iron or semisteel core, as required, to assure low torque and bubble-tight shutoff. The valve plug shall touch on the seat when in the closed position.

Buried plug valves shall be installed vertically with nonrising stems and shall open by turning a two inch square operating nut counterclockwise. An arrow shall be cast into the nut skirt to indicate the open direction.

Plug valves shall be as manufactured by DeZurik Corporation (Series 100), Keystone Valve Manufacturing Company (Ballcentric Type), or approved equal.

130.03 Resilient Seat Gate Valves

Gate valves shall be resilient seated, manufactured to meet or exceed the requirements of AWWA C509, Latest Revision, and in accordance with the following specifications.

Valves shall have an unobstructed waterway canal equal to or greater than the full nominal diameter of the valve.

The valves are to be nonrising stem with the stem made of cast, forged, or rolled bronze as shown in AWWA C509. Two stem seals shall be provided and shall be of the O-ring type, one above and one below the thrust collar.

The stem nut, also made of bronze, may be independent of the gate or cast integrally with the gate. If the stem nut is cast integrally, the threads shall be straight and true with the axis of the stem to avoid binding during the opening or closing cycle.

The sealing mechanism shall consist of a cast iron gate having a vulcanized Buna-N or SBR synthetic rubber coating or a Buna-N rubber seat mechanically retained on the gate. The resilient sealing mechanism shall provide zero leakage at the water working pressure when installed with the line flow in either direction.

The valve body, bonnet, and bonnet cover shall be cast iron ASTM A126, Class B. All ferrous surfaces inside the valve body shall have a fusion bonded epoxy coating. The coating shall meet or exceed all requirements of AWWA C500-81.

A two inch square operating nut shall be provided for operating the valve.

All valves are to be tested in strict accordance with AWWA C509.

Resilient seat gate valves shall be as manufactured by Mueller, Metro-Series, American/Darling or approved equal.

130.04 Ball Check Valves

When allowed to be used with submersible lift stations, all ball check valves shall be flanged end, ball check type, suitable for buried service. Ball check valves shall be rated for not less than 150 psi and shall be of corrosion resistant construction. Valve flanges shall be ANS 125 pound. Valve bodies shall be of cast iron construction. The balls shall be hollow steel with vulcanized nitrite rubber coating. For low static head applications, swing check valves may be substituted.

Check valves shall be HDL ball check valves, Type 2016 as manufactured by FLYGT Corporation, or approved equal.

130.05 Swing Check Valves

Swing check valves for sewage, sludge, and general service shall be in accordance with AWWA C 508, unless otherwise specified below, full-opening; designed for a working pressure of 150 psi unless otherwise shown, and shall have a flanged cover piece to provide access to the disc. Corrosive ferrous surface of valves, 4-inch and larger, which will be in contact with water, shall receive a fusion-bonded epoxy coating conforming to AWWA C550.

The valve body and cover shall be of cast iron to ASTM A 126, with flanged ends to ANSI B 16.1, or mechanical joint ends, as shown.

The valve disc shall be of cast iron, ductile iron, or bronze to ASTM B 62.

The valve seat and rings shall be of bronze to ASTM B 92 or B 148, or stainless steel.

The hinge pin shall be of bronze or stainless steel.

Suppliers or Equal:

American-Darling Valve Co.

APCO (Valve and Primer Corp.)

Crane Company

Mueller Co.

The valves shall have a lever and counterweight and shall be suitable for horizontal or vertical mounting.

130.05.1 Rubber Flapper Swing Check Valves

The Rubber Flapper Swing Check Valve shall have a heavily constructed cast iron body and cover. The body shall be long pattern design (not wafer), with integrally cast on end flanges. The flapper shall be Buna-N having an "O" ring seating edge and be internally reinforced with steel.

The body and cover shall be lined with 1/8" thick natural rubber. The lining shall be autoclaved to the body and cover and cured to 55 durometer shore A \pm 5. The lining shall be tested in conformance with ASTM D573.

Flapper to be captured between the body and the body cover in a manner to permit the flapper to flex from the closed to full open position during flow through the valve. Flapper shall be easily removed without need to remove valve from line. Check valves to have full pipe size flow area. Seating surface to be on a 45 degree angle requiring the flapper to travel only 35 degrees from closed to full open position, for minimum head loss and nonslam closure.

Buna-N flapper to have an elastic spring, molded internally, to assist the flapper to close against a slight head to prevent slamming. Flapper opening should be capable of passing three inch solids.

To create backflow through the check valve, i.e., to prime or back-flush a clogged pump, an external backflow device can be furnished.

Valve exterior to be painted with red oxide phenolic primer paint as accepted by the FDA for use in contact with potable water.

Materials of construction shall be certified in writing to conform A.S.T.M. specifications as follows:

Body and Cover	Cast Iron	ASTM A48, Class 30
Flapper	Buna N	
Lining	Natural Rubber	

Valve to be equal to APCO Series 100R Rubber Flapper Swing Check Valve, as manufactured by Valve & Primer Corp., Schaumburg, Illinois, U.S.A.

130.06 Air Release, Air Vacuum Valves, and Combination Type Valves

The air release and air vacuum valves shall be of the type especially designed for forced sewer systems. The valve shall be of the short body type and capable of releasing air, gas, or vapor under pressure during system operation or allow air to enter the system when the system is draining, as applicable. The valve shall be as shown on the Standard Details with a two inch inlet. The venting orifice shall be sized by the Design Engineer based on a working pressure of 75 psi. The valve shall be constructed of cast iron body and cover, stainless steel trim and float, with an adjustable orifice button to insure positive seating. The valve shall be furnished with back-flushing accessories. All rubber seats shall be Buna-N.

It shall be the responsibility of the design engineer to determine which valve is necessary for the pipeline conditions encountered.

Air release and air vacuum valves shall be Crispin Sewer Valves as manufactured by Multiplex Manufacturing Company, Berwick, PA; Val-Matic Sewage Air Valve manufactured by Val-Matic Valve and Manufacturing Corporation, Chicago, IL; or approved equal. (See Standard Details)

130.07 Gate Valves Three Inches and Smaller

Unless otherwise indicated on the Drawings, specified, or approved, gate valves three inches and smaller shall be 125 pound bronze valves with screwed ends to suit the piping in which they are installed. Body material shall conform to SSTM Standard Specification for Composition bronze Castings, Designation B62-70. Valves shall have union bonnet, rising stem, inside screw, and solid wedge gate.

Stems shall be made of wrought silicon bronze. If the Manufacturer does not furnish this stem material in the class specified, the valves shall be furnished in the next higher class in which the stem material is available.

Gate valves shall be manufactured by Jenkins Brothers, New York, NY; Lunkenheimer Co., Cincinnati, OH; or equal.

130.08 Valve Boxes and Vaults

All buried plug valves and resilient seat gate valves shall be equipped with valve boxes. Valve boxes shall be heavy roadway type, cast iron, three piece, slide type, or screw type with drop covers. The valve boxes shall be adjustable to six inches up or down from the nominal required cover of the pipe. A number six base section shall be provided. Minimum shaft diameter shall be 5-1/4 inches and minimum metal thickness shall be 3/16 inch. Boxes shall be coated with an approved bitumastic coating. Valve box covers shall have the word "SEWER" or "REUSE" cast thereon depending on the application. Swing check valves shall be installed in an approved suitable vault for easy access by the District maintenance staff.

Valve boxes shall be installed on firmly compacted material at a level approximately equal to the elevation of the valve packing plate. No contact between the valve and the box shall be permitted. On plug valves, the positioner on the operating mechanism shall be kept free of rocks, debris, etc.

Where valves are installed with over six feet of cover, or where the ground water table is within three feet of the ground level, an extension stem shall be provided to bring an operating nut within two feet of the finished grade. This extension stem shall be satisfactorily pinned to the valve operation nut to prevent dislodging during operation of the valve.

SECTION 140

PIPELINE INTEGRITY TESTS

140.01 General

The District will inspect all sewer facilities prior to acceptance and again just prior to the expiration of the one year guarantee.

When a section of pipe of a length deemed adequate by the Design Engineer is ready for testing, the pipe shall be flushed and then tested in accordance with the applicable testing method as described herein. Suitable temporary testing plugs or caps shall be installed. All necessary pressure pumps, pipe connections, meters, gauges, water, weirs, bulkheads, and other necessary equipment and all labor required for carrying out these tests shall be furnished. The Design Engineer shall notify the District at least 48 hours prior to any testing so that it may, at its option, have representative present during the testing.

Gravity sewers shall be tested in accordance with the Hydraulic Infiltration/Exfiltration Test as described herein or, at the Contractor's option, in accordance with the Low Pressure Air Test as described herein. Additionally, PVC Gravity sewers shall be tested for deflection as described herein. Force mains shall be tested in accordance with the Pressure and Leakage Test for Force Mains as described herein.

If the District Engineer so desires, the first section of any line between two manholes shall be tested as soon as possible after backfilling has been completed. If such tests appear to be satisfactory and acceptable, progressive testing of completed sections of the lines may be deferred at the option of the District's Engineer, and at the request of the Contractor, until all pipe has been laid and before final acceptance. However, if permitted, this will not constitute a waiver of any of the tests or the leakage requirements.

Sections of pipe tested for infiltration and exfiltration prior to completion of the project shall be subject to a final inspection at completion of the project, and also subject to additional leakage tests, if warranted in the opinion of the District Engineer.

If the section fails to pass the applicable tests, the Contractor shall do everything necessary to locate, uncover and repair or replace the defective pipe, fitting or joint, all at his own expense. Additional testing will be required to assure passage of the test.

140.02 Hydraulic Infiltration/Exfiltration Tests

Upon completion of a section of the sewer, the pipe shall be dewatered and tested to measure the infiltration for at least three (3) consecutive days. Test section shall be from manhole to manhole. Longer test sections may be used with the approval of the District Engineer.

The amount of infiltration/exfiltration including manholes, "Y" branches and connections shall not exceed 10 gallons per inch diameter per mile of sewer per 24 hours for clay.

For making the infiltration tests, underdrains, if used, shall be plugged, well points and other groundwater drainage shall be stopped to permit the groundwater to return to its normal level. Infiltration shall be measured by the use of weirs designed specifically for this purpose or other acceptable means approved by the District Engineer.

As required, suitable bulkheads shall be installed to permit the test of the sewer.

Where the crown of the pipe is below the natural groundwater table at the time and place of testing, the pipe shall be tested for infiltration. Suitable watertight plugs shall be installed and section of pipe to be tested shall be pumped dry before start of test. Where the crown of the pipe is above the natural water table, the pipe shall be tested for exfiltration by installing necessary plugs and filling pipes and manholes with water and maintaining a static head of water of a minimum of two feet above the crown of the pipe during the test. Exfiltration tests shall be conducted on main lines and lateral lines, unless waived by the District Engineer. The water level of internal pressure to be used for exfiltration test shall be determined by the Design Engineer.

The sewers shall pass the applicable test before any connections are made to buildings or to active sewers.

140.03 Low Pressure Air Test

The Contractor may use a low pressure air test as an option to the hydraulic infiltration/exfiltration leakage test for gravity lines.

The sewers shall pass the applicable test before any connections are made to buildings or active sewers.

For making the low pressure air tests, the Contractor shall use equipment specifically designed and manufactured for the purpose of testing sewer pipelines using low pressure air. The equipment shall be provided with an air

regulator valve or air safety valve so set that the internal air pressure in the pipeline cannot exceed 8 psig.

140.03.1 Preparation of Sewer Line

When required by the Engineer, the leakage test using low pressure air shall be made on each manhole to manhole section of pipeline after placement of the backfill.

The Contractor shall flush and clean the sewer line prior to testing, leaving the interior pipe surface wet for the test.

140.03.2 Conditions and Requirements

Low pressure air shall be introduced into the sealed line until the internal air pressure reaches 4 psig greater than the maximum pressure exerted by groundwater that may be above the invert of the pipe at the time of the test. However, the internal air pressure in the sealed line shall not be allowed to exceed 8 psig. When the maximum pressure exerted by the groundwater is greater than 4 psig, the Contractor shall conduct only an infiltration test.

Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be tested. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.

All air used shall pass through a single control panel.

When the sewer section to be tested contains more than one size of pipe, the minimum allowable time shall be based on the largest diameter pipe in the section, and shall be the time shown in the test table included hereinafter reduced by 0.5 minutes.

The Contractor shall be extremely cautious when testing with low pressure air. It is extremely important that the various plugs be installed and braced in such a way as to prevent blowouts. Inasmuch as a force of 250 lbf (112N) is exerted on an 8-inch (230 mm) plug by an internal pipe pressure of 5 psi (34 kPa), it should be realized that sudden expulsion of a poorly installed plug or of a plug that is partially deflated before the pipe pressure is released can be dangerous.

As a safety precaution, pressurizing equipment shall include a regulator or relief valve set at 8 psi to avoid overpressurizing and damaging an otherwise acceptable line. NO ONE shall be allowed in the manholes during testing.

140.03.3 Procedures

Determine the test duration for the section under test by computation from the applicable formula shown in ASTM C828-75T or from prepared air test tables included hereinafter. The pressure holding time is based on an average holding pressure of 3 psi (21 kPa) gauge or a drop from 3.5 psi (24 kPa) to 2.5 psi (17 kPa) gauge.

Air shall be introduced into the section of the line being tested until the internal air pressure of the sewer line is raised to approximately 4.0 psi (28 kPa) gauge. After an internal pressure of approximately 4.0 psi is obtained, allow at least 2 minutes for the air pressure to stabilize. The pressure will normally show some drop until the temperature of the air in the test section stabilizes.

When the pressure has stabilized and is at or above the starting test pressure of 3.5 psi (24 kPa) gauge, commence the test. Before starting the test, the pressure may be allowed to drop to 3.5 psig. Record the drop in pressure for the test period. If the pressure has dropped more than 1.0 psi (7 kPa) gauge during the test period, the line has failed. The test may be discontinued when the prescribed test time has been completed even though the 1.0 psig drop has not occurred.

The test shall be done in the presence of the Design Engineer and written record of the test and results prepared by the Design Engineer and submitted to the District.

140.03.4 Table for Air Testing

The air test table included hereinafter has been prepared utilizing applicable formulas from ASTM C838-75T. It is based on an allowable air loss of 0.003 ft. 3/min. per square foot of internal pipe surface, a maximum air loss per test section of 3.5 ft. 3/min. It applies when testing one pipe diameter only and for convenience ignores service lines which, in most instances, create only insignificant differences in test time.

AIR TEST TABLE

Based on Formulas from ASTM C 828-75T

SPECIFICATION TIME (min:sec) REQUIRED FOR PRESSURE DROP FROM 3-1/2

TO 2-1/2 PSIG

WHEN TESTING ONE PIPE DIAMETER ONLY

LENGTH of LINE, FEET	PIPE DIAMETER, INCHES						
	6	8	10	12	15	18	21
25	0:10	0:18	0:28	0:40	1:02	1:20	2:01
50	0:20	0:35	0:55	1:19	2:04	2:58	4:03
75	0:30	0:53	1:23	1:59	3:06	4:27	6:04
100	0:40	1:10	1:50	2:38	4:08	5:56	8:05
125	0:50	1:28	2:18	3:18	5:09	7:26	9:55
150	0:59	1:46	2:45	3:58	6:11	8:30	9:55
175	1:09	2:03	3:13	4:37	7:05	8:30	9:55
200	1:19	2:21	3:40	5:17	7:05	8:30	9:55
225	1:29	2:38	4:08	5:40	7:05	8:30	10:25
250	1:39	2:56	4:35	5:40	7:05	8:31	11:35
275	1:49	3:14	4:43	5:40	7:05	9:21	12:44
300	1:59	3:31	4:43	5:40	7:05	10:12	13:53
350	2:19	3:47	4:43	5:40	8:16	11:54	16:12
400	2:38	3:47	4:43	6:03	9:27	13:36	18:31
450	2:50	3:47	4:43	6:48	10:38	15:19	20:50
500	2:50	3:47	5:14	7:34	11:49	17:01	23:09
550	2:50	3:47	5:45	8:19	13:00	18:43	25:28
600	2:50	4:02	6:17	9:04	14:11	20:25	27:47

AIR TEST TABLE

Based on Formulas from ASTM C 828-75T

SPECIFICATION TIME (min:sec) REQUIRED FOR PRESSURE DROP FROM 3-1/2

TO 2-1/1 PSIG

WHEN TESTING ONE PIPE DIAMETER ONLY

LENGTH OF LINE, FEET	PIPE DIAMETER, INCHES						
	24	27	30	33	36	39	42
25	2:38	3:20	4:08	4:59	5:56	6:58	8:05
50	5:17	6:41	8:15	9:59	11:53	13:57	16:10
75	7:55	10:01	12:23	14:58	17:00	18:25	19:50
100	10:34	12:45	14:10	15:35	17:00	18:25	19:50
125	11:20	12:45	14:10	15:35	17:00	18:58	23:05
150	11:20	12:45	14:10	17:09	20:25	23:57	27:43
175	11:20	13:24	16:32	20:01	23:49	27:57	32:26
200	12:06	15:19	18:54	22:52	27:13	31:56	36:58
225	13:36	17:13	21:16	25:44	30:37	35:56	41:35
250	15:07	19:08	23:38	28:35	34:01	39:56	46:13
275	16:38	21:03	25:59	31:27	37:25	43:55	50:49
300	18:09	22:58	28:21	33:05	40:49	47:55	55:26
350	21:10	26:47	33:05	40:01	47:38	55:54	64:01
400	24:12	30:37	37:48	45:44	54:26	63:53	73:55
450	27:13	34:27	42:32	51:27	61:14	71:52	83:10
500	30:14	38:16	47:15	57:10	68:02	79:51	92:24
550	33:16	42:06	51:59	62:53	74:51	87:50	101:38
600	36:17	45:56	56:42	68:36	81:39	95:49	110:53
650	39:19	49:45	61:26	74:19	88:27	103:48	120:07

140.04 Pressure and Leakage Test for Force Mains

Except as otherwise directed by the District, all pipelines shall be given combined pressure and leakage tests in sections of length approved by the District's Engineer. The Contractor shall furnish and install suitable temporary plugs or caps; all necessary pressure pumps, pipe connections, meters, gauges, and other necessary equipment; and all labor required. The Design Engineer shall witness all tests.

Subject to approval of the Design Engineer and provided that the tests are made within a reasonable time considering the progress of the project as a whole, and the need to put the section into service, the Contractor may make the tests when he desires.

The section of pipe to be tested shall be filled with water of approved quality and all air shall be expelled from the pipe. If air release valves are not available at high points for releasing air, the Contractor shall make the necessary excavations and do the necessary backfilling and make the completion of the test.

The section under test shall be maintained full of water for a period of 24 hours prior to the combined pressure and leakage test being applied.

Two pressure and leakage tests shall be conducted for each pipeline segment. The first test shall be conducted at the average working pressure of the pipeline segment. The second test shall be conducted at a test pressure of 100 pounds per square inch.

The pressure and leakage test shall consist of first raising the water pressure (based on the elevation of the lowest point of the section under test and corrected to the gauge location) to the specified pressure. If the Contractor cannot achieve the specified pressure and maintain it for a period of one hour with no loss of pressure and no additional pumping, the section shall be considered as having failed to pass the pressure test. The District may require that the pressure and leakage test be run in accordance with AWWA C-600 Standards, latest revision. (Four Hour Test)

SECTION 150

SUBMERSIBLE LIFT STATIONS

150.01 General

It is the intent of this standard to specify a two pump submersible lift station complete in every respect whether or not covered by this specification or the construction details.

The surface of the lift station and paved access roadway shall be set at proper elevations that future access to the station will not be impaired by flooding, excessive road grades, swales, walls, or landscaping in any manner. A site plan of the lift station site (plot plan) indicating all topographical features, rights-of-way, and easements shall be submitted to the District for approval of the site and adjoining contiguous areas.

The Contractor shall coordinate with and pay all fees, deposits, and service costs to Florida Power and Light Corp. to bring three phase, 4 wire 230/120 volt (480 volts when required) underground power service to the lift station site.

The lift station and appurtenances shall include all couplings, anchor bolts, piping, valves, electrical equipment, etc., required for a complete working installation.

A list of equipment included under this item is given below. This list is not all inclusive and the Contractor shall supply all other equipment necessary for complete working installations. The lift station shall include:

Two (2) submersible type sewage pumps with 304 stainless steel guide rails and all accessories.

Two (2) discharge lines with swing check valves, plug or resilient seat gate valves installed within a precast concrete pit.
(See Standard Details)

One (1) pump level control system for pump lead-lag controls with high level alarm, electrical panel, etc.

One (1) wet well structure with access hatch.

One (1) influent (collection) manhole structure with piping connecting to the wet well structure. The distance between the collection manhole and the wet well shall be a maximum of 50 feet.

One (1) electrical control center, NEMA 4X, to house electrical equipment, pump controls, alarms and protection.

150.02 Operating Conditions

Each pump shall have sufficient design capacity to satisfy the design criteria and conditions specified by the design Engineer. The design engineer shall submit calculations based on design criteria enumerated in these standards for the following:

- A. Average Daily Flow
- B. Peak Design Flow
- C. System Head Curves
- D. Wet Well Cycle Time
- E. Flotation

150.03 Pumps and Motors

The pumps shall be capable of handling grit and raw unscreened sewage. The design shall be such that the pump unit will be automatically and firmly connected to the discharge piping when lowered into place on its mating discharge connection, permanently installed in the wet well. The pump shall be easily removable for inspection or service requiring no bolts, nuts, or other fastenings to be disconnected.

All major parts, such as the stator casing, oil casing, sliding bracket, volute, and impeller shall be of gray iron. All surfaces coming into contact with sewage shall be protected by a coating resistant to sewage. All exposed bolts and nuts shall be of stainless steel.

A wear ring system shall be installed to provide efficient sealing between the volute and impeller.

The impeller shall be hard alloy gray cast iron of non-clogging design capable of handling solids, fibrous material, heavy sludge, and other matter found in normal sewage applications. The impeller shall be constructed with a long throughout without acute turns. The impeller shall be dynamically balanced. The impeller shall be a slip fit to the shaft and key driven. Non-corroding fasteners shall be used.

Each pump shall be provided with a mechanical rotating shaft seal system running in an oil reservoir having separate, constantly hydro-dynamically lubricated and lapped seal faces.

The lower seal unit between the pump and oil chamber shall contain one stationary and one positively driven rotating tungsten-carbide ring.

The upper seal unit between the oil pump and motor housing shall contain one stationary tungsten-carbide ring and one positively driven rotating carbon ring. Each interface shall be held in contact by its own spring system supplemented by external liquid pressures. The seals shall be easily inspected and replaceable.

The shaft sealing system shall be capable of operating submerged to depths of, or pressure equivalent to, 65 feet. No seal damage shall result from operating the pumping unit out of its liquid environment. The seal system shall not rely upon the pumped media for lubrication.

A sliding guide bracket shall be an integral part of the pump unit. The volute casing shall have a machined discharge flange to automatically and firmly connect with the cast iron discharge connection, which when bolted to the floor of the sump and discharge line, will receive the pump discharge connection flange without the need of adjustment, fasteners, clamps or similar devices.

Installation of the pump unit to the discharge connection shall be the result of a simple linear downward motion of the pump unit guided by no less than two guide bars. No other motion of the pump unit, such as tilting or rotating, shall be acceptable. Sealing of the discharge interface by means of a diaphragm, O-ring, or other device will not be considered acceptable nor equal to a metal to metal contact of the pump discharge flange and mating discharge connection specified and required. No portion of the pump unit shall bear directly on the floor of the wet well. There shall be no more than a 90 degree bend allowed between the volute discharge flanges and station piping.

The pump motor shall be housed in an air or oil filled watertight casing and shall have moisture resistant Class "F" 155 degree C insulation. Oil filled casing shall be filled with transformer oil, quality BP Energol JSO, or Shell Diala D or DX. The motor shall be a minimum of 5 BHP, rated for operation at 1700 or 1750 rpm, on a 230 volt, 3-phase, 60 hertz power supply. The cable entry water seal design shall be such that precludes specific torque requirements to insure a watertight and submersible seal. Epoxies, silicones or other secondary sealing systems shall not be required or used. The cable entry junction box and motor shall be separated by a stator lead sealing gland or terminal board which shall isolate the motor interior from foreign materials gaining access through the pump top.

Pump motor cable installed shall be suitable for submersible pump applications and this shall be indicated by a code or legend permanently marked on the cable. Cable sizing shall conform to NEC specifications for pump motors and

shall be of adequate size for the motor rating. Pump motor cable shall be ample length to reach the rack mounted panel. Cable length to be determined by the site plans.

The pump cable shall have 90 degree C rated insulated material based on 40 degree ambient and shall have anti-roping and anti-wicking design. All mating surfaces of major parts shall be machined and fitted with nitrile O-rings where watertight sealing is required. Machining and fittings shall be such that sealing is accomplished by automatic compression in two planes and O-ring contact made on four surfaces, without the requirement of specific torque to affect this. Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered adequate not equal.

Tolerances of all parts shall be such that allows replacement of any parts without additional machining required to insure sealing a described above. No secondary sealing compounds, greases, or other devices shall be used.

Each unit shall be provided with an adequately designed cooling system. Thermal radiators integral to the stator housing, cast in on unit, are acceptable. Where water jackets along or in conjunction with radiators are used, separate circulation shall be provided. Cooling media channels and ports shall be no-clogging by virtue of their dimensions. Provisions for external cooling and flushing shall be provided.

The pumps and motors shall be manufactured by FLYGT Corporation.

150.04 Control Panel

The Contractor shall furnish and install a heavy duty type District Standard control panel as shown on the plans and specified here, as manufactured by Sta-Con Incorporated, QCI, or approved equal, in accordance with the detail sheets.

The control panel shall contain all the remote electrical equipment necessary to provide for the operation of the pumps. The panel shall start and stop the pumps in the wet well.

The control panel shall start the "lead" pump when the liquid level rises to a preselected elevation "D". If the influent rate exceeds the capacity of the "lead" pump, the lag pump shall be started when the liquid level rises to a preselected elevation "C" (higher than "D"). If the liquid level rises to a preselected elevation "B" (higher than "C"), the high level alarm shall be activated. When the liquid level falls to a persecuted elevation "E" (lower than "D"), both pumps shall be stopped.

The control panel shall be contained in a single enclosure, fabricated of not less than 14 gauge 304 stainless steel, NEMA 4x construction. The door shall be formed with minimum lip of 3/4" and full height hinged. Closure mechanisms shall be No. 3 S.S. fasteners with No. 3 keepers as manufactured by Simmons Fasteners, or approved equal.

The interior door shall be constructed of .080 inch thick 6061-T6 aluminum. The interior and exterior doors shall be provided with a stop mechanism to hold the doors open which working in the panel. A rain shield shall be provided.

The control panel shall include the following items plus any other items shown on the plans or required for a complete, operational installation.

Circuit breakers with combination full voltage motor Starters for each pump.

"Hand-Off-Auto" selector switch for each pump, heavy duty oil tight type (toggle switches will not be acceptable).

Automatic pump alternator with test switch.

Duplex receptacle with 15 amp circuit breaker 115V GFI.

Control transformer with 24 volt secondary, fused secondary.

Control power circuit breaker.

Main circuit breaker.

Emergency power minimum 100 amp circuit breaker and 60 amp, 4 wire, 3 pole, reverse service generator receptacle, Appleton (ACR 1034-RS), or Crouse-Hinds (AR 1042-S22).

Lightning arrestor, 3 phase.

Surge capacitor.

Phase monitor, to prevent energization of pump motors in the event of phase failure or reversal or low voltage.

Indicating light for each level regulator (float switch).

"Running" indicating light for each pump.

Elapsed time meter for each pump, 2-1/2", 6 digit non-reset.

High level alarm light, 120 V AC, 100 W with Flasher, outdoor type mounted on top of the control panel.

The panel shall include back-up circuitry to permit one pump to operate with a normal drawdown in the event of failure (open circuit) of the "stop" level regulator.

Spare parts to be furnished with the panel include:

- 2 - 24V Relays
- 1 - Alternator
- 1 - Phase Monitor
- 12 - Lamps
- 12 - Fuse Links

A copy of the panel wiring diagram shall be attached to the inside of the outer panel door. An extra copy shall be given to the District.

150.05 Control Panel Components

The basic components and layout of the control panel are shown on Sheet 2 of 2 of the Lift Station Standard details.

Substitutions of these components will be permitted for approved equal, interchangeable products upon obtaining specific written approval from the District.

150.06 Access Hatch

The wet well access hatch shall be single leaf design with a minimum clear opening at 36" x 48". The frame shall be 3" x 3" x 1/4" aluminum angles and the cover shall be 1/4" aluminum angles and the cover shall be 1/4" aluminum diamond pattern. The hatch shall be completed with anchor straps, automatic hold open arm and cover release, forged brass or stainless steel hinges with stainless steel pins, hasp and staple lock, flush type handles, upper guide holders and sensor cable holder. The cover shall be reinforced to withstand a live load of 300 lbs./sq. ft. Hinges shall be of the interior type.

150.07 Mercury Roto Floats

Four (4) 24 Volt mercury level control switches shall be installed in the wet well to control the operation of the pumps with variations of liquid level in the wet well. The float switches shall be a snap action switch activated by a rolling steel ball in a switching tube sealed in a polypropylene casing with a firmly bonded

electrical cable protruding. Floats shall be manufactured by Anchor Scientific Inc., known as Roto-Floats.

150.08 Compatibility of Equipment

Before placing installation into service, the Contractor shall run the pumps continuously with the motor not submerged for 30 minutes under full load current with no damage resulting to the pump motor. the pumps shall also be tested for the design GPM and TDH conditions and shall experience a heat rise of not more than 45 degrees C above ambient temperature.

150.10 Information and Services to be Furnished by Manufacturer of
of Equipment

Detailed wiring diagrams of the entire installation including main power supply, pump motors, control circuits, alarm circuits, and metering circuits shall be submitted. The diagrams shall include schematic and connection wiring diagrams.

Four (4) copies of detailed installation drawings including wiring diagrams, pump curves and maintenance and operating manuals shall be submitted to the District at the time of initial start-up.

The services of a factory-trained representative shall be furnished for the lift station start-up. The representative shall check all electrical components, wiring, and pump operations.

150.11 Warranty

The pump manufacturer shall warrant the pumps for a period of five (5) years from the date of pump manufacturer's start-up. the warrant must include a minimum 100% coverage of the manufacturer's shop labor and parts for the first eighteen months, then 50% coverage through the third year, and then 25% coverage through the fifth year.

SECTION 151

LOW PRESSURE SEWER SYSTEMS

151.01 General Intent

It is the intent of the District to provide sanitary sewer service to the citizens, businesses, and industry of the area in a manner which maximizes use of existing facilities, minimizes environmental damage, and provides solutions to existing problems.

Gravity collection systems with central lift stations are the preferred methods of collecting and transporting sewage to the regional facilities. All property owners should anticipate connection via these conventional facilities unless otherwise directed by the District.

The District recognizes that the construction of gravity sanitary sewer lines is not conducive to all areas, and that utilization of an alternative system may be necessary to provide access to regional facilities.

The District may at its sole discretion allow or direct the utilization of LPSS where it is determined to be in the best interest of the District. The District may direct the use of LPSS to minimize the impacts of gravity sewer construction upon existing neighborhoods or upon environmentally sensitive areas.

The use and implementation of LPSS shall be at the sole discretion of the District and no installation shall be considered as a precedent for justifying the acceptance of LPSS in a similar or like situation.

151.02 Administration

The administrative procedures for construction are set forth in the latest revision of the District Construction Standards and Technical Specifications and shall be adhered to unless specifically modified in writing by the District.

151.03 Utilization - Existing Developments

For the purpose of this section, the term "existing developments" shall be considered as those areas which have previously developed on septic tanks to the extent that a substantial portion of the subdivision is now built out; or, under less prevalent circumstances, an area which has received site plan approval and is plated/subdivided based upon use of septic tanks.

The criteria for the District's determination of whether the use of LPSS is warranted includes, but is not limited to: existing developments of less than 40 homes, or in areas of high water tables, or in areas where work space for construction activities is unreasonably restricted or in areas where available gravity collection lines have not been provided by prior construction.

Existing gravity sewer systems will be utilized to the maximum extent possible; however, LPSS may be considered in existing neighborhoods where gravity construction would be unreasonably restricted in the opinion of the District Engineer.

151.04 Responsibility

151.04.1 District

A low pressure sewer system may consist of one or more pumping units. A "unit" shall be considered as the individual pumping unit which serves a single residence, or a commercial or industrial customer. In the latter case, the unit may contain two pumps (duplex).

All plans for the construction of any portion of an LPSS shall be submitted to the District Engineer for review and approval.

All LPSS facilities which are located within public rights-of-way shall be conveyed to the District for operation and maintenance.

Any facility, associated with an LPSS, which is located outside of the private property being served must be within a dedicated easement. The easement shall be to the benefited property owner, successors and assigns, or in the event the facility serves more than one property it shall be conveyed to the District.

The District shall be responsible for the operation and maintenance of all facilities (force mains, valves, etc.) within rights-of-way, or dedicated plated utility easements which serve more than one unit.

151.04.2 Residential or Nonresidential User Responsibilities

Each individual residential or nonresidential user of the LPSS system shall provide his own pump station, force main and connection to the District owned collection/transmission lines. The District shall be responsible for the operation and maintenance of equipment serving his individual property, whether located on his property or in easements off of his property. The residential or nonresidential user shall be responsible for the installation of the pump station, control panel, force main valves, and all appurtenances which are a part of the

system solely serving the individual user. The cost of parts used to maintain pumping units shall be borne by the property owner unless specified elsewhere.

The residential or nonresidential user shall also provide electrical power from his meter to the control panel, and all operating costs shall be his responsibility.

151.05 Submissions And Approvals

All installations of individual units shall be reviewed and approved by the District Engineer prior to construction. The District Engineering Department shall be notified at time of installation of the pumping unit and at time of connection to the District line. Connection excavations shall remain open and protected until such time as an inspection has been performed and a satisfactory connection is made.

All installations shall be made in accordance with District Technical Specifications, and local plumbing and electrical codes, and the regulations of the Florida Department of Environmental Regulation.

Submittals for area lines which will be taken over by the District for operation and maintenance shall be made by a professional engineer, registered in the State of Florida. Six (6) sets of signed and sealed plans shall be submitted for approval. The construction shall also be inspected and certified by a Florida registered professional engineer upon completion.

Submittals for individual installations shall include a shop drawing of the pump station and control panel, and an as-built drawing showing tie-in dimensions of the force main, valves, and any electrical conduits.

The use of pumping units is restricted to several makes and models for which the District will maintain a limited spare parts inventory for emergency situations only. The District assumes no liability or responsibility for the operation or maintenance of any individual units.

151.06 Definition

A low pressure sewer system is defined as a means of conveying sewage received from individual pumping units through a small pressurized force main to a discharge point which can be part of an existing force main or gravity system.

151.07 General System Design Considerations

The following particulars should be considered in the design of any proposed low pressure system:

1. Geographical location.
2. Type of development - number of residences.
3. Topography of service area (where applicable).
4. Layout of existing or proposed service area.
5. Projected sewage flows.
6. Location of nearest existing sewer facility.
7. Soil and water table information.
8. Availability of electric power.

151.07.1 System Layout And Alignment

The pressure sewer system should be designed so that all contributory lines are branched into a main collector. "Looping" and "dead-endings" of macerated sewage in remote areas of the system shall be avoided.

Pressure lines should be laid out to provide runs as short as possible with a minimum of major change in direction.

In order to facilitate maintenance and repair, force mains should be laid outside the limits of pavement or heavy traffic areas.

All system lines shall be kept full, under a positive pressure head at all times. This can be maintained by locating the system terminus at the highest elevation, or by employment of a positive pressure control device at the terminus.

To minimize the number of potential air pockets, pressure lines should be installed on a continuously rising grade as much as possible to predetermined points where air release devices and cleanout ports can be installed in accordance with the Standard Details.

151.07.2 Design Flow

As in any collection system, a pressure sewer system must be designed to effectively handle all sewage flow generated in the service area especially during times of peak flows.

Peak flow shall be determined by accepted sanitary sewer engineering principals and standards established by regulatory agencies. Proper design should assure that each contributing pump unit in the service area, no matter what its location or what other units are operating at the same time, will be able to deliver into the system during these peak flow system conditions at a rate sufficient to insure that there will be no sewage removal problem at any individual building or unit. A rate in the range of 8-10 gal./min. is normally considered sufficient.

151.07.3 Line Sizing And Velocities

Line sizing must be designed to insure that scouring velocities will occur in the system pressure lines at some regular interval. At the same time they must avoid excessive system pressures which can jeopardize the delivery capacity of any unit on the system.

To insure that scouring will occur during design flows, it is recommended that the velocities in the pressure lines be maintained in the 2-5 ft./sec. range at regular intervals.

151.07.4 Operation Of Contributing Pumping Units

A most important design consideration is that the proper operation of any and each pumping unit on the system be assured during any flow conditions which could exist. This includes the most demanding maximum peak design flow which may be seldom, if ever, encountered (such as immediately following an extended power outage).

151.07.5 System Flushing

Design shall provide for the ability to mechanically purge sewage from the system at regular intervals. Flushing connections to the force main system are shown in the Standard Details.

151.07.6 Air Release

Design shall provide for relief of air at high points along the system. Valves and piping configuration is shown in the Standard Details.

151.08 Pumping Units

The pumping units shall combine a centrifugal submersible pumping unit(s) with a patented grinding assembly which is capable of reducing sewage and its normal constituents (together with sticks, rubber, bones, rags, plastics, etc.) to a particulate slurry which can easily be transported through small diameter pipes.

The units shall be furnished complete with unit tank, electrical control panel, level controls, alarms, check and ball valves, and other necessary appurtenances as shown on the Standard Details.

Pumps shall be equal in all respects to those manufactured by Marley Pump Co., (Hydromatic - Model 5PG 200) or Peabody Barnes Model PSG V 20I. All units shall be minimum 2 HP with 1-1/4" vertical discharge outlet.

151.09 Piping And Appurtenances

151.09.1 Pipe

Pipe for small diameter pressure lines shall be lightweight, smooth flow, polyvinyl chloride (PVC) with a flow factor (C) equal to at least 150. Pipe shall be Type I, PVC 1120 with a hydrostatic design stress of 2000 psi for liquid at 73.4 F. Heavy duty schedule 80 PVC will be used for pressure lines. Where pressure lines cross paved roadways, a protective galvanized steel sleeve will be used to facilitate removal of the pressure pipe.

151.09.2 Valves and Cleanouts

Valves (with boxes) shall be strategically placed along the pressure main, at junction points, changes of direction, and recommended intervals along extensive straight runs. (See LP Details)

Valves shall be thermoplastic ball type made of Type I, grade I, PVC, rated at 150 psi at 120 F. Valves shall be set in precast concrete or molded PVC type meter boxes with labeled traffic bearing lids.

Each pumping unit shall be isolated from the low pressure force main by a PVC ball valve positioned at the street right-of-way line. This valve and service line will typically be 1-1/4" in diameter, set in a meter box, at no more than 18" depths. (See Details)

151.09.3 System Wiring and Control

Each individual contributing pumping unit shall be connected by underground conduit to the individual home electrical power supply. This conduit may be laid in the same trench as the gravity service pipe to the unit tank. Wiring and conduits shall be installed in accordance with all applicable local codes and regulations.

Liquid level controls shall be a sealed mercury switch in an approved float ball. The switch shall be sealed for life with a heavy neoprene jacketed control cord permanently attached.

A high water activated alarm shall be supplied. An alarm light shall be mounted on the building or control panel in such a manner so that it will be visible to building occupants and from the contiguous street areas.

The electrical control panel shall consist of the following:

- Corrosion Proof Enclosure
- NEMA 3R rating
- Hinged Access Panel
- Lockable Latch
- 120V AC Control Voltage - single phase
- GFI Receptacle on dead front
- Audible Alarm
- Rated Disconnect Switch

The electrical control panel enclosure and its components shall be UL listed.

Typical wiring diagram is shown on the Standard Details.

151.09.4 Tanks and Covers

Tanks shall be constructed of polymer or reinforced fiberglass polyester resin and the minimum size shall be 30" x 60" for a simplex configuration. Interior surface to be 10-20 mil. thick gel coated to provide a smooth sealed surface. Lockable gasketed water tight covers shall be flat aluminum and capable of supporting a 300 lb. wheel load. A 1-1/2" tap shall be provided to accommodate the installation of an insect screened PVC vent pipe. The fiberglass tank shall have an integral anti-flotation flange which will anchor into a concrete collar designed to counteract uplift forces.

The wall thickness of the fiberglass tank shall be sufficient to withstand a water saturated sand load of 120 pcf with a safety factor of two (2) for all depths.

Inlet hubs shall be as shown on Detail.

All hardware shall be stainless steel and be leak proof sealed.

The cover (lid) shall be sealed with a rubber gasket and stainless steel bolts and nuts to prevent infiltration of exterior liquids. The lid shall be set at a minimum, six (6") inches above final grade.

Conduit opening shall be sealed with an approved duct seal.

Float and wire hanger bracket shall be stainless steel (Type 304).

Check valves shall be PVC ball or swing type and shall be located outside of tank together with a PVC isolation valve location in a meter pit.

All interior piping shall be Schedule 80 PVC. A PVC union on the horizontal discharge pipe shall allow for the quick removal of the grinder pump assembly.

SECTION 152

ADOPTION OF STANDARDS

The Loxahatchee River Environmental Control District Manual of Minimum Construction Standards and Technical Specifications were initially adopted and promulgated by the Governing Board in April, 1983.

The current edition, which contains revisions to specifications and details, is effective as of August, 1999.

Richard C. Dent
Executive Director
Loxahatchee River Environmental Control District

LOW PRESSURE FORCE MAIN SYSTEM INDEX

- LP-1 GRINDER PUMP RESIDENTIAL - PRIMARY LOCATION DETAIL
- LP-2 SIMPLEX RESIDENTIAL GRINDER - PUMP CONTROL PANEL DETAILS
ALTERNATE LOCATION (FREE STANDING)
- LP-3 TYPICAL WET WELL & SIMPLEX PUMP UNIT
- LP-4 ELECTRICAL CONTROL PANEL SCHEMATIC FOR SIMPLEX GRINDER PUMP
- LP-5 TYPICAL WET WELL GRAVITY CONNECTOR HUB (NOT USED)
- LP-5A ALTERNATE PIPE CONNECTION DETAIL
- LP-6 DUPLEX COMMERCIAL - GRINDER PUMP CONTROL PANEL DETAIL
- LP-7 ELECTRICAL CONTROL PANEL FOR DUPLEX GRINDER PUMP (1 PHASE)
- LP-7A ELECTRICAL CONTROL PANEL FOR DUPLEX GRINDER PUMP (3 PHASE)
- LP-7A ELECTRICAL CONTROL PANEL FOR DUPLEX GRINDER PUMP (3 PHASE)
- LP-7A ELECTRICAL CONTROL PANEL FOR DUPLEX GRINDER PUMP (3 PHASE)
- LP-8 TYPICAL COMMERCIAL WET WELL & DUPLEX PUMP UNIT
- LP-8A TYPICAL RESIDENTIAL WET WELL & DUPLEX PUMP UNIT
- LP-9 TYPICAL SINGLE SERVICE SCHEMATIC
- LP-10 TYPICAL DOUBLE SERVICE SCHEMATIC
- LP-11 TERMINAL FLUSHING PORT DETAIL
- LP-12 IN LINE FLUSHING PORT
- LP-13 AIR/VACUUM VALVE DETAIL
- LP-14 FORCE MAIN INTO SHALLOW MANHOLE
- LP-15 FORCE MAIN INTO DEEP MANHOLE
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- LP-16A TYPICAL FORCE MAIN CONNECTION VALVE DETAIL D.I.P.
- LP-17 BURIED IN LINE VALVE DETAIL
- LP-18 TYPICAL ROAD CROSSING REPAIR DETAIL
- LP-19 TRENCH DETAIL
- LP-20 GENERAL NOTES
- LP-21 LOW PRESSURE SEWER SYSTEM TESTING PROCEDURE

LP_FM_INDEX.DWG

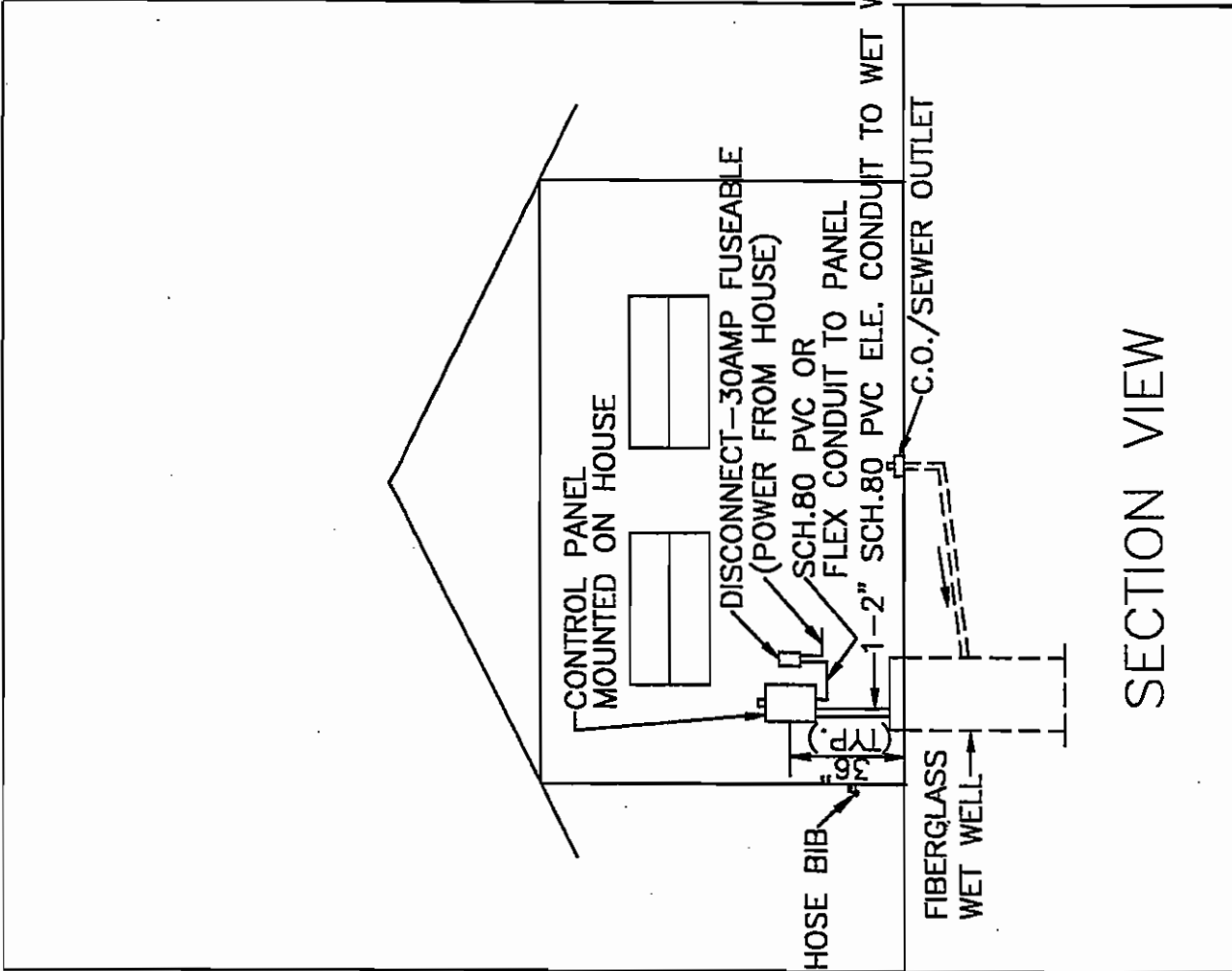
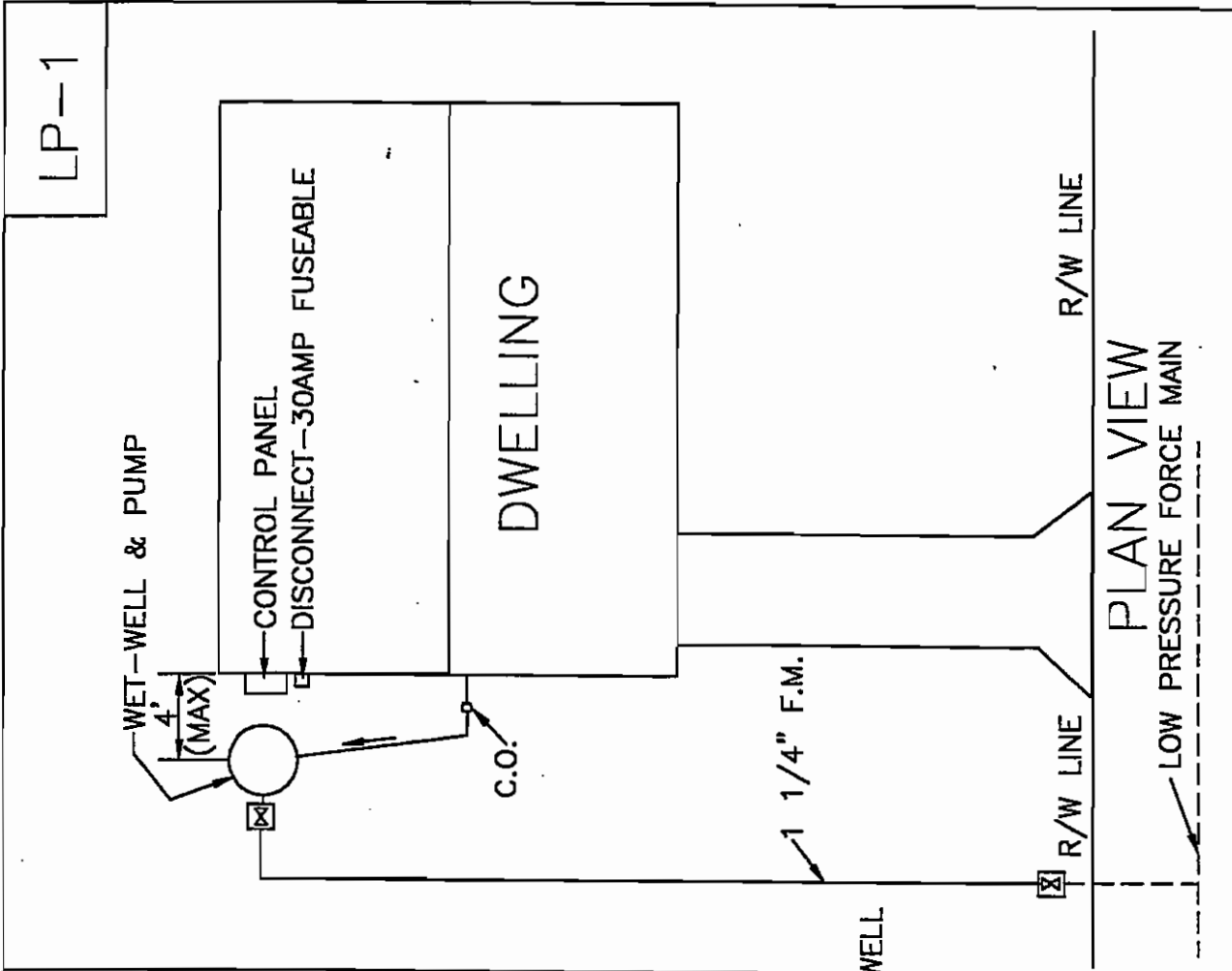
DATE 5/96

REVISION 02/06

LOXAHATCHEE RIVER DISTRICT

LOW PRESSURE F.M. DETAILS INDEX

INDEX



LP-1

PLAN VIEW
LOW PRESSURE FORCE MAIN

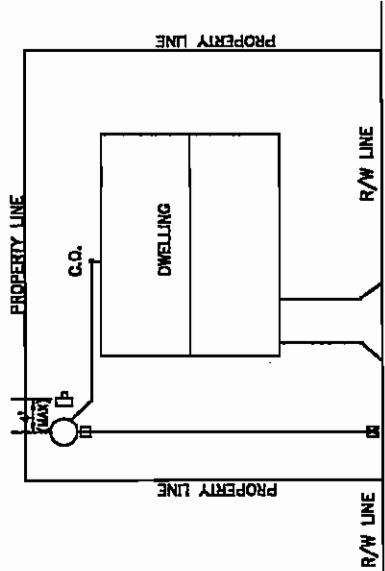
SECTION VIEW

GRINDER PUMP RESIDENTIAL-PRIMARY LOCATION DETAIL

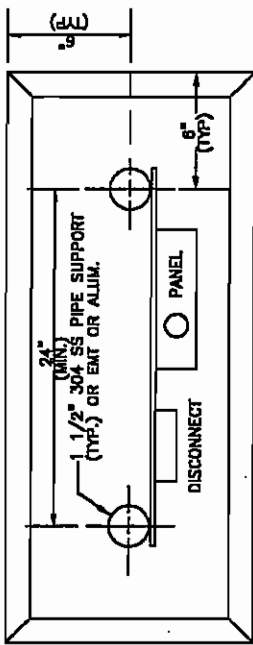
(N.T.S.)

LOW PRESSURE FORCE MAIN SYSTEM

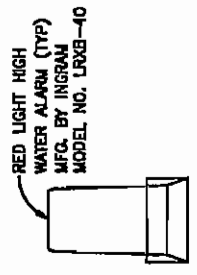
LP-2



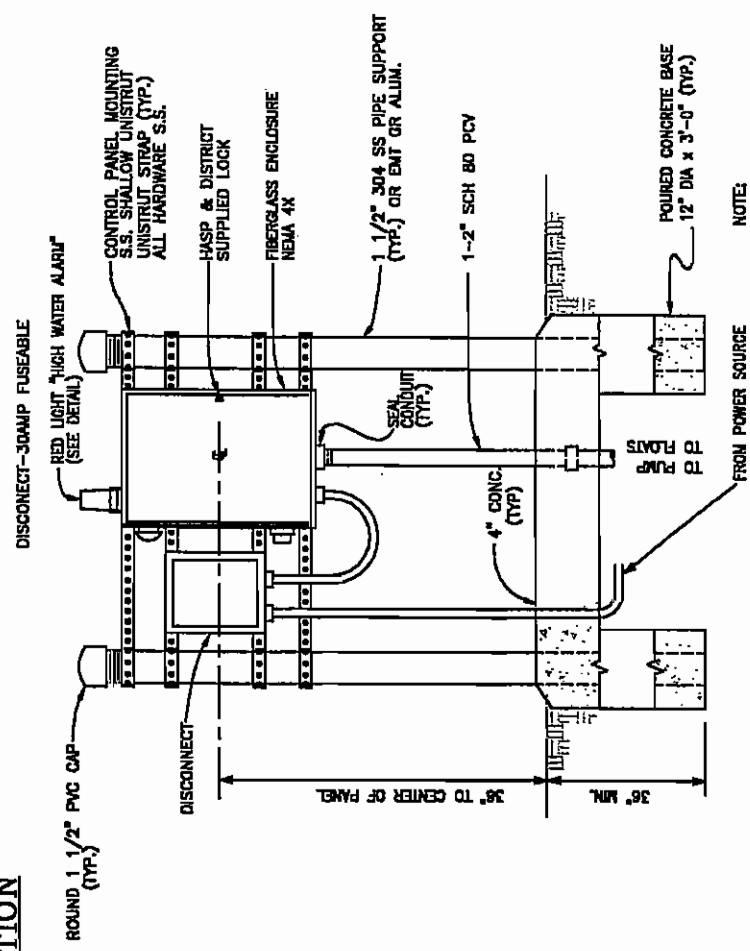
TYP. ALTERNATE LOCATION



PLAN VIEW
ELECTRICAL PANEL
& CONCRETE PAD



ALARM LIGHT DETAIL

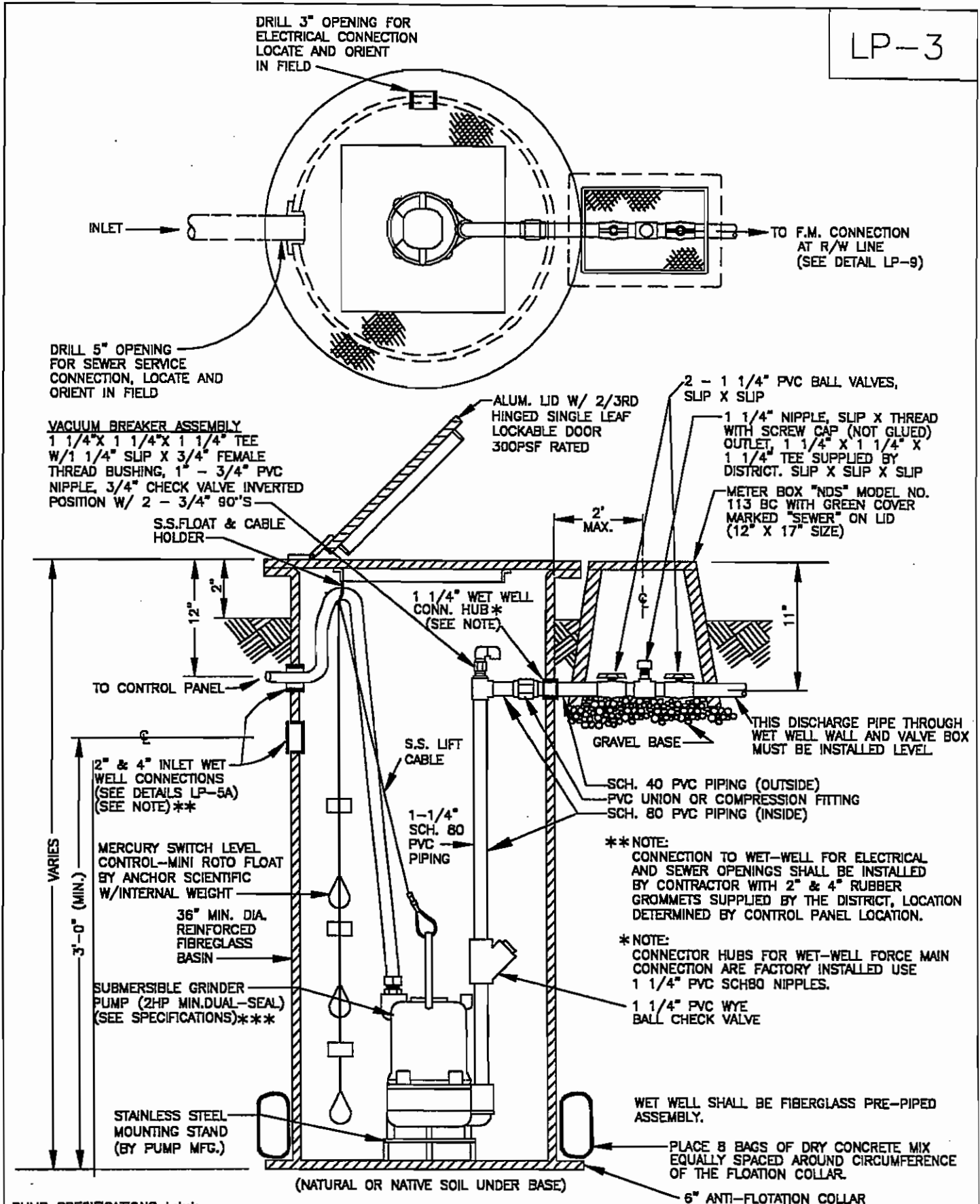


NOTE:
ALL GROUNDING TO
BE PER N.E.C. AND/
OR LOCAL CODES

FRONT ELEVATION

SIMPLEX RESIDENTIAL GRINDER - PUMP CONTROL PANEL DETAILS
ALTERNATE LOCATION (FREE STANDING)
(N.T.S.)

LOW PRESSURE FORCE MAIN SYSTEM

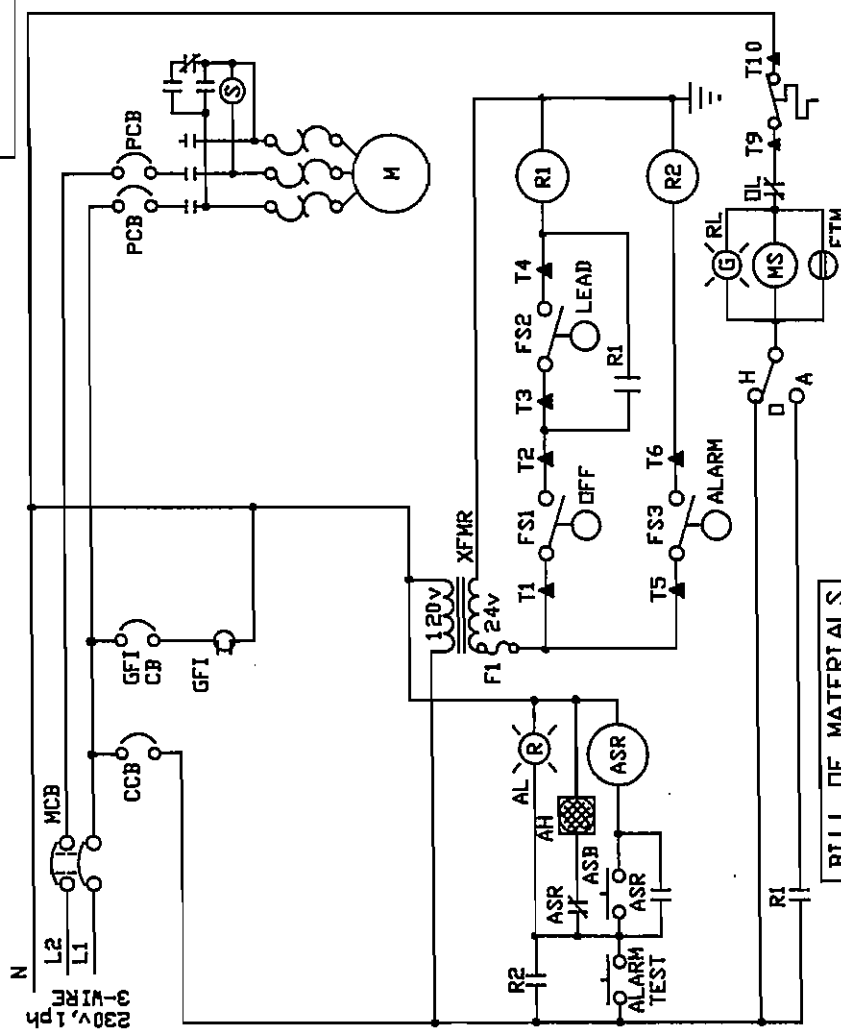


PUMP SPECIFICATIONS:***
 BARNES-GRINDER PUMP #SGV2022L, 2HP, 230V, 1PH, 60HZ, 5.13" IMPELLER
 HYDROMATIC-GRINDER PUMP #HPG200M2, 2HP, 230V, 1PH, 60HZ, 5" IMPELLER

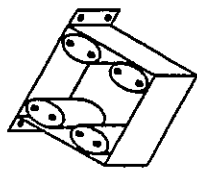
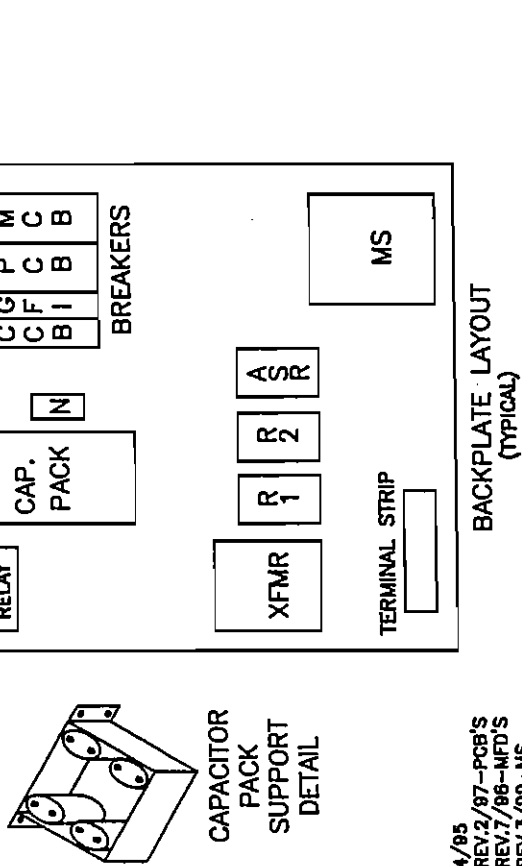
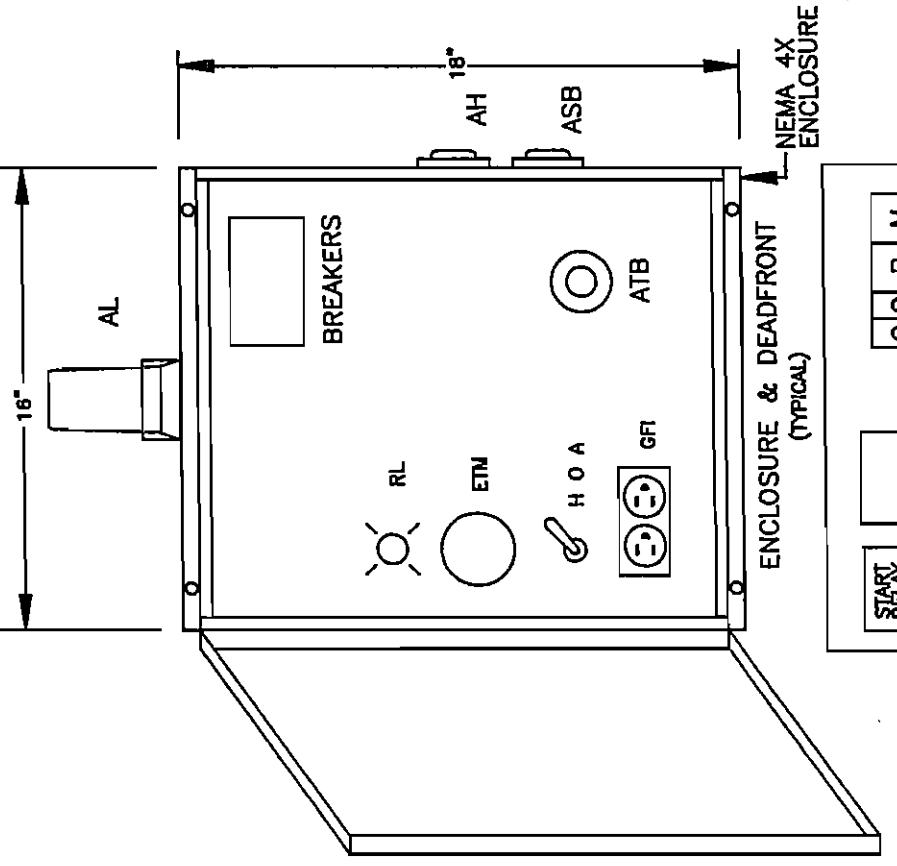
LOW PRESSURE FORCE MAIN SYSTEM

(N.T.S.)
 TYPICAL WET WELL &
 SIMPLEX PUMP UNIT

LP-4



- BILL OF MATERIALS**
- ENC FIBERGLASS ENCLOSURE STAHLIN #RJ-1816HPL
 - MCB MAIN CIRCUIT BREAKER SQ-D, QDU225
 - CCB CONTROL CIRCUIT BREAKER SQ-D, QDU110
 - PCB CONTROL CIRCUIT BREAKER SQ-D, QDU220
 - GFICB GFI CIRCUIT BREAKER SQ-D, QDU115
 - MS STARTER SQ-D, 8536 NEMA SIZE 1'
 - DL HEATER SQ-D, B25, FBI3.9
 - XFMR TRANSFORMER ENM, T50B2
 - ETM ELAPSED TIME METER CARLING, 2FC53-73
 - HOA HAND OFF AUTO SWITCH DIALCD, 95-5710-09-301
 - RL RUN LIGHT INGRAM, LRXB-40
 - AL ALARM LIGHT PIEZO, MW-09-201-V
 - AH ALARM HORN AA ELEC. AAEKU14AL (BLADE TYPE)
 - ASR ALARM SILENCE RELAY AA ELEC. AAE-D12
 - R1,2 CONTROL RELAY TELEMECANIQUE, XB3-BAE1
 - ASB ALARM SILENCE BUTTON TELEMECANIQUE, XB3-BAE1
 - ATB ALARM TEST BUTTON LEVITON, 6599-1
 - GFI CONVENIENCE RECEPTACLE DIALCD, 95-5710-09-301
 - IL INDICATING LIGHT BUSS, MDL-3
 - F1 FUSE RUN CAP, AERDVOX
 - CAP. PACK START CAP, AERDVOX
 - TO MATCH START RELAY, STEVECO
 - GRINDER PUMP'S
- TERMINAL STRIP**
- | | | | | | |
|-----|-----------|----------|---------|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| FS3 | FS2 ALARM | FS1 LEAD | FS1 OFF | | |
- DR APPROVED EQUAL PANEL & COMPONENTS SHALL CONFORM TO INDUSTRIAL UL LISTING PRE SEC. 508 N. E. C.

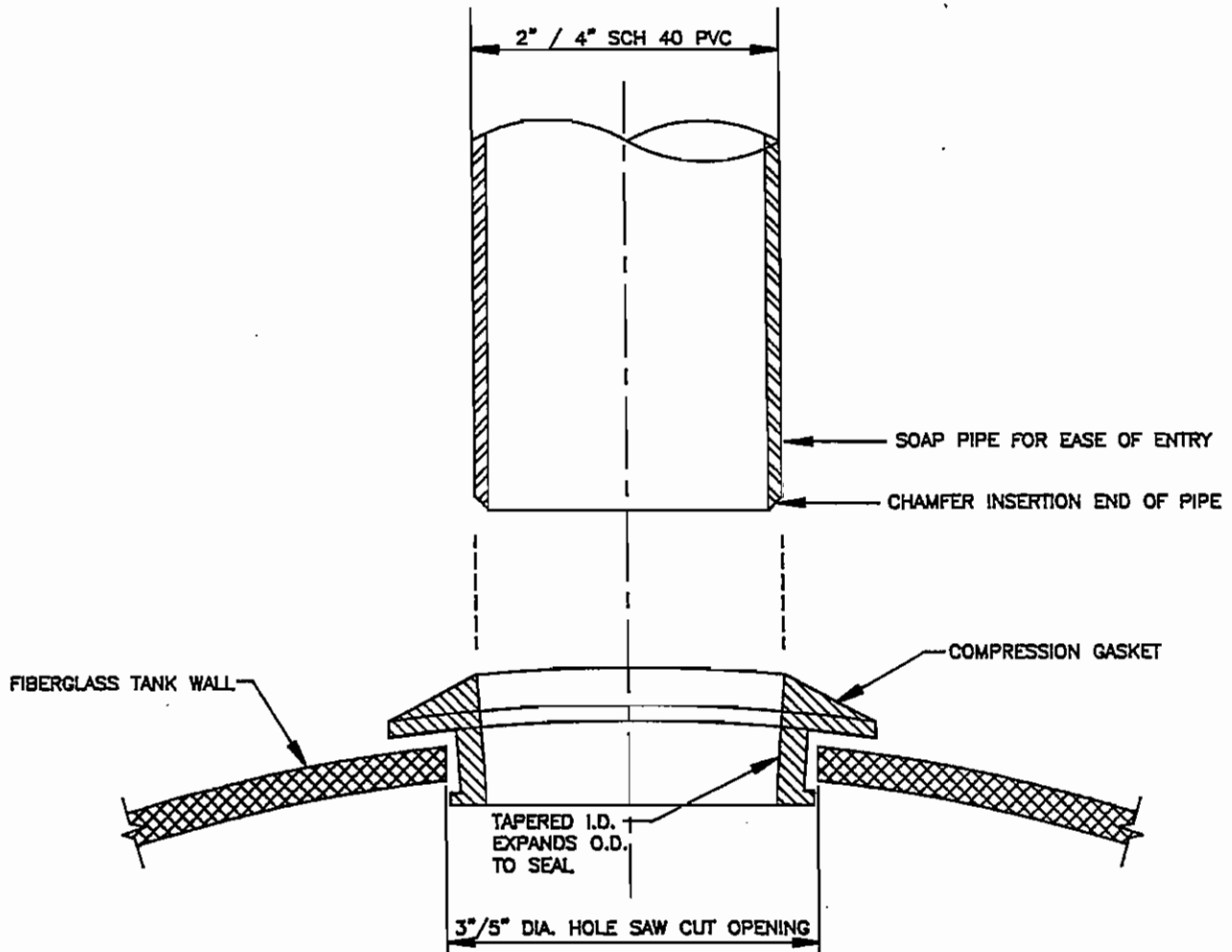


CAPACITOR PACK SUPPORT DETAIL

4/95
REV.2/87-PCB'S
REV.7/86-MFD'S
REV.3/89-MS

LOW PRESSURE FORCE MAIN SYSTEM

LPSIMELE



NOTE:

FOR A 4" PVC PIPE, USE A 5" DIA. HOLE SAW TO CUT OUT COUPON FROM WET WELL WALL. THE DISTRICT WILL SUPPLY THE PROPER COMPRESSION GASKET FOR A 4" DIA. PVC PIPE

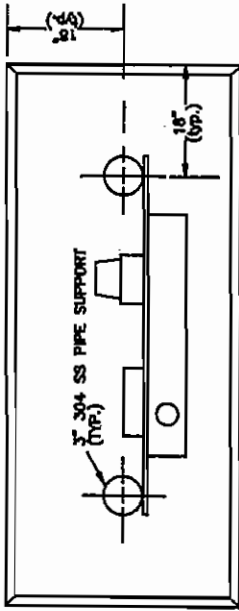
FOR A 2" PVC PIPE, USE A 3" DIA. HOLE SAW TO CUT OUT COUPON FROM WET WELL WALL. THE DISTRICT WILL SUPPLY THE PROPER COMPRESSION GASKET FOR A 2" DIA. PVC PIPE

SIMPLEX PUMP UNIT
ALTERNATE PIPE CONNECTION DETAIL

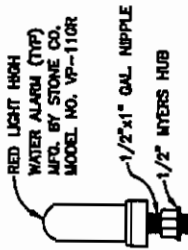
(N.T.S.)

LOW PRESSURE FORCE MAIN SYSTEM

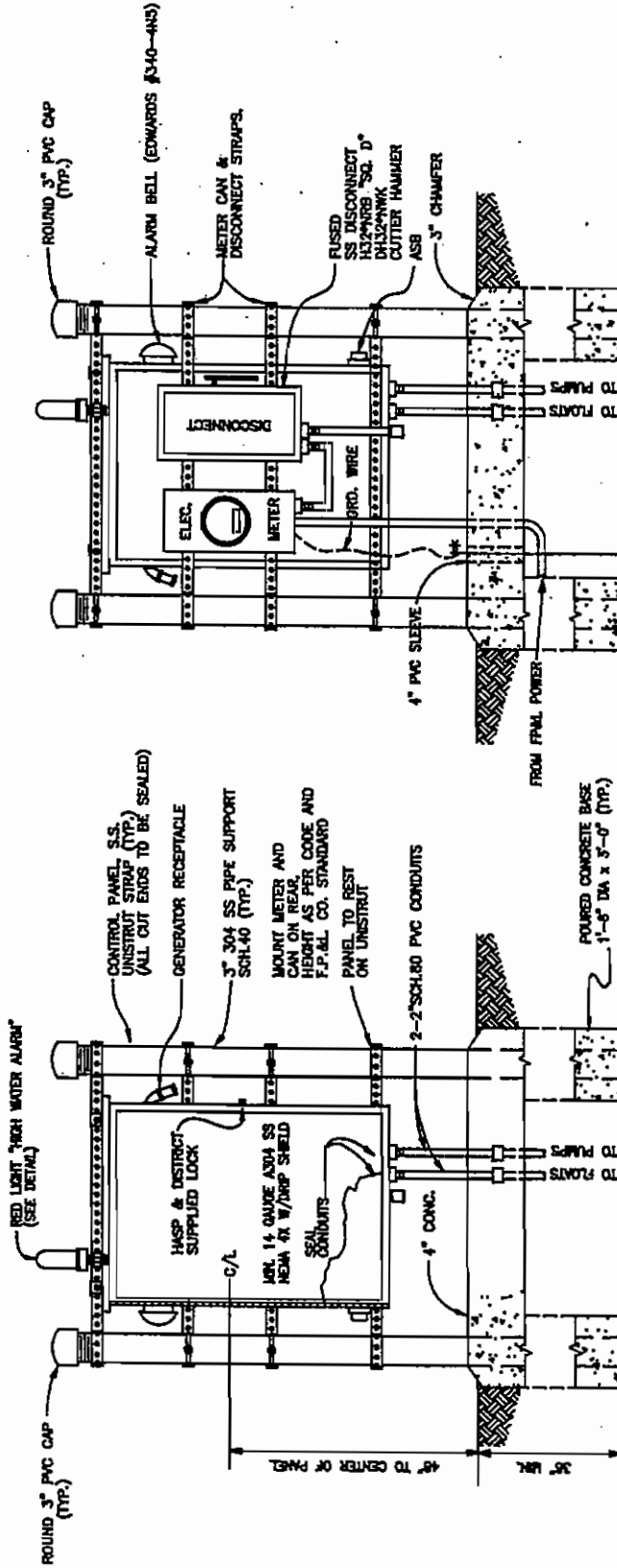
LP-6



PLAN VIEW
ELECTRICAL PANEL
& CONCRETE PAD



ALARM LIGHT DETAIL



FRONT ELEVATION

* CLAMPED CONN. ON GROUND ROD, TO BE 4" ABOVE SLAB.
AT NO TIME IS GROUND WIRE TO PENETRATE CONCRETE SLAB.

REAR ELEVATION

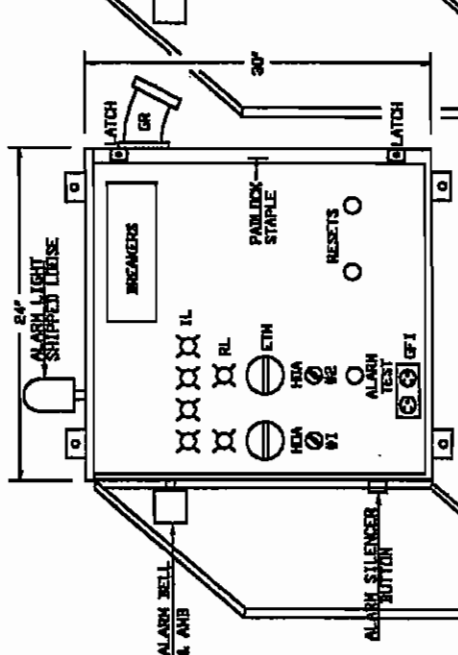
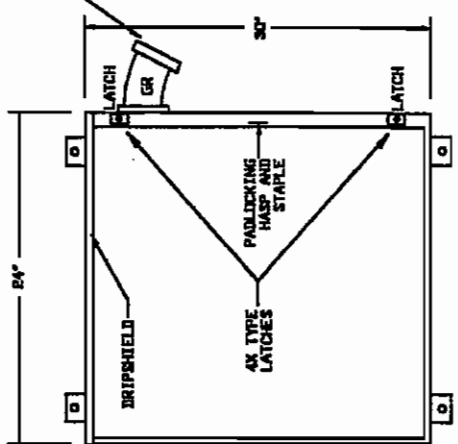
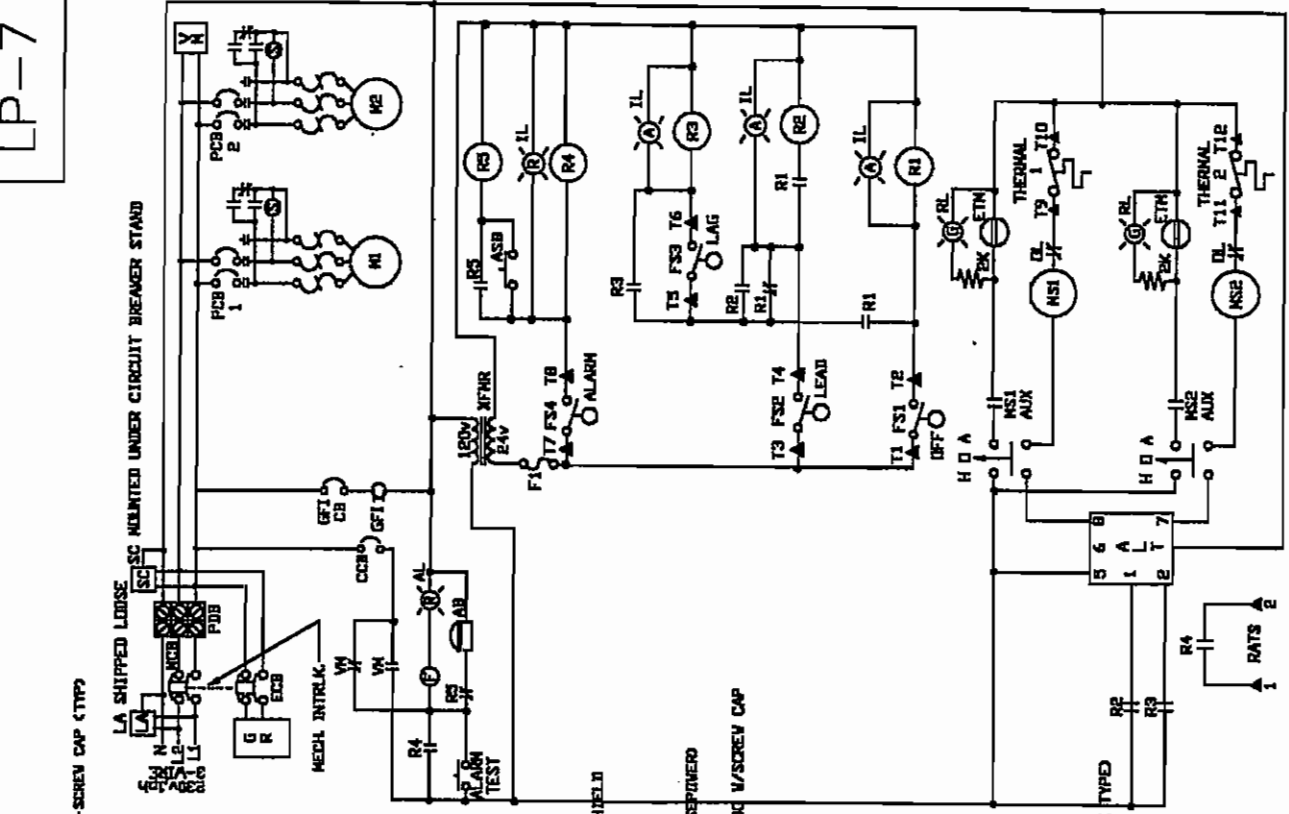
5/8"x10" GROUND ROD
TOP END TO BE 6" ABOVE SLAB.
POSITIONED THROUGH 4" PVC SLEEVE IN CONCRETE.

DUPLEX COMMERCIAL - GRINDER PUMP CONTROL PANEL DETAILS

(N.T.S.)

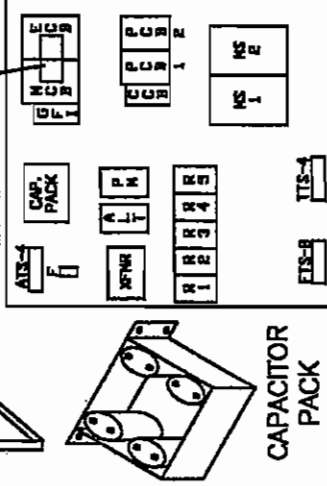
LOW PRESSURE FORCE MAIN SYSTEM

LP-7



304 STAINLESS STEEL NEMA 4X TYPE ENCLOSURE
BILL OF MATERIALS

- 304 STAINLESS STEEL ENCLOSURE
- MAIN CIRCUIT BREAKER
- EMERGENCY CIRCUIT BREAKER
- PUMP CIRCUIT BREAKER
- CONTROL CIRCUIT BREAKER
- GFI CIRCUIT BREAKER
- STARTER
- HEATER
- TRANSFORMER
- GENERATOR MONITOR
- VOLTAGE MONITOR
- ALARM TEST PUSH BUTTON
- ALARM BELL
- ALARM MOUNTING BOX
- FLASHER
- RUN LIGHT
- INDICATING LIGHT
- AMBER LENS
- RED LENS
- HAND OFF AUTO SWITCH
- ELAPSED TIME METER
- ALTERNATOR
- CONTROL RELAY
- FUSE
- CONVENIENCE RECEPTACLES
- LIGHTNING ARRESTOR
- SURGE CAPACITOR
- CAP. PACK
- RUN CAP.
- START RELAY
- TO MATCH GRINDER PUMP'S
- ALARM SILENCE RELAY
- OR APPROVED EQUAL



BACKPLATE LAYOUT TYPICAL

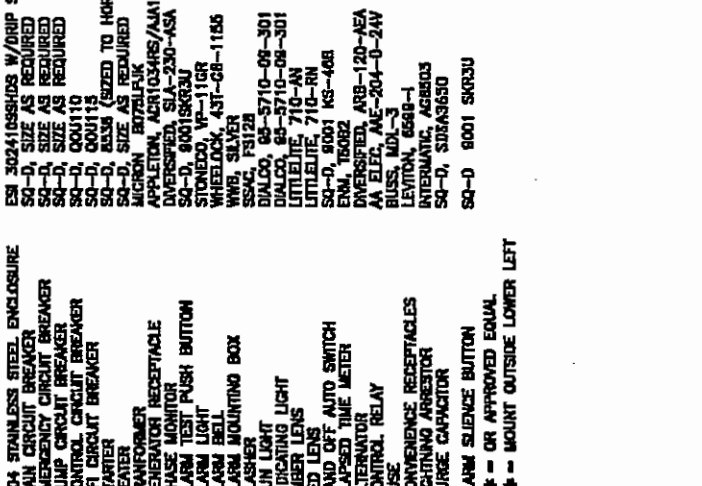
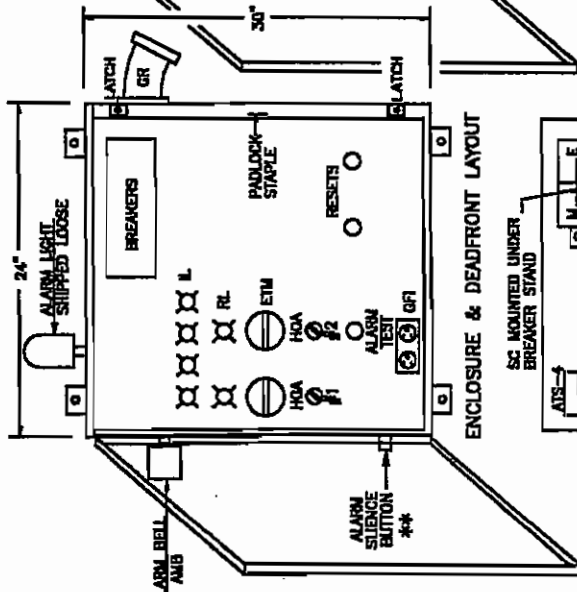
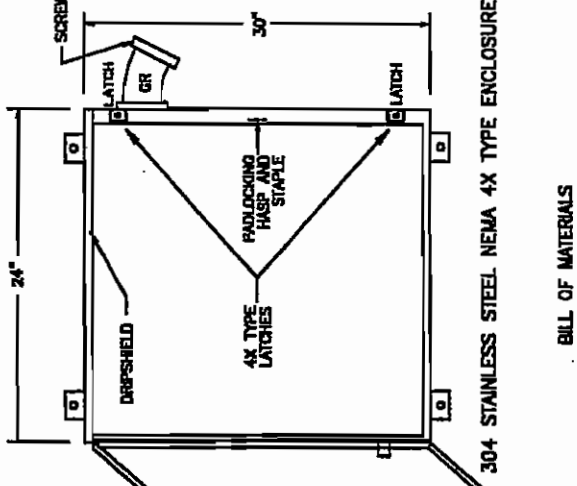
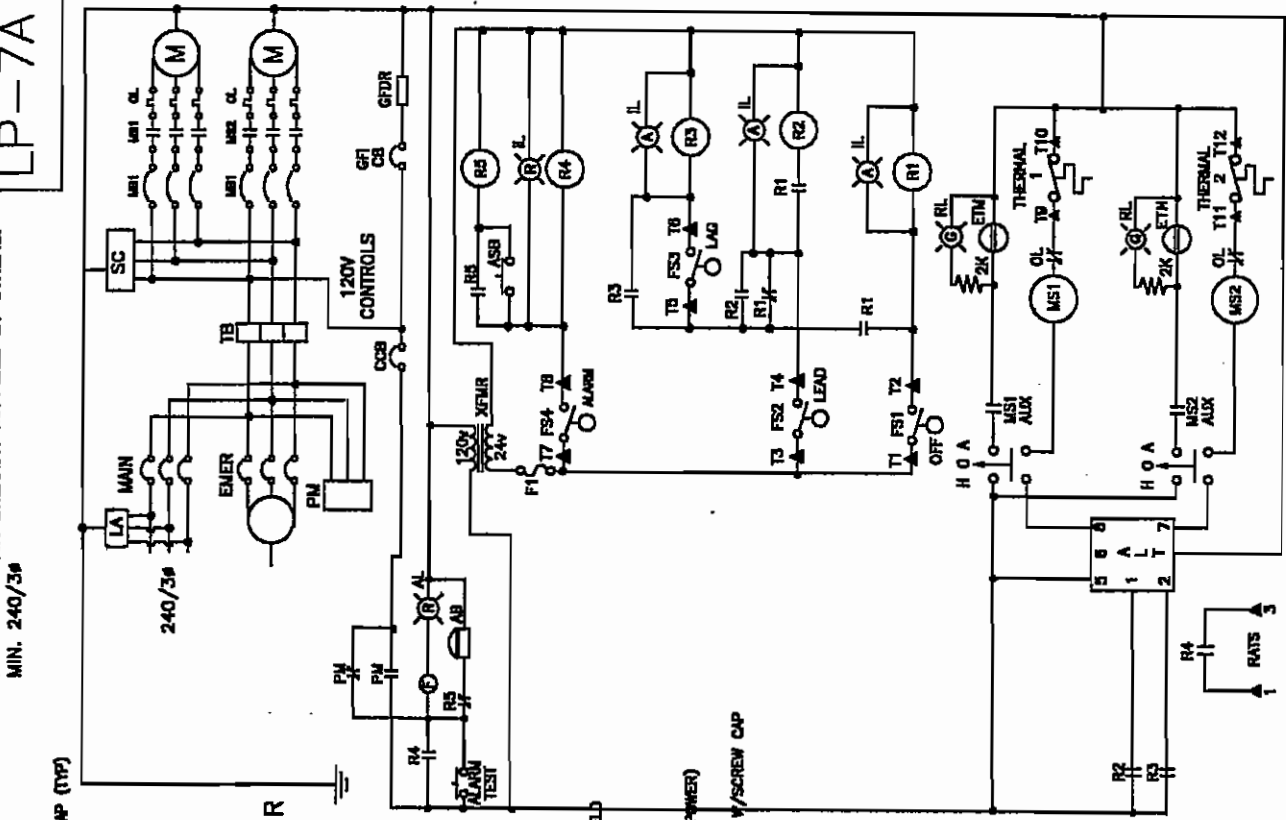
ELECTRICAL CONTROL PANEL SCHEMATIC FOR DUPLEX GRINDER PUMP 1PHASE
LOW PRESSURE FORCE MAIN SYSTEM

LPDUPELETPH

6/85 REV. 7/88-MFD'S, 3/99-MS1&2, 5/00-CHG. LA, 11/02-CHG. AB

LP-7A

NOTE: POWER TO MAIN BREAKER SUPPLIED BY OTHERS.
MIN. 240/3φ



BILL OF MATERIALS

- 304 STAINLESS STEEL ENCLOSURE
- MAIN CIRCUIT BREAKER
- EMERGENCY CIRCUIT BREAKER
- PUMP CIRCUIT BREAKER
- CONTROL CIRCUIT BREAKER
- OFI CIRCUIT BREAKER
- STARTER
- HEATER
- TRANSFORMER
- GENERATOR RECEPTACLE
- PHASE MONITOR
- ALARM TEST PUSH BUTTON
- ALARM LIGHT
- ALARM BELL
- ALARM MOUNTING BOX
- FLASHER
- SSAC, FS128
- RUN LIGHT
- INDICATING LIGHT
- AMBER LENS
- RED LENS
- LITTLELITE, 710-RN
- SC-D, 8001 KS-408
- ENAL, T6082
- DIVERSIFIED, ARB-120-NEA
- AA ELEC, AE-204-0-24V
- BLISS, MDL-3
- LEVITON, 6669-1
- INTERMATIC, ACR603
- SC-D, SDRAS1650
- ALARM SILENCE BUTTON
- ** OR APPROVED EQUAL
- ** MOUNT OUTSIDE LOWER LEFT

BILL OF MATERIALS

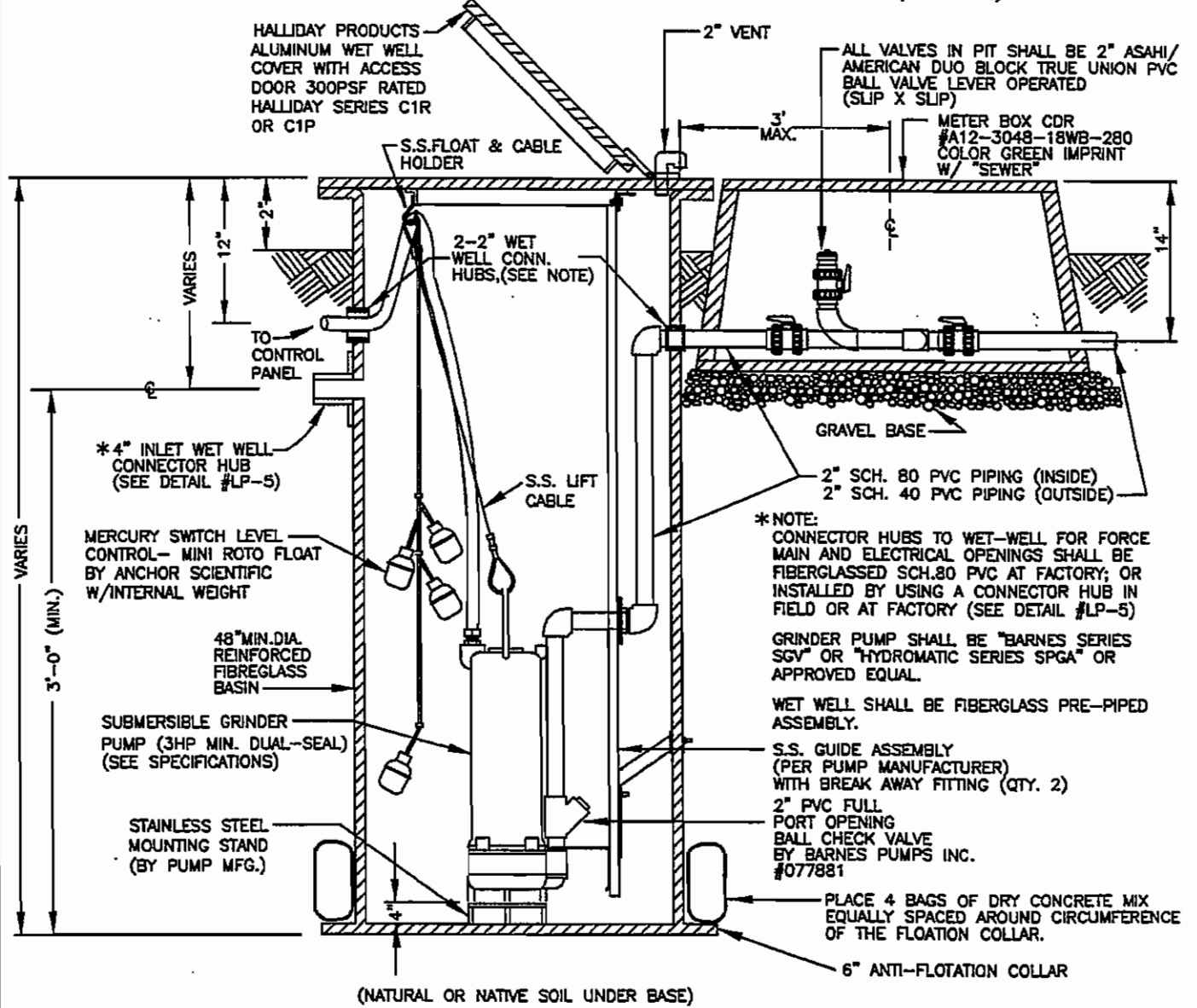
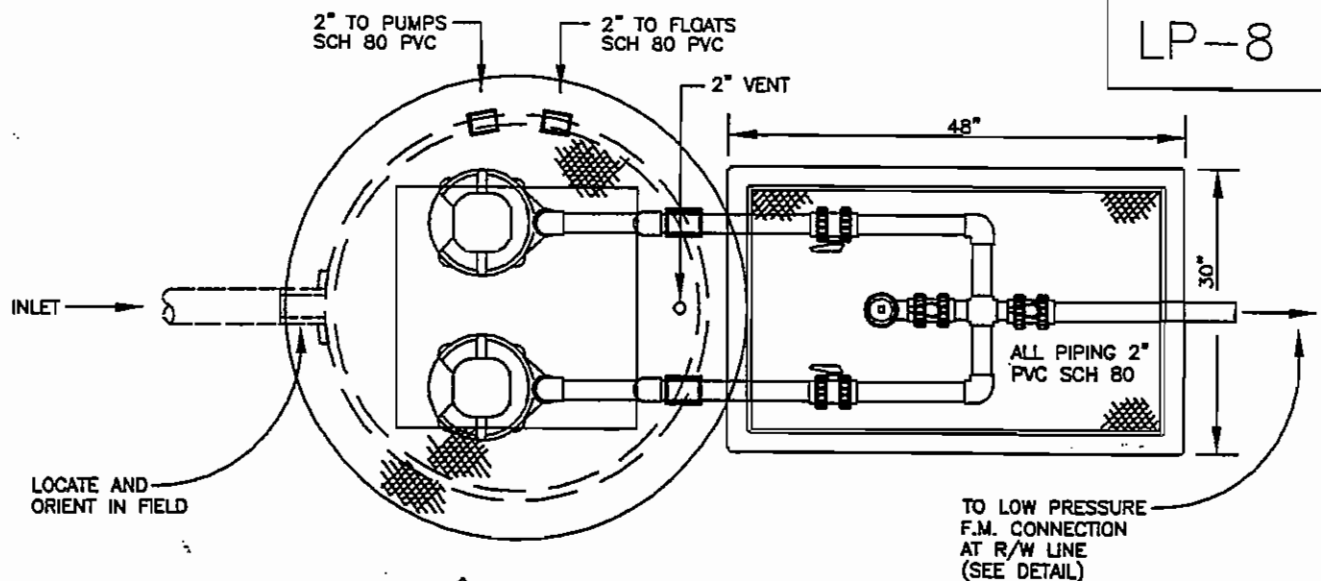
- ESC 3024105SHDS W/DRIP SHIELD
- SC-D, SIZE AS REQUIRED
- SC-D, SIZE AS REQUIRED
- SC-D, SIZE AS REQUIRED
- SC-D, 00U110
- SC-D, 00U115
- SC-D, 8338 (SIZED TO HORSEPOWER)
- MICRON BT72LFJK
- APPLETON, ACR1034RS/AJ100 W/SCREW CAP
- DIVERSIFIED, SLA-230-ASA
- SC-D, 8001SKR3U
- STONECO, VP-11GR
- WHEELLOCK, A3T-CR-1155
- WWS, SILVER
- SSAC, FS128
- DIALCO, 66-5710-08-301
- DIALCO, 66-5710-08-301
- LITTLELITE, 710-RN
- SC-D, 8001 KS-408
- ENAL, T6082
- DIVERSIFIED, ARB-120-NEA
- AA ELEC, AE-204-0-24V
- BLISS, MDL-3
- LEVITON, 6669-1
- INTERMATIC, ACR603
- SC-D, SDRAS1650
- SC-D 8001 SKR3U

ELECTRICAL CONTROL PANEL SCHEMATIC FOR DUPLEX GRINDER PUMP 3 PHASE
LOW PRESSURE/GRAVITY SYSTEMS

LPDUPELE3PH

4/02, REV. 6-02, REV.11/02-CHG. AB

LP-8

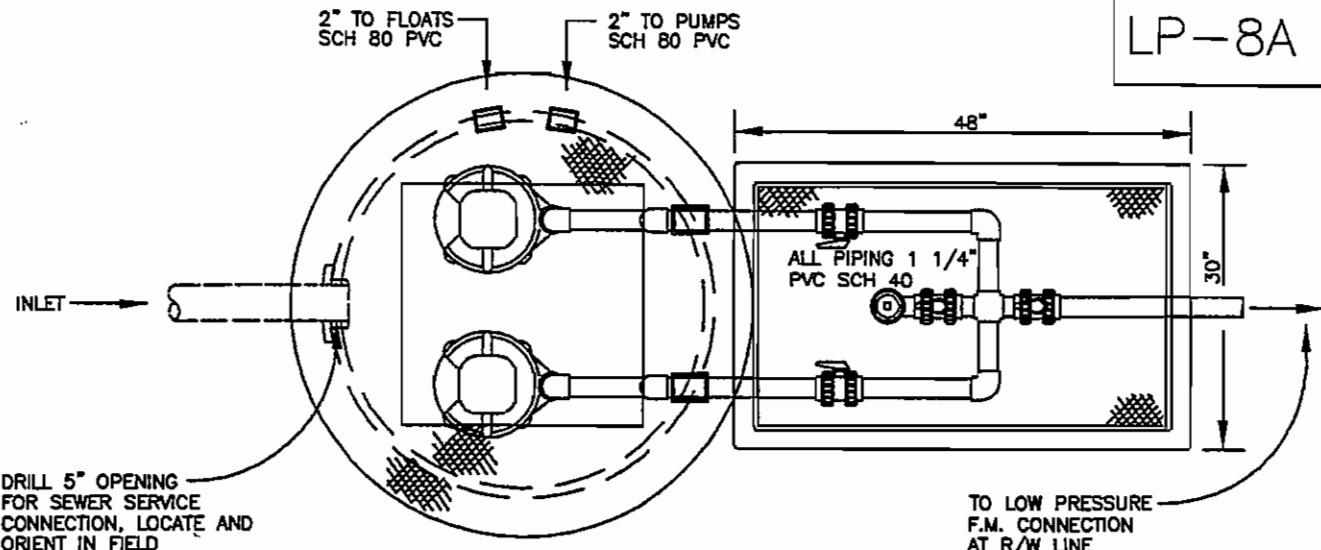


LOW PRESSURE FORCE MAIN SYSTEM

(N.T.S.)
TYPICAL WET WELL &

COMMERCIAL DUPLEX PUMP UNIT

LP-8A

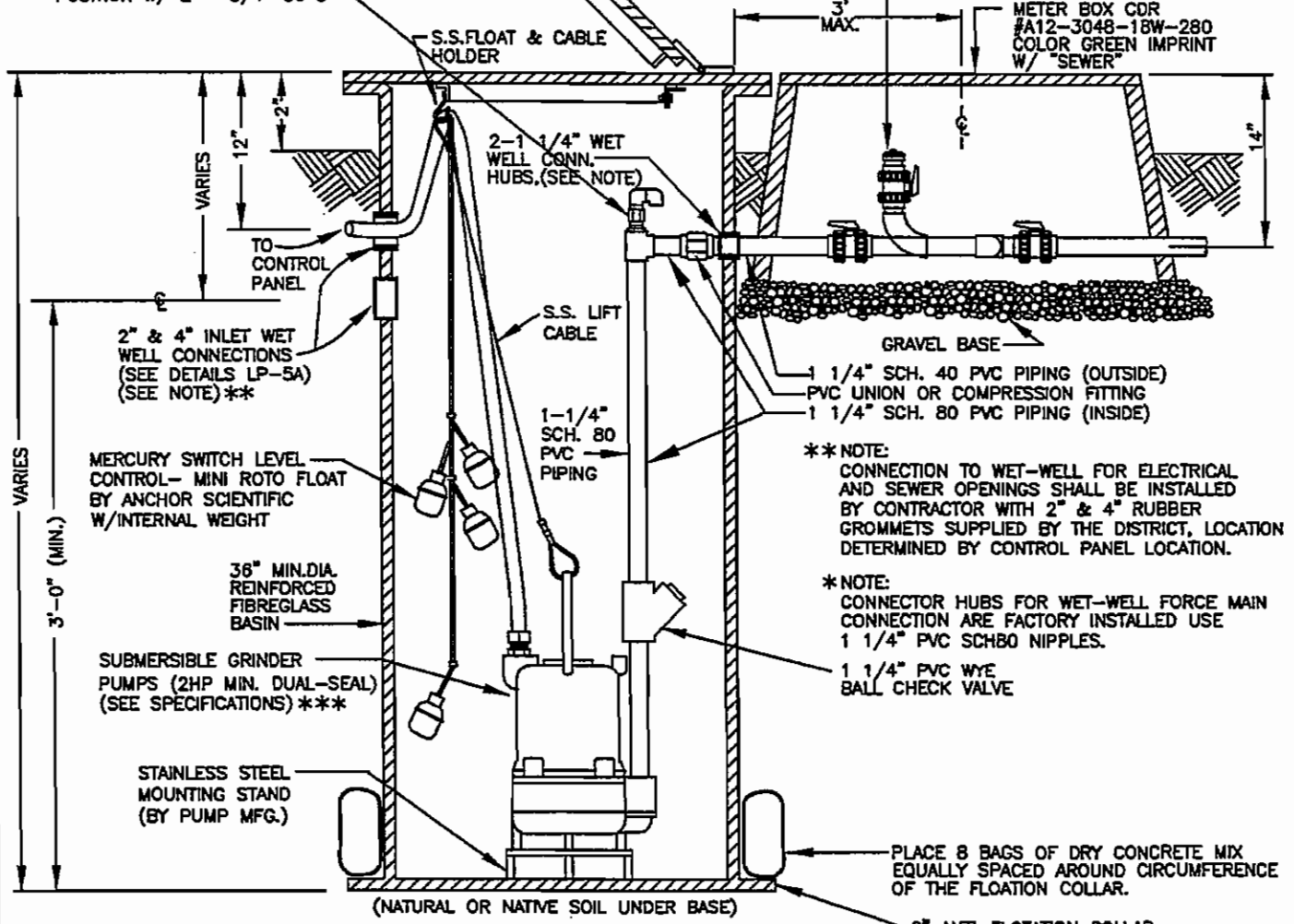


VACUUM BREAKER ASSEMBLY
 1 1/4" X 1 1/4" X 1 1/4" TEE
 W/1 1/4" SLIP X 3/4" FEMALE
 THREAD BUSHING, 1" - 3/4" PVC
 NIPPLE, 3/4" CHECK VALVE INVERTED
 POSITION W/ 2 - 3/4" 90'S

HALLIDAY PRODUCTS
 ALUMINUM WET WELL
 COVER WITH ACCESS
 DOOR 300PSF RATED
 HALLIDAY SERIES C1R
 OR C1P

ALL VALVES IN PIT SHALL BE 1 1/4" ASAHI/AMERICAN DUO BLOCK TRUE UNION PVC BALL VALVE LEVER OPERATED (SLIP X SLIP)

METER BOX CDR #A12-3048-18W-280 COLOR GREEN IMPRINT W/ "SEWER"



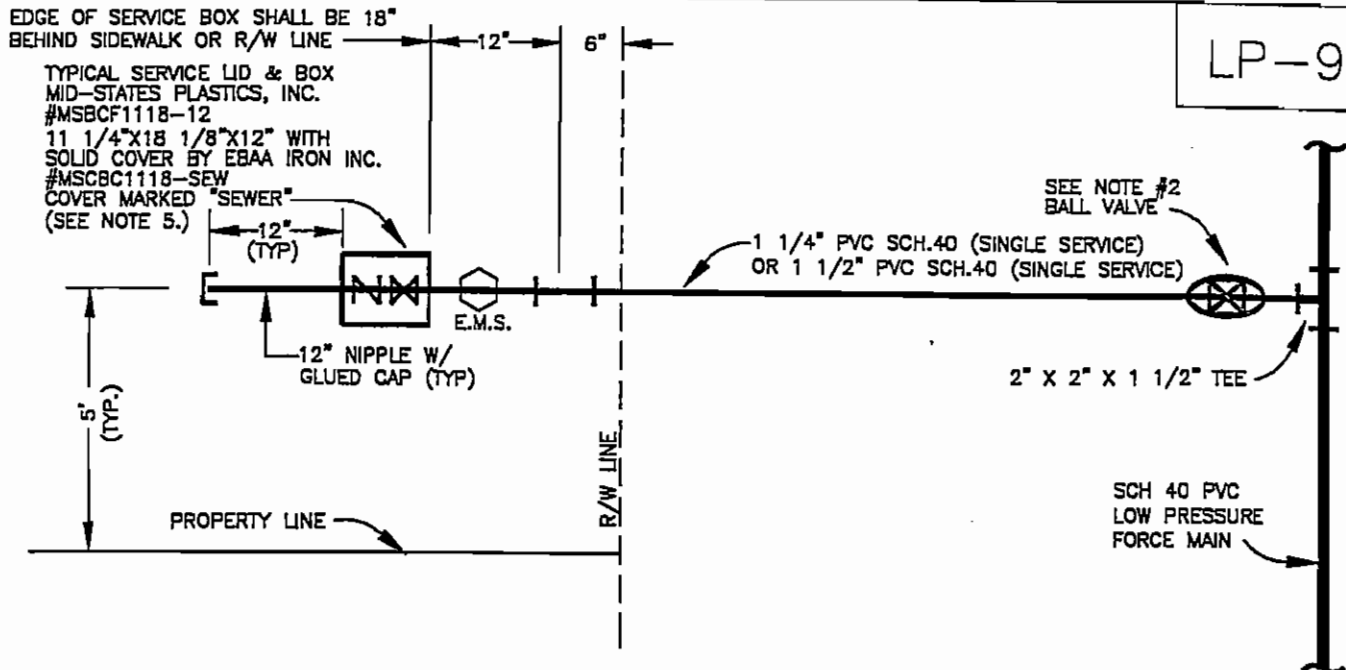
** NOTE:
 CONNECTION TO WET-WELL FOR ELECTRICAL AND SEWER OPENINGS SHALL BE INSTALLED BY CONTRACTOR WITH 2" & 4" RUBBER GROMMETS SUPPLIED BY THE DISTRICT, LOCATION DETERMINED BY CONTROL PANEL LOCATION.

* NOTE:
 CONNECTOR HUBS FOR WET-WELL FORCE MAIN CONNECTION ARE FACTORY INSTALLED USE 1 1/4" PVC SCH80 NIPPLES.

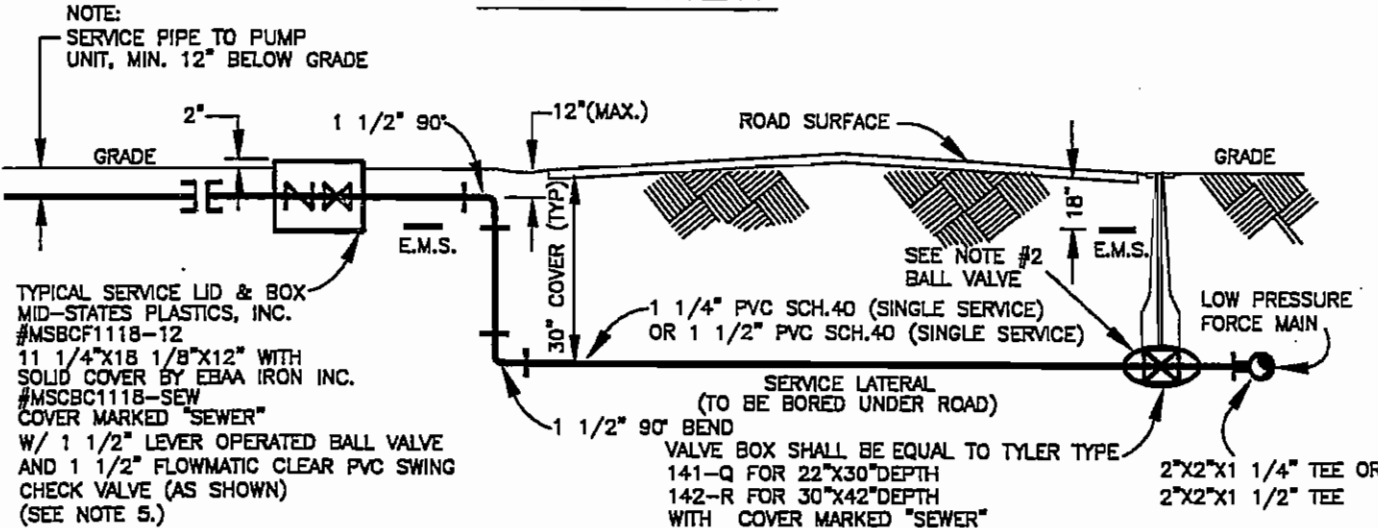
***PUMP SPECIFICATIONS:
 BARNES-GRINDER PUMPS #SGV2022L, 2HP, 230V, 1PH, 60HZ, 5.13" IMPELLER
 HYDRMATIC-GRINDER PUMP #HPG200M2, 2HP, 230V, 1PH, 60HZ, 5" IMPELLER

LOW PRESSURE FORCE MAIN SYSTEM

(N.T.S.)
 TYPICAL WET WELL &
 RESIDENTIAL DUPLEX PUMP UNIT



PLAN VIEW



TYPICAL ROAD CROSSING SECTION VIEW

- NOTES: (N.T.S.)
1. ACTUAL LOCATIONS OF SERVICES SHALL BE DETERMINED IN FIELD BY RESIDENT ENGINEER DEPENDING UPON EXISTING CONDITIONS & LOCATION OF EXISTING SEPTIC TANK.
 2. IN R.O.W. ALL BALL VALVES SHALL BE FORD BRASS BALL VALVE CURB STOP #B11555 FOR 1 1/4" WITH BOX, OR FORD BRASS BALL VALVE CURB STOP #B11666 FOR 1 1/2" WITH BOX, BOTH W/ FORD QT67 OPERATING NUT, USE BRASS NIPPLES EACH SIDE OF BRASS BALL VALVES.
 3. SEE PLAN SHEET FOR LOCATION OF SERVICES.
 4. A #57 ROCK BEDDING SHALL BE PLACED BELOW VALVE BOXES.
 5. SERVICE VALVES AT OR BEHIND R.O.W. WILL BE "LEGEND VALVE" SCH 40 1 1/2" PVC BALL VALVE, SLIP X SLIP LEVER OPERATED OR APPROVED EQUAL, CHECK VALVE USE 1 1/2" FLOWMATIC CLEAR PVC SWING CHECK VALVE, SLIP X SLIP

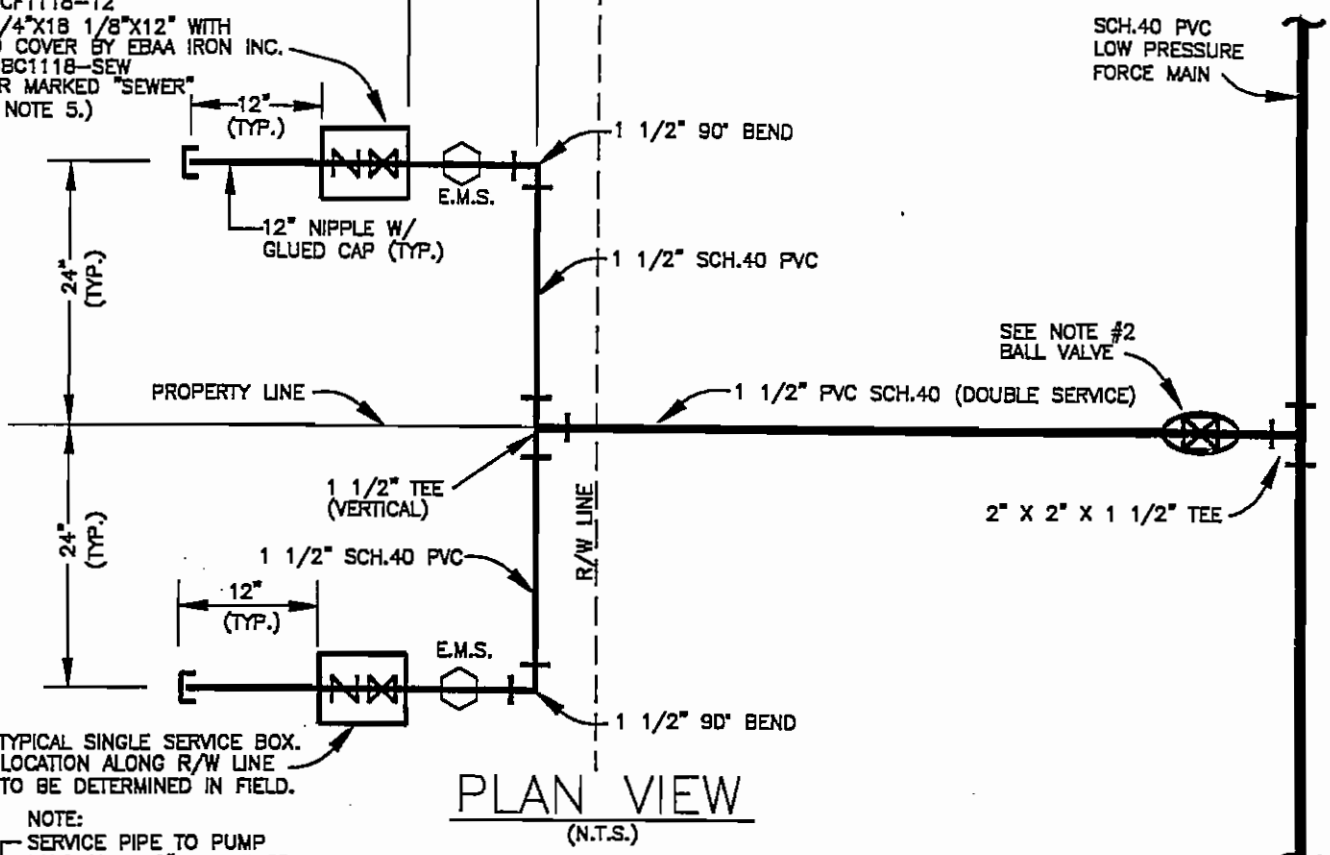
TYPICAL SINGLE SERVICE SCHEMATIC

(N.T.S.)

LP-10

EDGE OF SERVICE BOX (SINGLE OR DOUBLE)
SHALL BE 18" BEHIND SIDEWALK
OR R/W LINE

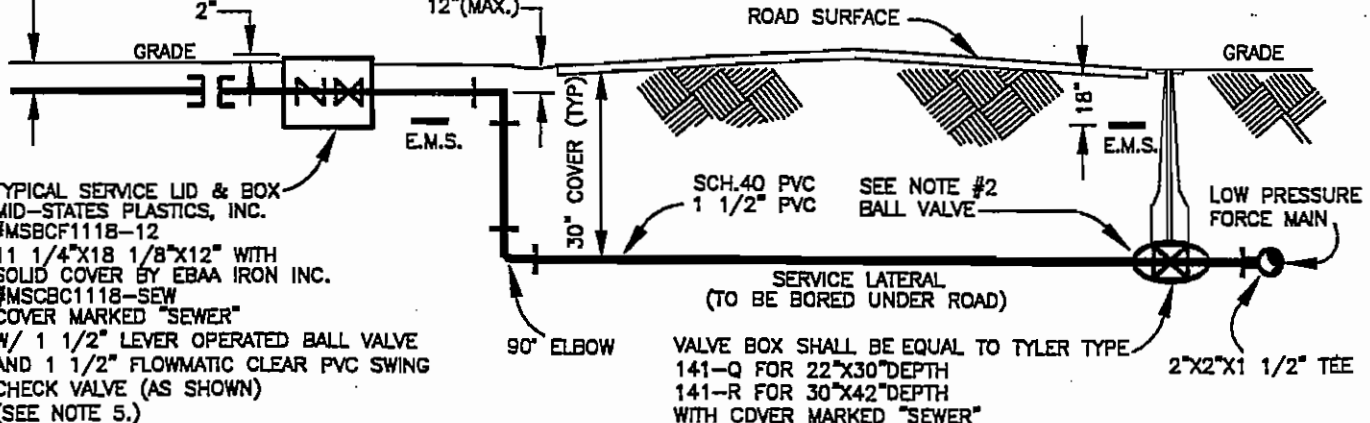
TYPICAL SERVICE LID & BOX
MID-STATES PLASTICS, INC.
#MSBCF1118-12
11 1/4"x18 1/8"x12" WITH
SOLID COVER BY EBAA IRON INC.
#MSCBC1118-SEW
COVER MARKED "SEWER"
(SEE NOTE 5.)



TYPICAL SINGLE SERVICE BOX.
LOCATION ALONG R/W LINE
TO BE DETERMINED IN FIELD.

PLAN VIEW
(N.T.S.)

NOTE:
SERVICE PIPE TO PUMP
UNIT, MIN. 12" BELOW GRADE



TYPICAL SERVICE LID & BOX
MID-STATES PLASTICS, INC.
#MSBCF1118-12
11 1/4"x18 1/8"x12" WITH
SOLID COVER BY EBAA IRON INC.
#MSCBC1118-SEW
COVER MARKED "SEWER"
W/ 1 1/2" LEVER OPERATED BALL VALVE
AND 1 1/2" FLOWMATIC CLEAR PVC SWING
CHECK VALVE (AS SHOWN)
(SEE NOTE 5.)

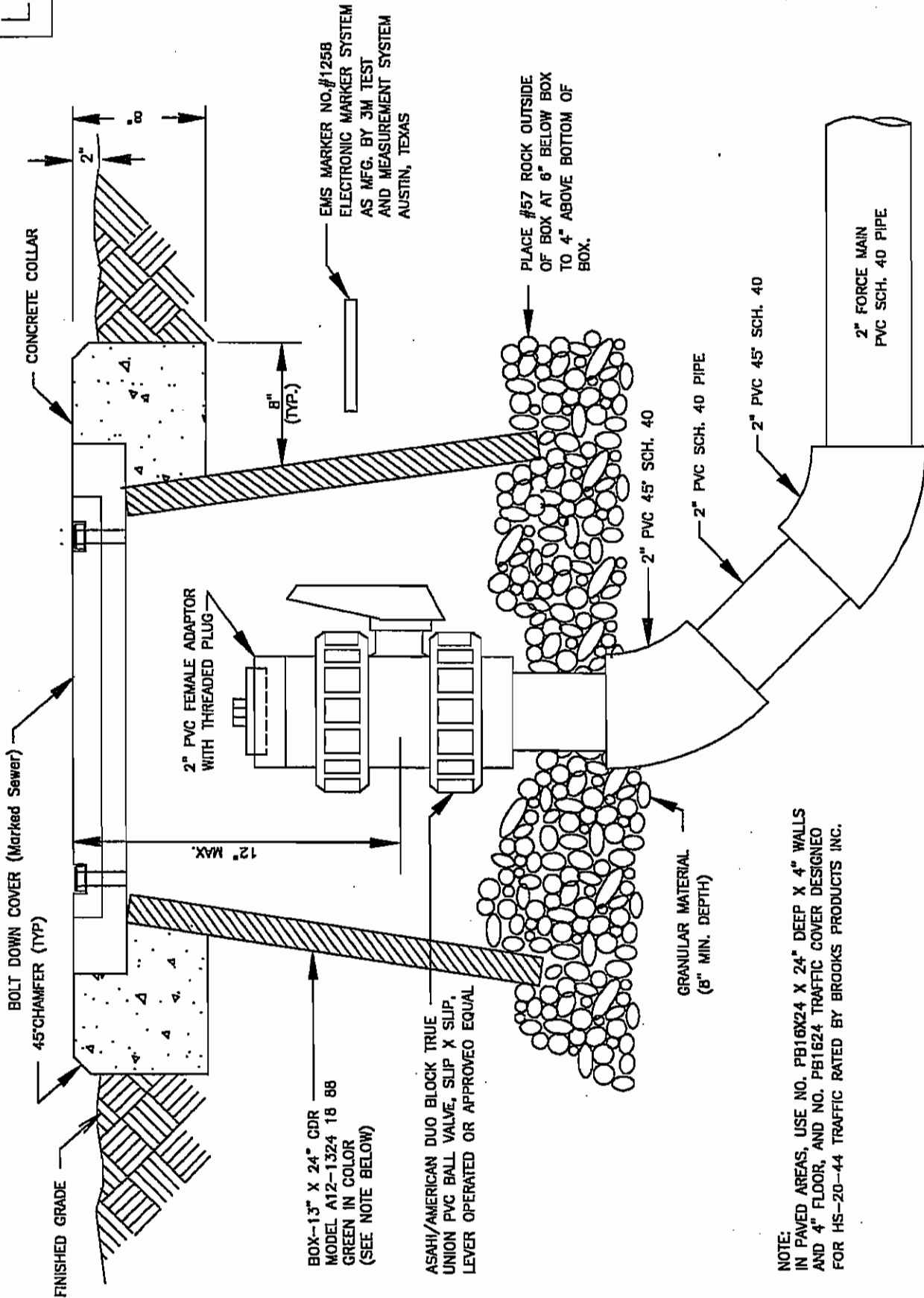
VALVE BOX SHALL BE EQUAL TO TYLER TYPE
141-Q FOR 22"x30" DEPTH
141-R FOR 30"x42" DEPTH
WITH COVER MARKED "SEWER"

TYPICAL ROAD CROSSING SECTION VIEW
(N.T.S.)

NOTES:

1. ACTUAL LOCATIONS OF SERVICES SHALL BE DETERMINED IN FIELD BY RESIDENT ENGINEER DEPENDING UPON EXISTING CONDITIONS & LOCATION OF EXISTING SEPTIC TANK.
2. IN R.O.W. ALL BALL VALVES SHALL BE FORD BRASS BALL VALVE CURB STOP B 11666 FOR 1 1/2" WITH BOX.
3. SEE PLAN SHEET FOR LOCATION OF SERVICES.
4. A #57 ROCK BEDDING SHALL BE PLACED BELOW VALVE BOXES.
5. SERVICE VALVES AT OR BEHIND R.O.W. WILL BE "LEGEND VALVE" SCH 40 1 1/2" PVC BALL VALVE, SLIP X SLIP LEVER OPERATED OR APPROVED EQUAL, CHECK VALVE USE 1 1/2" FLOWMATIC CLEAR PVC SWING CHECK VALVE, SLIP X SLIP

TYPICAL DOUBLE SERVICE SCHEMATIC
(N.T.S.)



EMS MARKER NO.#1258
ELECTRONIC MARKER SYSTEM
AS MFG. BY JM TEST
AND MEASUREMENT SYSTEM
AUSTIN, TEXAS

PLACE #57 ROCK OUTSIDE
OF BOX AT 6" BELOW BOX
TO 4" ABOVE BOTTOM OF
BOX.

2" FORCE MAIN
PVC SCH. 40 PIPE

TERMINAL FLUSHING PORT DETAIL

(N.T.S.)

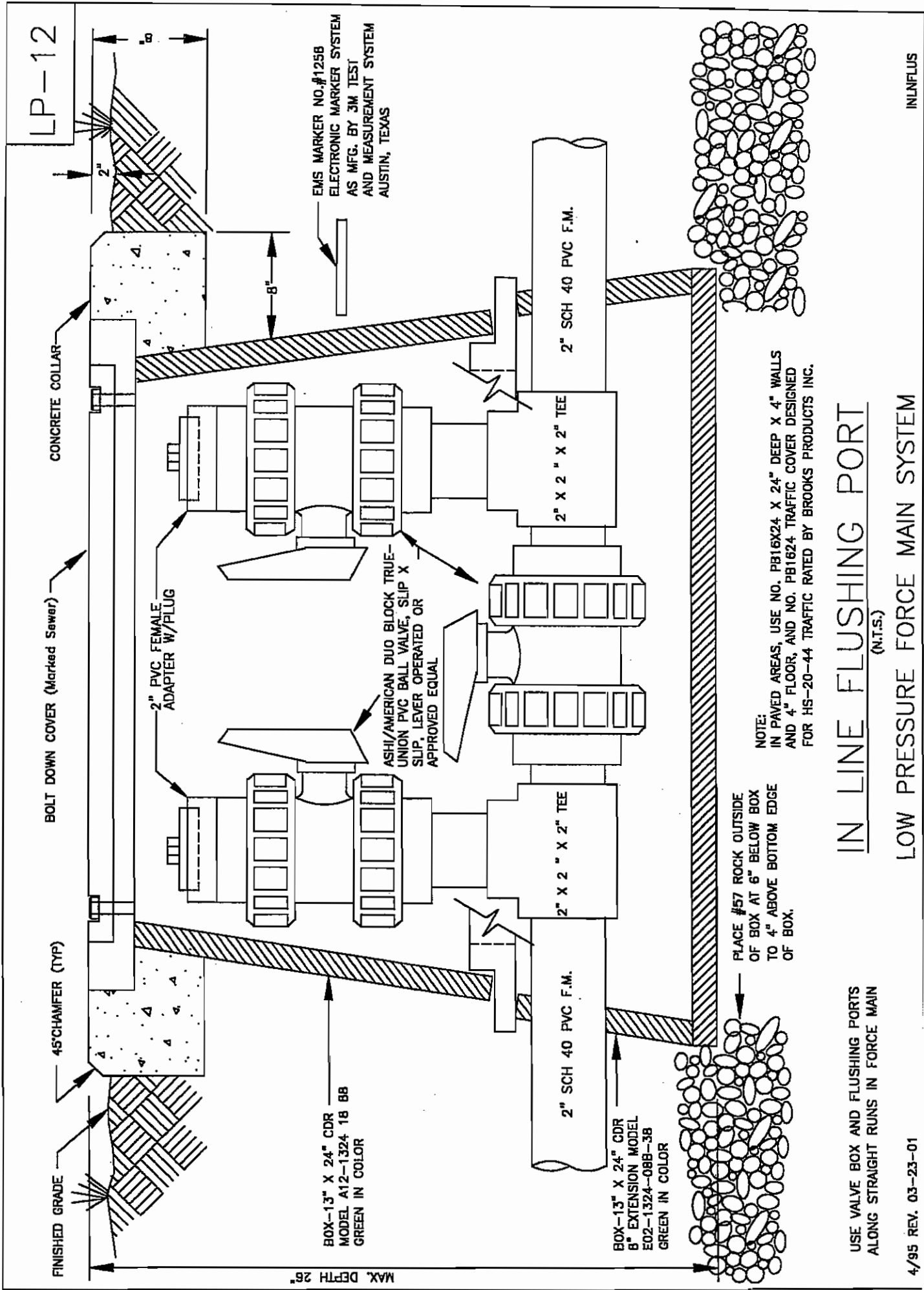
LOW PRESSURE FORCE MAIN SYSTEM

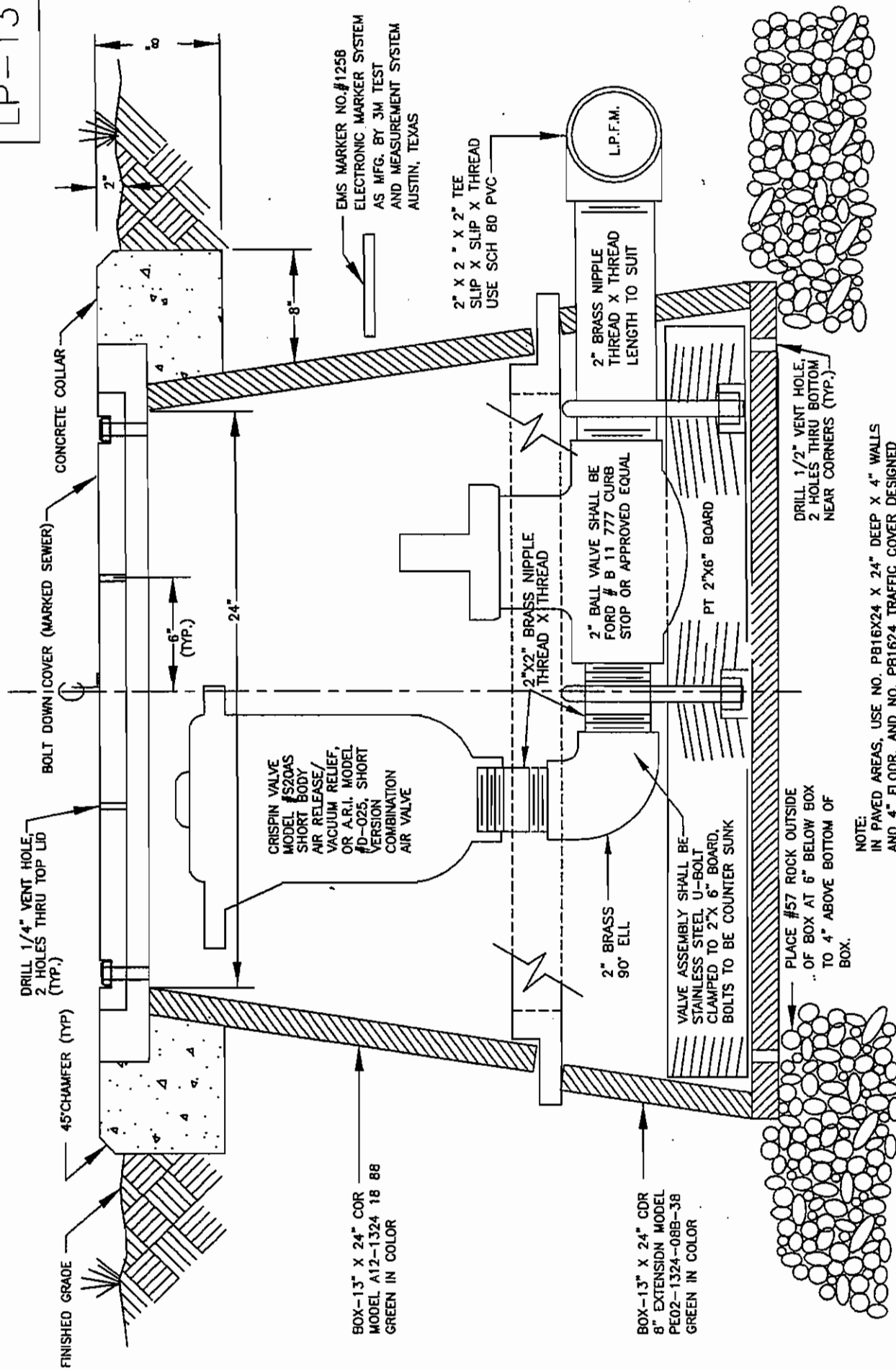
BOX-13" X 24" GDR
MODEL A12-1324 18 88
GREEN IN COLOR
(SEE NOTE BELOW)

ASAHI/AMERICAN DUO BLOCK TRUE
UNION PVC BALL VALVE, SLIP X SLIP,
LEVER OPERATED OR APPROVED EQUAL

GRANULAR MATERIAL
(8" MIN. DEPTH)

NOTE:
IN PAVED AREAS, USE NO. PB16X24 X 24" DEEP X 4" WALLS
AND 4" FLOOR, AND NO. PB1624 TRAFFIC COVER DESIGNED
FOR HS-20-44 TRAFFIC RATED BY BROOKS PRODUCTS INC.



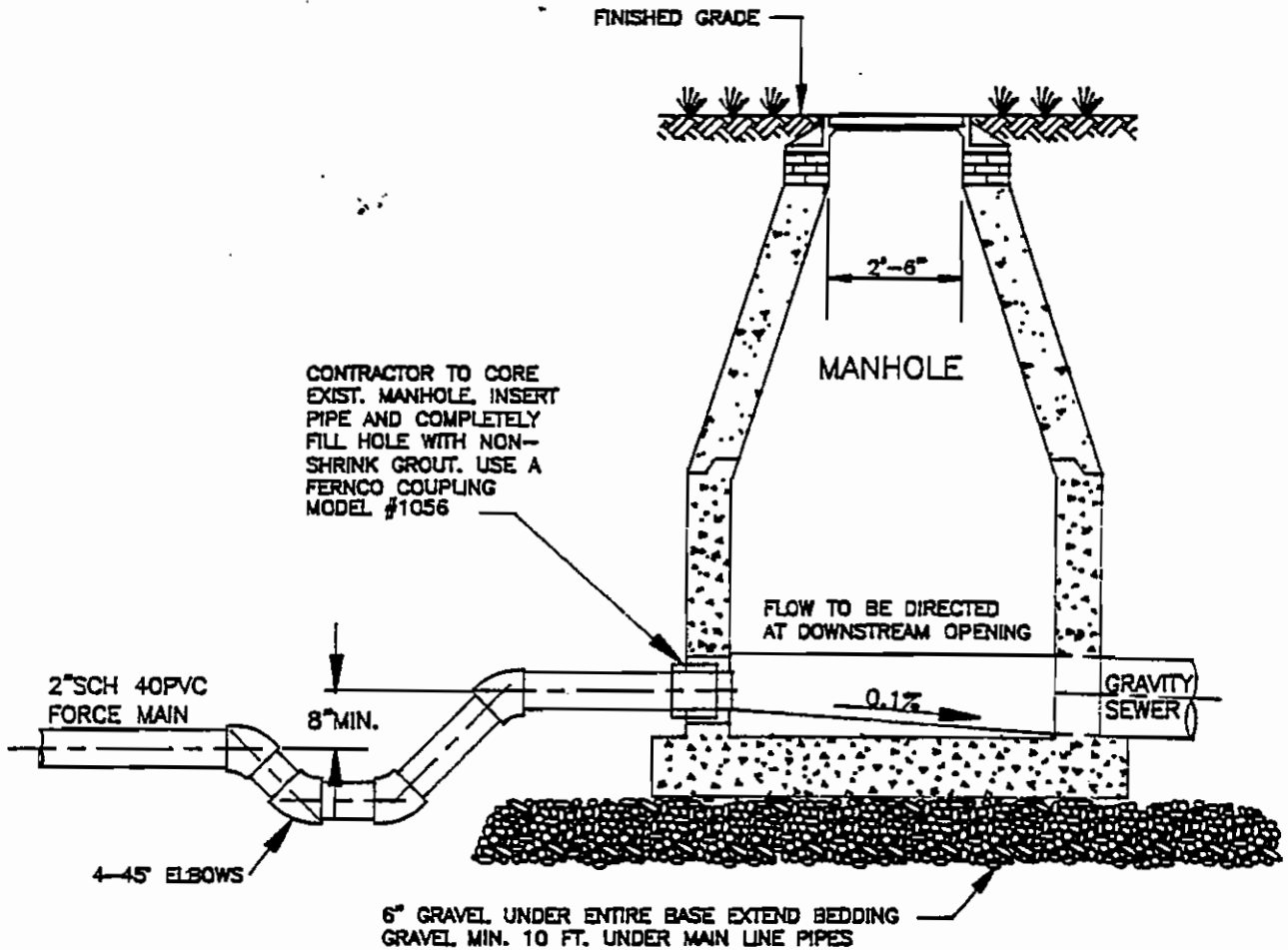


NOTE:
 IN PAVED AREAS, USE NO. PB16X24 X 24" DEEP X 4" WALLS AND 4" FLOOR, AND NO. PB1624 TRAFFIC COVER DESIGNED FOR HS-20-44 TRAFFIC RATED BY BROOKS PRODUCTS INC.

AIR/VACUUM VALVE DETAIL

(N.T.S.)

LOW PRESSURE FORCE MAIN SYSTEM



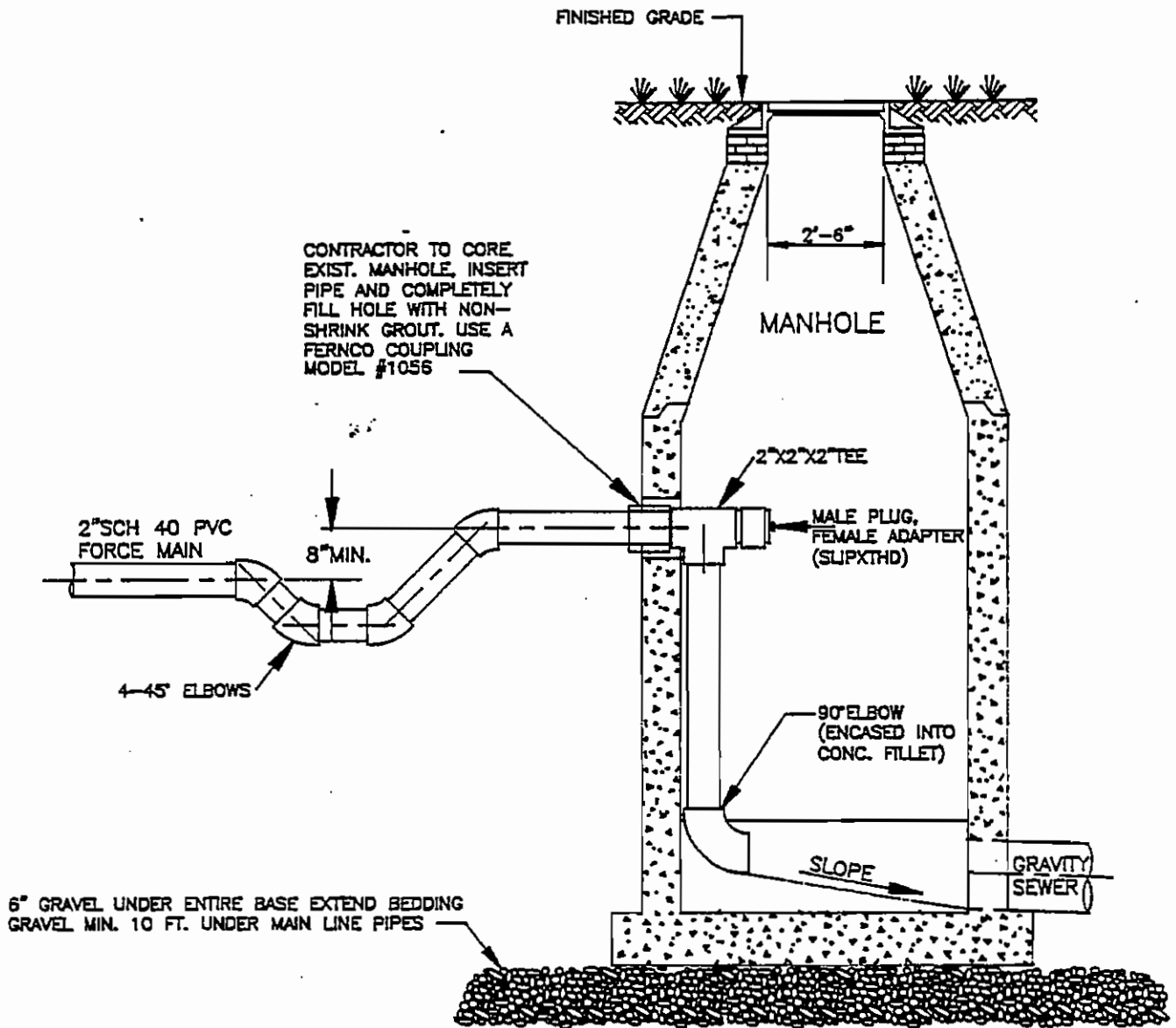
NOTES:

1. WHEN ELEVATION OF FORCE MAIN AT MANHOLE IS HIGHEST POINT OF FORCE MAIN, TRAP CAN BE ELIMINATED.

FORCE MAIN INTO SHALLOW MANHOLE

(N.T.S.)

LOW PRESSURE FORCE MAIN SYSTEM



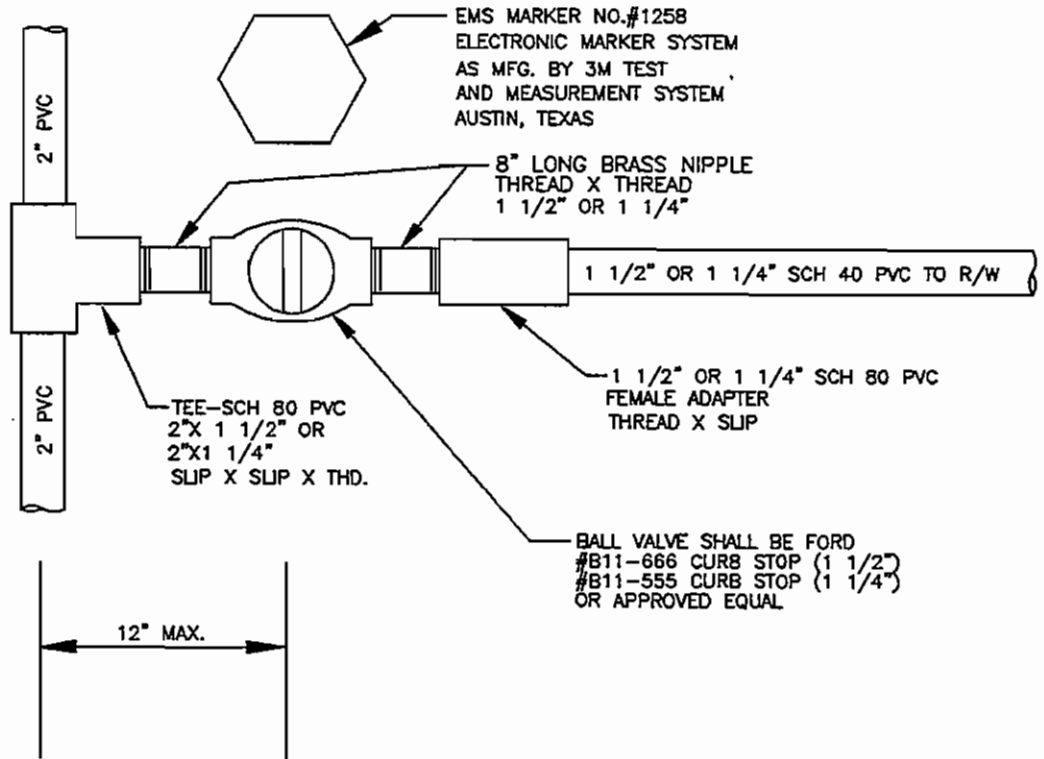
NOTES:

1. ALL DROP PIPING INCLUDING TEE SHALL BE SCH 40 PVC
2. WHEN ELEVATION OF FORCE MAIN AT MANHOLE IS HIGHEST POINT OF FORCE MAIN, TRAP CAN BE ELIMINATED.

FORCE MAIN INTO DEEP MANHOLE

(N.T.S.)

LOW PRESSURE FORCE MAIN SYSTEM

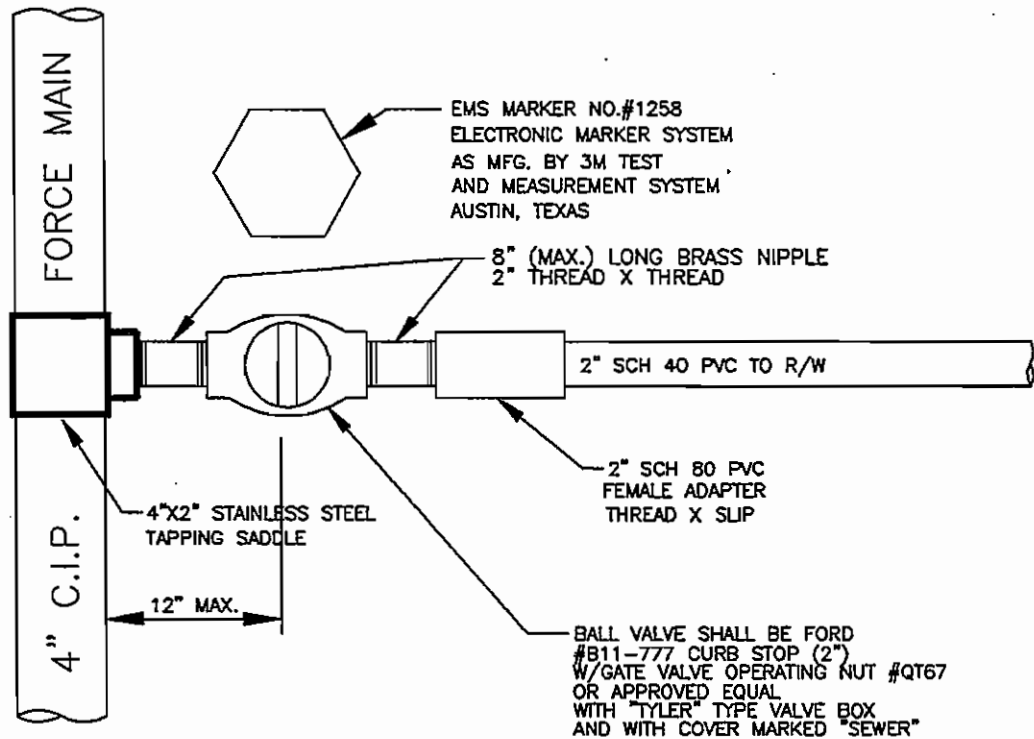


NOTES:

1. EMS SHALL BE INSTALLED ON STREET SIDE OF TEE AND VALVE.
2. VALVE BOX WILL BE TYLER 141Q FOR 22"-30" DEPTH OR TYLER 142R FOR 30"-42" DEPTH WITH CURB ROD TO WITHIN 6" OF FINISHED GRADE. (SEE DETAIL #LP-17)
3. WHEN CUTTING INTO AN EXISTING FORCE MAIN LINE USE REPAIR TYPE SLIP OR COMPRESSION COUPLINGS IMMEDIATELY UPSTREAM AND DOWNSTREAM OF TEE WITH COMPRESSION.

TYPICAL FORCE MAIN CONNECTION VALVE DETAIL

(N.T.S.)



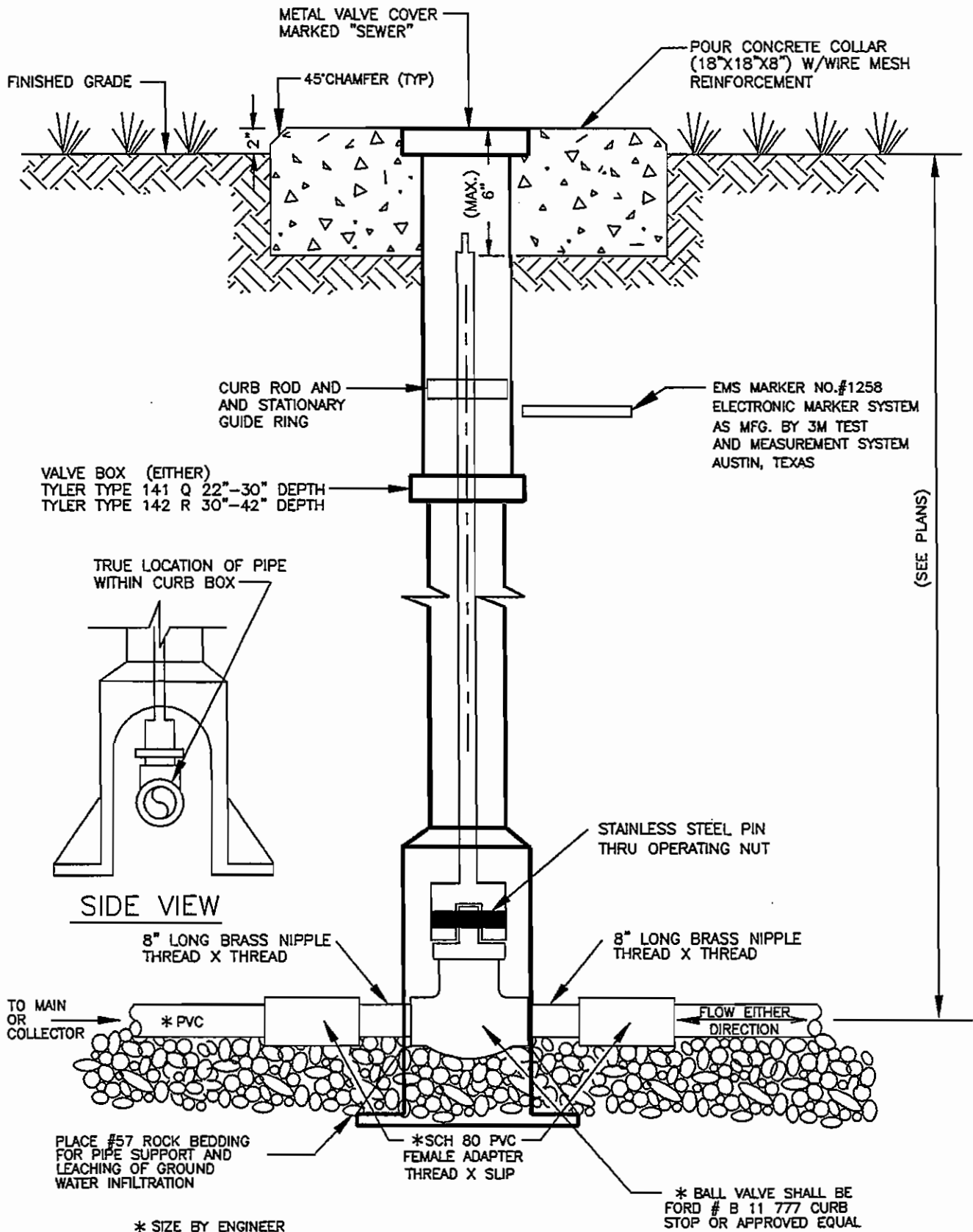
NOTES:

1. EMS SHALL BE INSTALLED ON STREET SIDE OF TEE AND VALVE.
2. VALVE BOX WILL BE TYLER 141Q FOR 22"-30" DEPTH OR TYLER 142R FOR 30"-42" DEPTH.
3. WHEN CUTTING INTO AN EXISTING FORCE MAIN LINE USE REPAIR TYPE SLIP OR COMPRESSION COUPLINGS IMMEDIATELY UPSTREAM AND DOWNSTREAM OF TEE WITH COMPRESSION.

FORCE MAIN CONNECTION VALVE DETAIL

(N.T.S.)

LOW PRESSURE FORCE MAIN SYSTEM



(SEE PLANS)

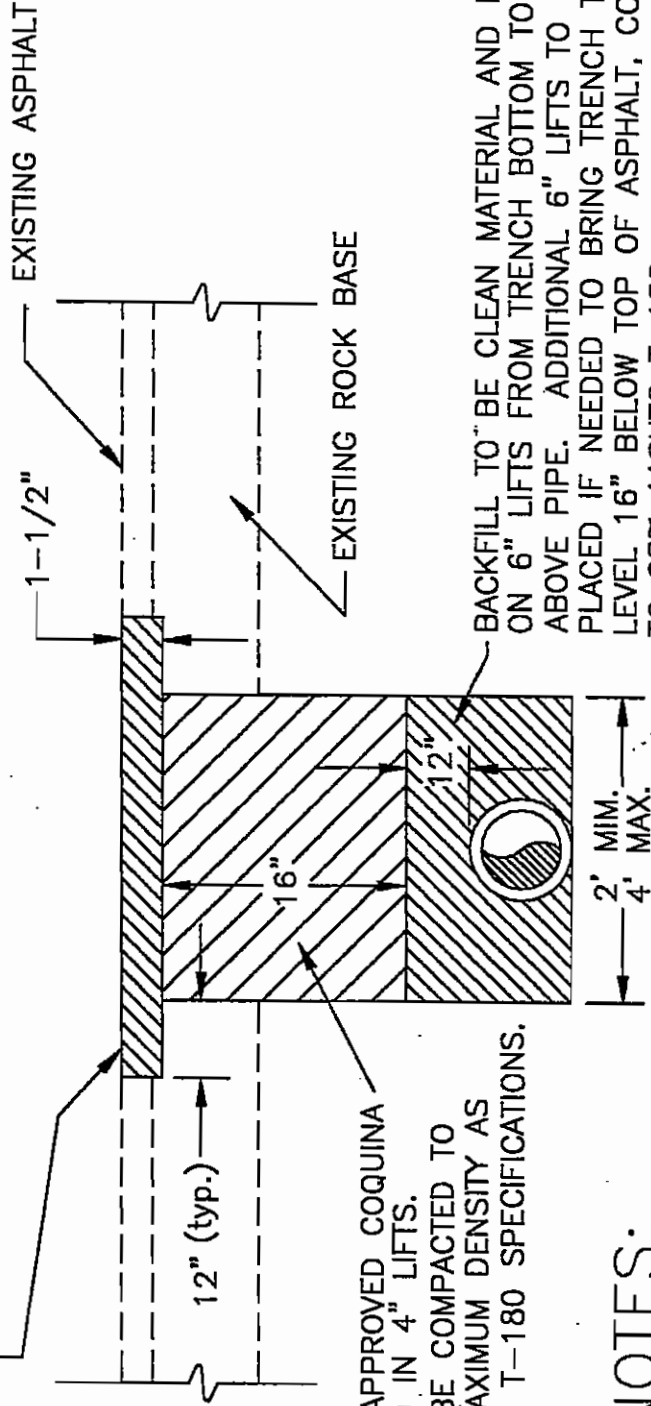
BURIED INLINE VALVE DETAIL

(N.T.S.)

LOW PRESSURE FORCE MAIN SYSTEM

REPLACEMENT PAVEMENT MUST BE TYPE S-1 ASPHALTIC CONCRETE 1-1/2" THICK HOT MIX, WITH TACK COAT. IT MUST BE ROLLED OR COMPACTED TO A SMOOTH SURFACE LEVEL WITH EXISTING ROAD SURFACE.

LP-18



BASE MATERIAL TO BE APPROVED COQUINA 16" THICK, AND PLACED IN 4" LIFTS. BASE MATERIAL SHALL BE COMPACTED TO NOT LESS THAN 98% MAXIMUM DENSITY AS DETERMINED BY AASHTO T-180 SPECIFICATIONS.

BACKFILL TO BE CLEAN MATERIAL AND PLACED ON 6" LIFTS FROM TRENCH BOTTOM TO 12" ABOVE PIPE. ADDITIONAL 6" LIFTS TO BE PLACED IF NEEDED TO BRING TRENCH TO A LEVEL 16" BELOW TOP OF ASPHALT, COMPACTED TO 98% AASHTO T-180.

NOTES:

1. SAW CUT ASPHALT BEFORE EXCAVATING.
2. COMPACTION MUST BE DONE BY A MECHANICAL VIBRATORY COMPACTOR. EACH LIFT MUST RECEIVE 5 PASSES OF THE COMPACTOR OVER ENTIRE SURFACE. BEFORE COMPACTING EACH LIFT, WATER MUST BE APPLIED AT THE RATE OF 1 GAL. PER LINEAL FOOT OF THE TRENCH FOR BACKFILL AND 1/2 GAL. PER LINEAL FOOT OF TRENCH FOR COQUINA BASE. WATER TO BE SPRINKLED EVENLY OVER TRENCH WIDTH.
3. IF EXCAVATION LEAVES LESS THAN 1' OF UNDISTURBED BASE BETWEEN TRENCH AND SAW CUT ASPHALT, ADDITIONAL WIDTH OF ASPHALT MUST BE CUT.

TYPICAL ROAD CROSSING REPAIR DETAIL

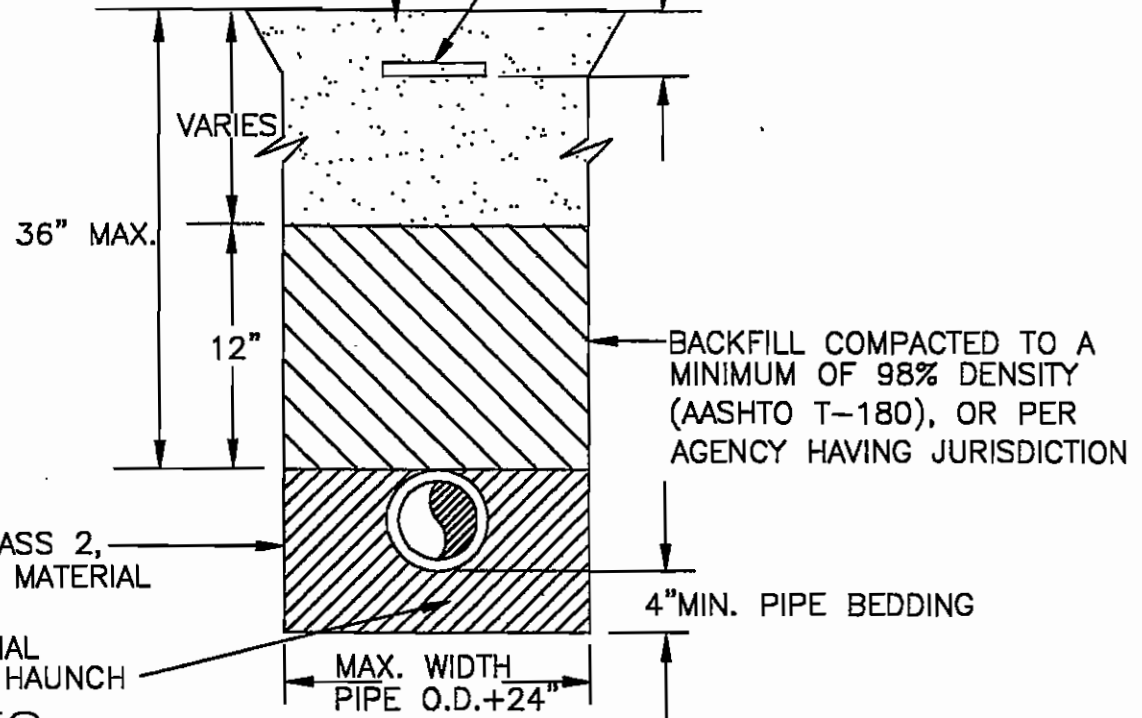
N.T.S.

LOW PRESSURE FORCE MAIN SYSTEM

REMAINDER OF BACKFILL MAY BE PLACED BY MACHINE AND COMPACTED TO A MINIMUM OF 98% DENSITY (AASHTO T-180), OR PER AGENCY HAVING JURISDICTION

GREEN UNDERGROUND MARKING F.M. TAPE

6" MAX.



CLASS 1, CLASS 2, OR CLASS 3 MATERIAL

WORK MATERIAL UNDER PIPE HAUNCH

MAX. WIDTH PIPE O.D.+24"

NOTES:

CLASS 1 MATERIAL - ANGULAR 1/4" TO 3/4" GRADED STONE SUCH AS CORAL, CRUSHED STONE, OR CRUSHED SHELLS OR BEDDING ROCK (100% PASSING 1" SIEVE).

CLASS 2 MATERIAL - COURSE SAND AND GRAVEL'S WITH MAXIMUM PARTICLE SIZE OF 1/4-INCH WITH SMALL PERCENTAGE OF FINES COMPACTED TO A MINIMUM OF 90% STANDARD PROCTOR DENSITY.

CLASS 3 MATERIAL - FINE SAND AND CLAYEY GRAVEL'S, INCLUDING FINE SANDS, SAND-CLAY MIXTURES AND GRAVEL-CLAY MIXTURES, COMPACTED TO A MINIMUM OF 90% STANDARD PROCTOR DENSITY. INCLUDED IN CLASS 3 ARE EXISTING SOIL TYPES CLASSIFIED AS SELECT BACKFILL.

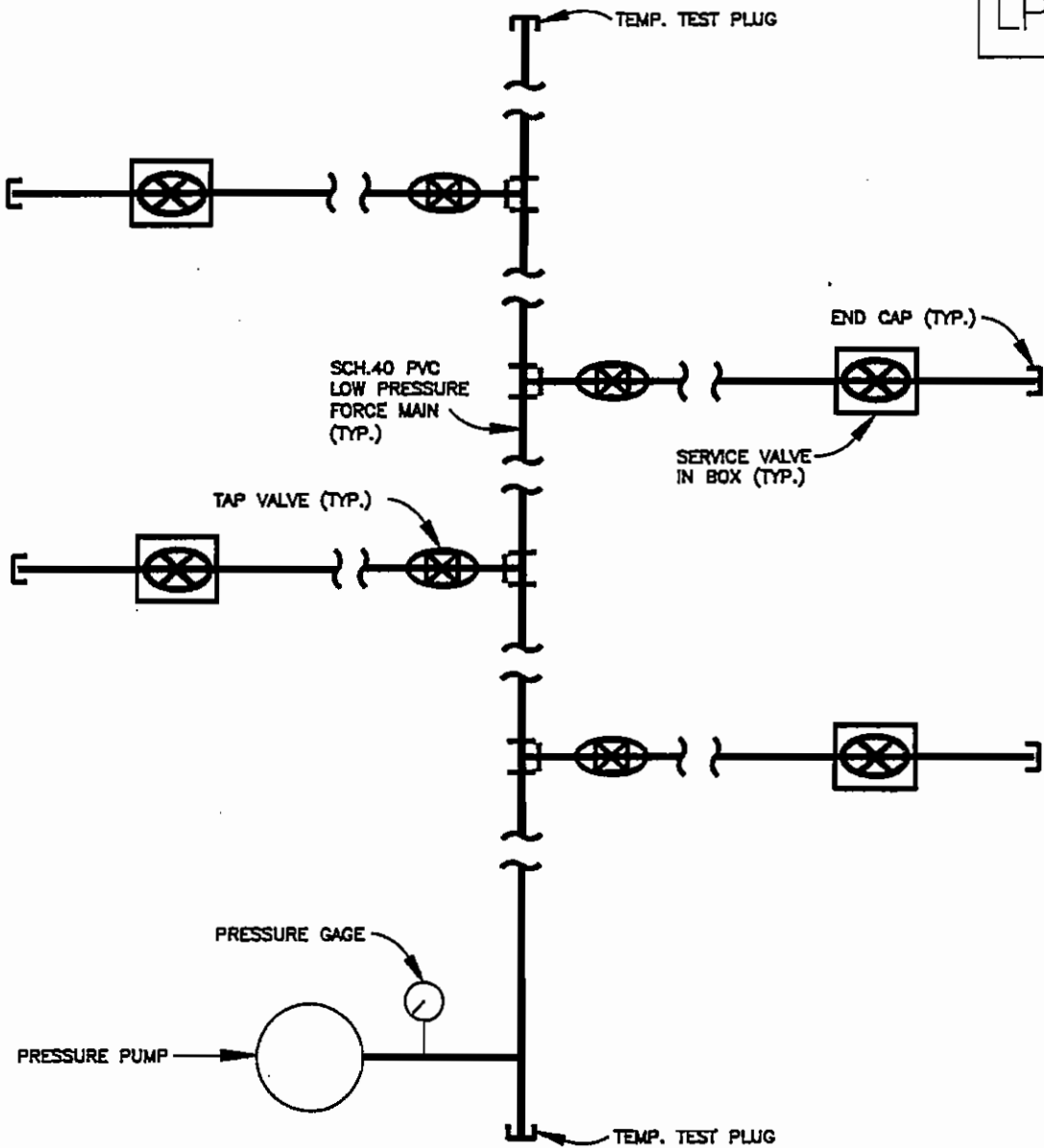
IF CLASS 1 MATERIAL IS USED FOR BEDDING, IT MUST BE USED FOR THE ENTIRE EMBEDMENT.
A DRY TRENCH SHALL BE MAINTAINED WHEN USING CLASS 2 AND CLASS 3 MATERIAL.

TRENCH DETAIL

N.T.S.

GENERAL NOTES

1. LOW PRESSURE PUMPING UNITS SHALL BE LOCATED SO THAT SURFACE WATER RUN OFF SHALL NOT INTERFERE WITH ELECTRICAL COMPONENTS.
2. MANUFACTURER SHALL SUPPLY AND ATTACH ELECTRICAL CONTROL PANEL SCHEMATIC TO INSIDE FACE OF CONTROL PANEL DOOR.
3. THE DISTRICT WILL BE CERTIFYING ALL LOW PRESSURE LIFT STATIONS WHEN COMPLETE. MANUFACTURER SHALL SCHEDULE A START UP TEST AND SUBMIT ALL AS-BUILT DATA TO THE DISTRICT FOR CERTIFICATION.
4. LIFT STATION AND CONTROL PANEL SHALL BE LOCATED SO THAT BOTH ARE ACCESSIBLE FOR MAINTENANCE.
5. WHERE FEASIBLE, HOMEOWNER SHALL PROVIDE WATER HOSE BIB, HOSE FOR MAINTENANCE OPERATIONS.
6. AIR RELEASE VALVE AND/OR VACUUM RELIEF VALVES SHALL BE PROVIDED ON ALL LOW PRESSURE FORCE MAIN INSTALLATION IMMEDIATELY UPSTREAM OF DISCHARGE POINT TO REGIONAL GRAVITY OR FORCE MAIN SYSTEMS.
7. FORCE MAIN MARKING TAPE OR MAGNETIC LOCATING DEVICES WILL BE INSTALLED OVER FORCE MAIN, VALVES, AND SERVICES, 18" MAX. BURIED DEPTH.



PLAN VIEW
(N.T.S.)

NOTES:

1. CLOSE ALL SERVICE VALVES.
2. OPEN ALL TAP VALVES.
3. PRESSURIZE SYSTEM & TEST TO 50 P.S.I. FOR ONE (1) HOUR.
4. CLOSE TAP VALVES ONE AT A TIME.
5. BLEED OFF SERVICE VALVES ONE AT A TIME, AT END CAPS.
6. CHECK PRESSURE.
7. IF PRESSURE DROPS SERVICE VALVE IS NOT HOLDING PRESSURE.
8. REPAIR OR REPLACE IF NECESSARY.
9. REPEAT STEP 5 THRU 8 FOR EACH SERVICE CONNECTION.
10. SEE LOW PRESSURE DETAILS, LP-9 & LP-10 FOR TYPICAL LAYOUTS.

LOW PRESSURE FORCE MAIN SYSTEM

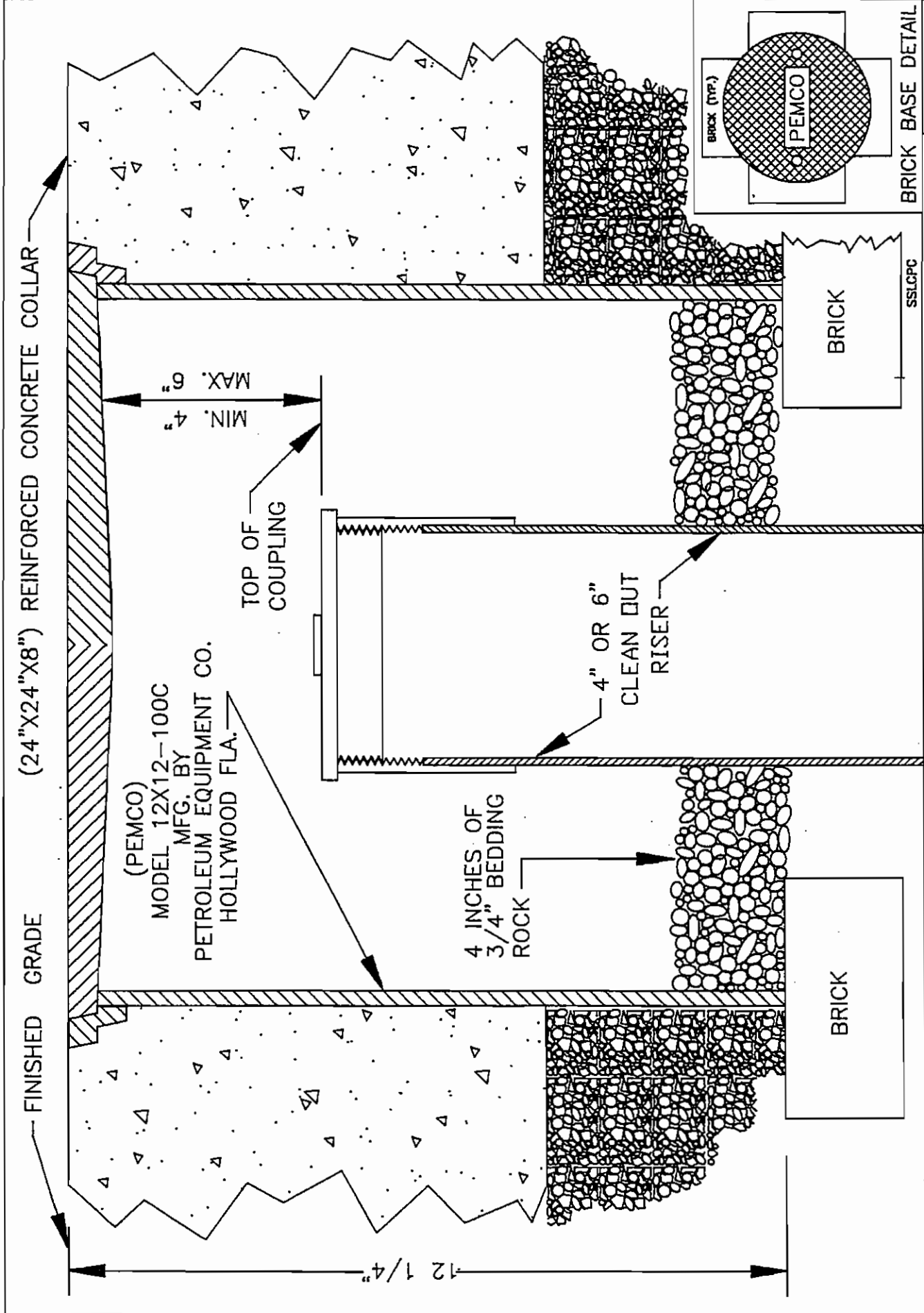
LOW PRESSURE SEWER SYSTEM
TESTING PROCEDURE

STANDARD WATER AND SEWER SEPARATION STATEMENT

1. STORM AND SANITARY SEWERS CROSSING UNDER WATER MAINS SHALL BE LAID TO PROVIDE A MINIMUM VERTICAL DISTANCE OF EIGHTEEN (18) INCHES BETWEEN THE INVERT OF THE UPPER PIPE AND THE CROWN OF THE LOWER PIPE, WHERE THIS MINIMUM SEPARATION CANNOT BE MAINTAINED, THE CROSSING SHALL BE ARRANGED SO THAT THE SEWER PIPE JOINTS AND WATER MAIN JOINTS ARE EQUIDISTANT FROM THE POINT OF CROSSING WITH NO LESS THAN TEN (10) FEET BETWEEN ANY TWO JOINTS AND BOTH PIPES SHALL BE D.I.P. WHERE THERE IS NOT AN ALTERNATIVE TO SEWER PIPES CROSSING OVER A WATER MAIN, THE CRITERIA FOR MINIMUM SEPARATION BETWEEN LINES AND JOINTS IN THE ABOVE, SHALL BE REQUIRED AND BOTH PIPES SHALL BE D.I.P. IRRESPECTIVE OF SEPARATION. D.I.P. IS NOT REQUIRED FOR STORM SEWERS.
2. MAINTAIN TEN (10) FEET HORIZONTAL DISTANCE BETWEEN WATER MAIN AND STORM OR SANITARY SEWER MAIN, AS A MINIMUM.
3. FORCE MAIN CROSSING WATER MAIN SHALL BE LAID TO PROVIDE A MINIMUM VERTICAL DISTANCE OF EIGHTEEN (18) INCHES BETWEEN THE OUTSIDE OF THE FORCE MAIN AND OUTSIDE OF THE WATER MAIN WITH WATER MAIN CROSSING OVER THE FORCE MAIN.

LOW PRESSURE FORCE MAIN SYSTEM

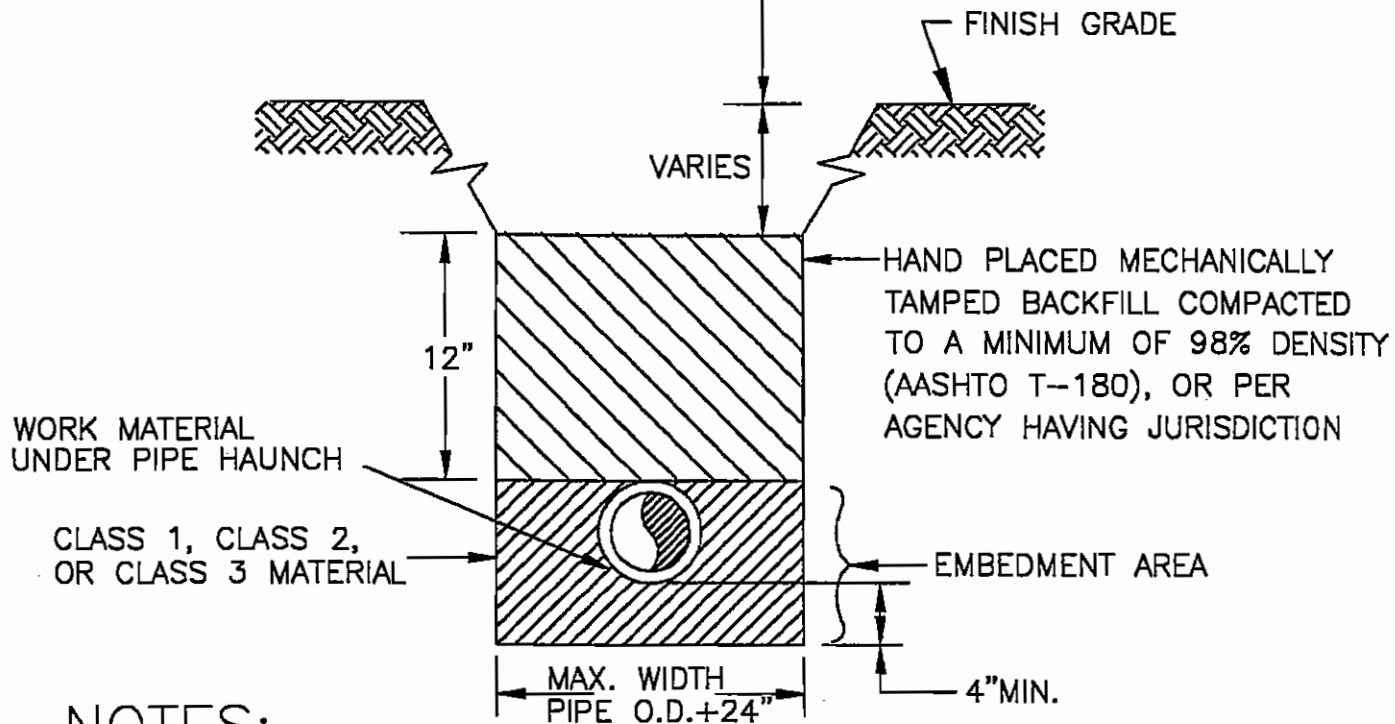
SD-1	SANITARY SEWER LATERAL CLEANOUT PROTECTIVE COVER
SD-2	PVC PIPE GRAVITY SEWER
SD-3	SINGLE SERVICE CONNECTION DETAIL
SD-4	DOUBLE SERVICE CONNECTION DETAIL
SD-5	GREASE TRAP DETAIL
SD-6	PRECAST MANHOLE DETAIL
SD-7	GRAVITY SEWER INSIDE DROP MANHOLE
SD-8	MANHOLE FRAME AND COVER
SD-8A	MANHOLE EXTENSION RING
SD-9	SEWER M.H. INSTALLATION INTO AN EXISTING GRAVITY SEWER
SD-10	SANITARY SEWER/STORM DRAIN CONFLICT STRUCTURE
SD-10A	SANITARY SEWER/STORM DRAIN ALTERNATE CONFLICT STRUCTURE
SD-11	DUCTILE IRON PIPE FORCEMAIN EMBEDMENT
SD-12	P.V.C. PIPE FORCEMAIN EMBEDMENT
SD-13	ONE BOLT FITTING THRUST RESTRAINT
SD-14	FORCEMAIN THRUST RESTRAINT
SD-15	FORCEMAIN TERMINAL END THRUST BLOCK
SD-16	FORCEMAIN TO SHALLOW MANHOLE
SD-17	FORCEMAIN TO DEEP MANHOLE
SD-18	AUTOMATIC AIR RELEASE VALVE OFFSET FORCE MAIN CONDITION
SD-19	AUTOMATIC AIR RELEASE VALVE
SD-19A	TYPICAL F. M. A. R. V. DETAIL ALTERNATE OFFSET CONFIGURATION
SD-20	FORCEMAIN LOW POINT DETAIL
SD-21	BURIED VALVE DETAIL
SD-22	TAPPING FORCEMAIN DETAIL
SD-23	TRENCH / PAVEMENT RESTORATION DETAIL
SD-24	TRENCH / PAVEMENT RESTORATION DETAIL W/FLOWABLE FILL
PAGE 1	RECORD DRAWING SUBMITTAL GUIDE
PAGE 2	SEPARATION STATEMENT (HEALTH DEPARTMENT)



DATE	9/82	LOXAHATCHEE RIVER DISTRICT SANITARY SEWER LATERAL CLEAN OUT PROTECTIVE COVER (FOR USE IN PAVED AREAS ONLY)	SD
REVISION	6/98		
			1

N.T.S.

REMAINDER OF BACKFILL MAY BE
 PLACED BY MACHINE AND COMPACTED
 TO A MAXIMUM OF 98% DENSITY
 (AASHTO T-180), OR PER AGENCY
 HAVING JURISDICTION



NOTES:

- CLASS 1 MATERIAL - ANGULAR 1/4" TO 3/4" GRADED STONE SUCH AS CORAL, CRUSHED STONE, OR CRUSHED SHELLS OR BEDDING ROCK (100% PASSING 1" SIEVE).
- CLASS 2 MATERIAL - COURSE SAND AND GRAVEL'S WITH MAXIMUM PARTICLE SIZE OF 1/4-INCH WITH SMALL PERCENTAGE OF FINES COMPACTED TO A MINIMUM OF 90% STANDARD PROCTOR DENSITY.
- CLASS 3 MATERIAL - FINE SAND AND CLAYEY GRAVEL'S, INCLUDING FINE SANDS, SAND-CLAY MIXTURES AND GRAVEL-CLAY MIXTURES, COMPACTED TO A MINIMUM OF 90% STANDARD PROCTOR DENSITY. INCLUDED IN CLASS 3 ARE EXISTING SOIL TYPES CLASSIFIED AS SELECT BACKFILL.

IF CLASS 1 MATERIAL IS USED FOR BEDDING, IT MUST BE USED FOR THE ENTIRE EMBEDMENT AREA.
 A DRY TRENCH SHALL BE MAINTAINED WHEN USING CLASS 2 AND CLASS 3 MATERIAL.

TRENCHDT.DWG

DATE	9/82
REVISION	1/02

LOXAHATCHEE RIVER DISTRICT
PVC PIPE GRAVITY SEWER
EMBEDMENT DETAIL
 N.T.S.

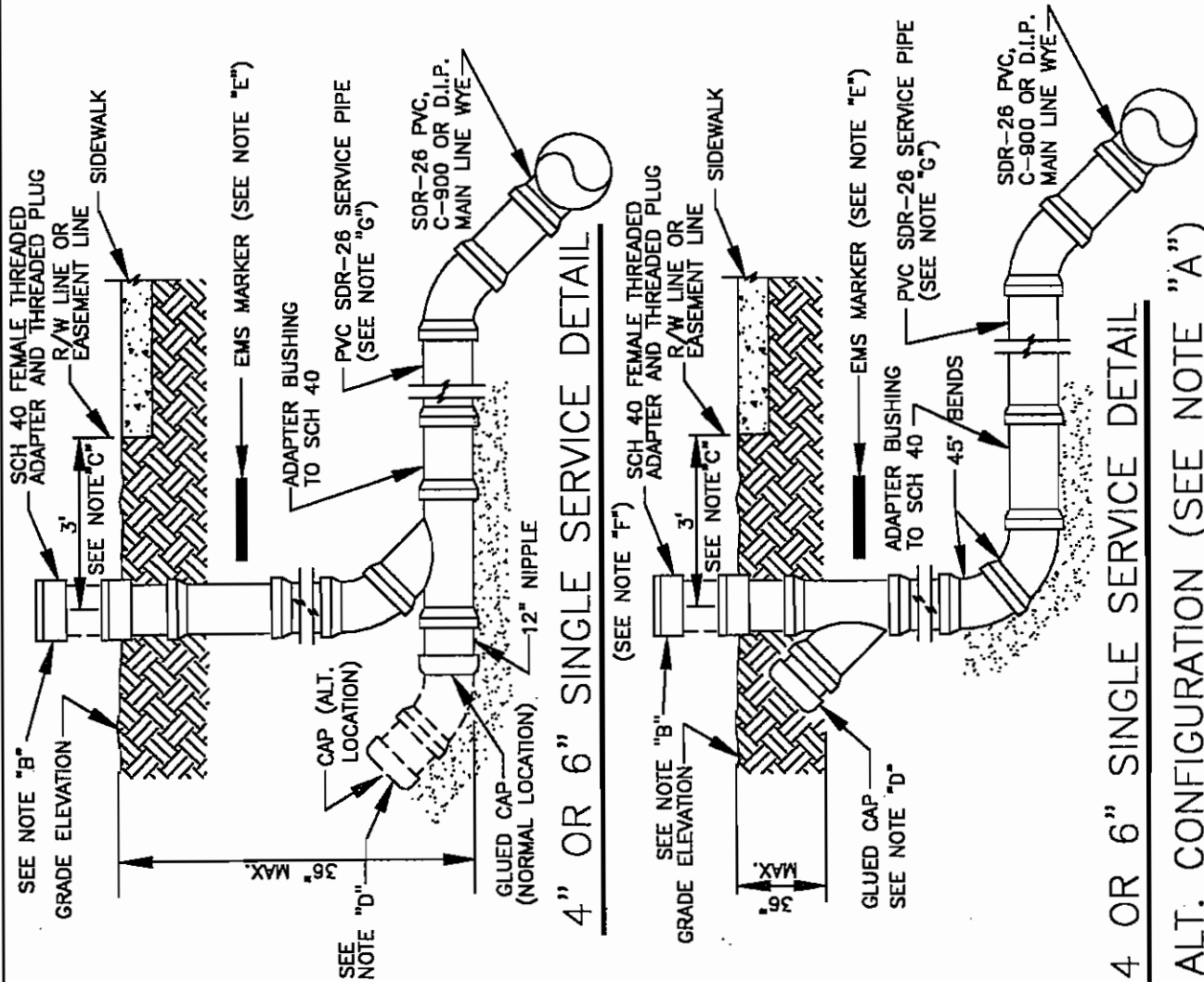
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 2

NOTES

- WHERE SEWER LATERALS MAY BE FORCED TO BE INSTALLED AT A DEPTH GREATER THAN 36" DUE TO CONFLICT WITH OTHER UTILITIES, THE WYE FITTING MAY BE PLACED IN A VERTICAL POSITION ON THE CLEAN-OUT RISER PIPE (MAX. 36").
- LEAVE RISER 18" (MIN.) ABOVE GRADE. WHEN HOUSE RISER CONNECTION IS MADE BY BUILDING PLUMBER, RISER PIPE WILL BE CUT OFF, AND SET 2" ABOVE SOD GRADE (ADAPTER SHALL BE LEFT UNGLUED).
- IN AREAS WHERE NO SIDEWALK EXISTS OR WHERE NONE ARE PLANNED, THE CLEANOUT RISER WILL BE SET AT R/W OR EASEMENT LINE.
- IN AREAS WHERE GROUND WATER TABLE IS LESS THAN 36" FROM FINISHED GRADE, NIPPLE OUT OF WYE WILL BE EXTENDED UP TO A POINT 6" MIN. ABOVE GROUND WATER TABLE.
- EMS MARKER MODEL NO.1258, SERVICE LINE ELECTRONIC MARKER AS MFG. BY 3M CO., TO REMAIN IN PLACE AFTER CONNECTION OF BUILDING SEWER. BURY IN FRONT OF CLEANOUT RISER 18" BELOW FINISHED GRADE.
- 6" SINGLE SERVICES USED ONLY FOR COMMERCIAL OR MULTI-FAMILY RESIDENTIAL UNITS.
- WHEN MAINLINE IS C-900 PVC OR DIP (EPOXY COATED), SERVICE PIPE SHALL BE SAME MATERIAL AS MAIN LINE.

NOTE: (PLUMBERS ONLY)

WHERE EXISTING SERVICE LATERAL IS VITRIFIED CLAY PIPE, BELL (HUB) WILL BE REMOVED WITH APPROVED SAW AND A "FERNCO" VCP X PVC COUPLING WILL BE USED TO JOIN THE EXISTING AND NEW PIPE. FERNCO COUPLING WILL BE WRAPPED IN STRANDS OF COPPER WIRE AND COUPLING WILL BE BEDDED IN TYPE 57 ROCK TO UNDISTURBED MATERIAL. WHERE EXISTING SERVICE LATERAL IS DIP OR C-900, A DISTRICT APPROVED PVC TRANSITION COUPLING WILL BE USED.



4 OR 6" SINGLE SERVICE DETAIL

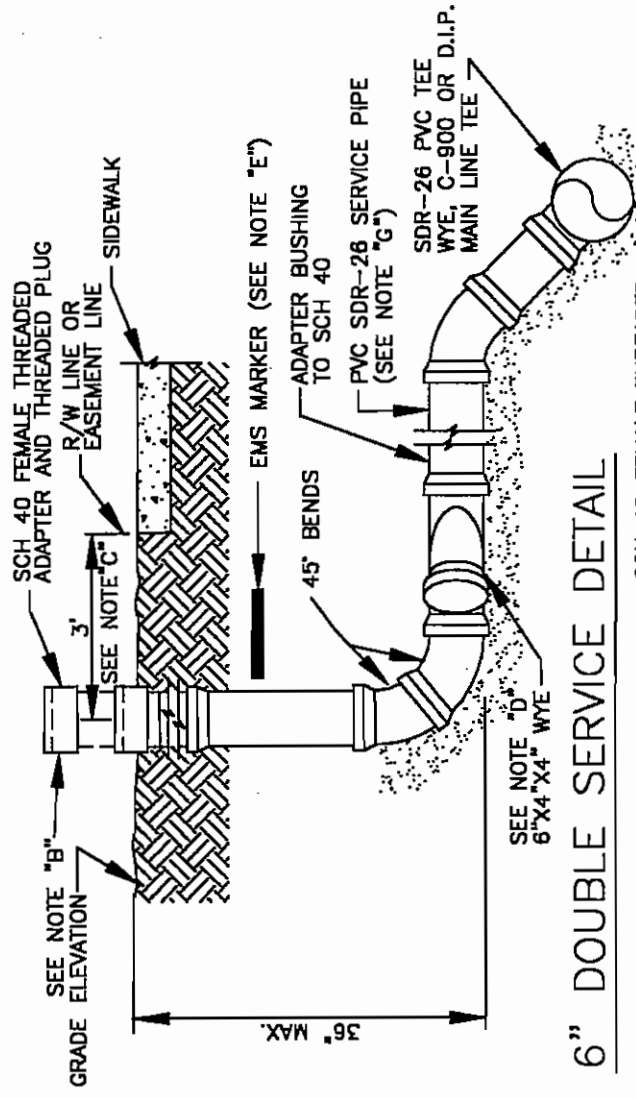
ALT. CONFIGURATION (SEE NOTE "A")

REVISION
6/98

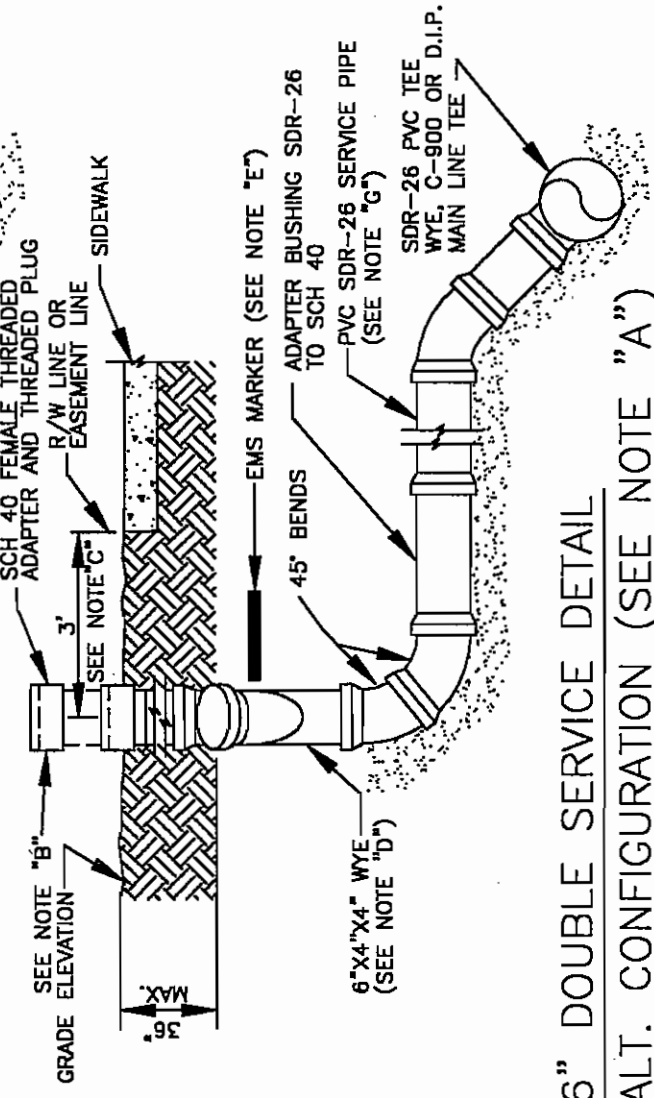
LOXAHATCHEE RIVER DISTRICT
SINGLE SERVICE CONNECTION DETAIL

SD-SSERV

SD-3



6" DOUBLE SERVICE DETAIL



6" DOUBLE SERVICE DETAIL

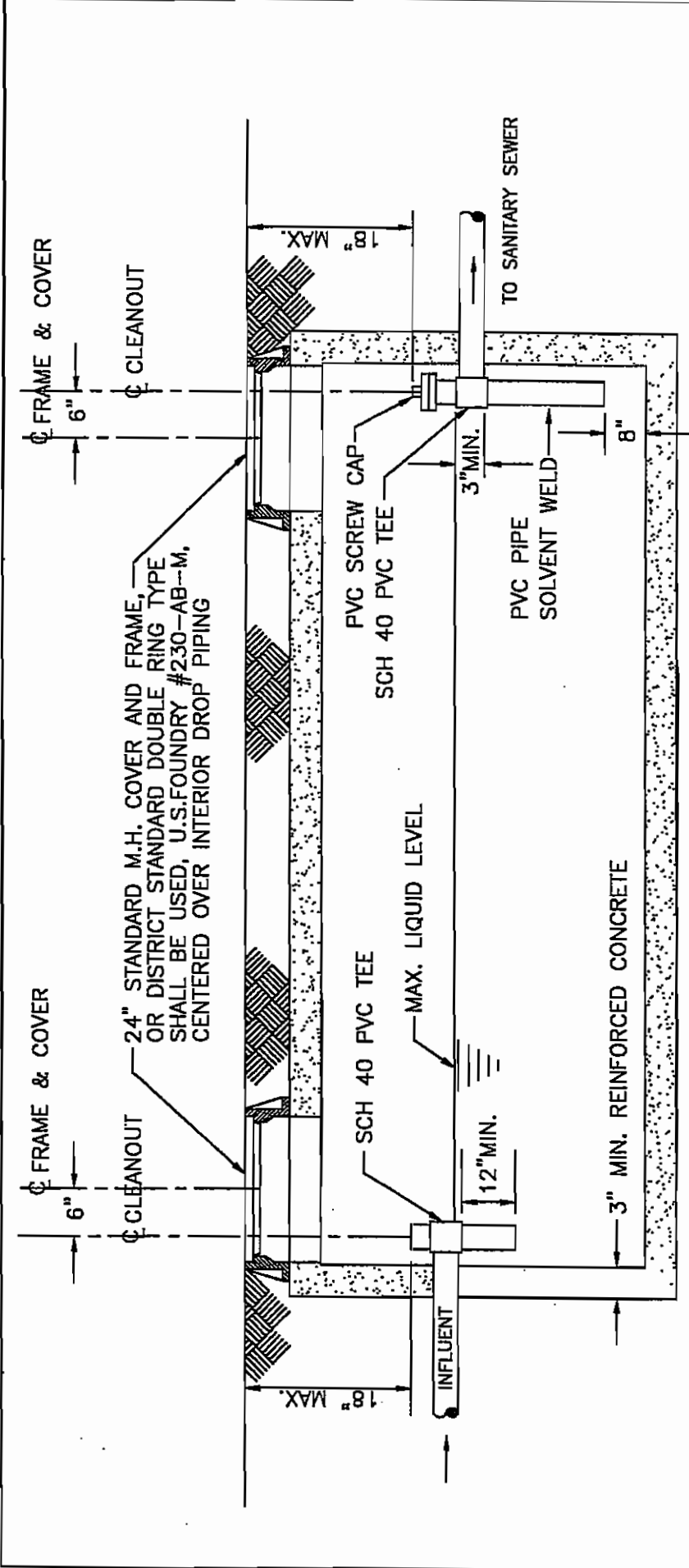
ALT. CONFIGURATION (SEE NOTE "A")

NOTES

- A. WHERE SEWER LATERALS MAY BE FORCED TO BE INSTALLED AT A DEPTH GREATER THAN 36" DUE TO CONFLICT WITH OTHER UTILITIES, THE WYE FITTING MAY BE PLACED IN A VERTICAL POSITION ON THE CLEAN-OUT RISER PIPE (ALTERNATE CONFIGURATION).
- B. LEAVE RISER 18" (MIN.) ABOVE GRADE. WHEN HOUSE RISER CONNECTION IS MADE BY BUILDING PLUMBER, RISER PIPE WILL BE CUT OFF, AND SET 2" ABOVE SOD GRADE (ADAPTER SHALL BE LEFT UNGLUED).
- C. IN AREAS WHERE NO SIDEWALK EXISTS OR WHERE NONE ARE PLANNED, THE CLEANOUT RISER WILL BE SET AT R/W OR EASEMENT LINE.
- D. IN AREAS WHERE GROUND WATER TABLE IS LESS THAN 36" FROM FINISHED GRADE, NIPPLES OUT OF WYE WILL BE EXTENDED UP TO A POINT 6" MIN. ABOVE GROUND WATER TABLE.
- E. EMS MARKER MODEL NO.1258, SERVICE LINE ELECTRONIC MARKER AS MFG. BY 3M CO., TO REMAIN IN PLACE AFTER CONNECTION OF BUILDING SEWER. BURY IN FRONT OF CLEANOUT RISER 18" BELOW FINISHED GRADE.
- F. 6" SINGLE SERVICES USED ONLY FOR COMMERCIAL OR MULTI-FAMILY RESIDENTIAL UNITS (SEE SD-3)
- G. WHEN MAINLINE IS C-900 PVC OR EPOXY COATED DIP, SERVICE PIPE SHALL BE SAME MATERIAL AS MAINLINE.

NOTE:
(PLUMBERS ONLY)

WHERE EXISTING SERVICE LATERAL IS VTRIFIED CLAY PIPE, BELL (HUB) WILL BE REMOVED WITH APPROVED SAW AND A "FERNCO" VCP X PVC COUPLING WILL BE USED TO JOIN THE EXISTING AND NEW PIPE. FERNCO COUPLING WILL BE WRAPPED IN STRANDS OF COPPER WIRE AND COUPLING WILL BE BEDDED IN TYPE 57 ROCK. WHERE EXISTING SERVICE LATERAL IS DIP OR C-900, A DISTRICT APPROVED PVC TRANSITION COUPLING WILL BE USED.



NOTES

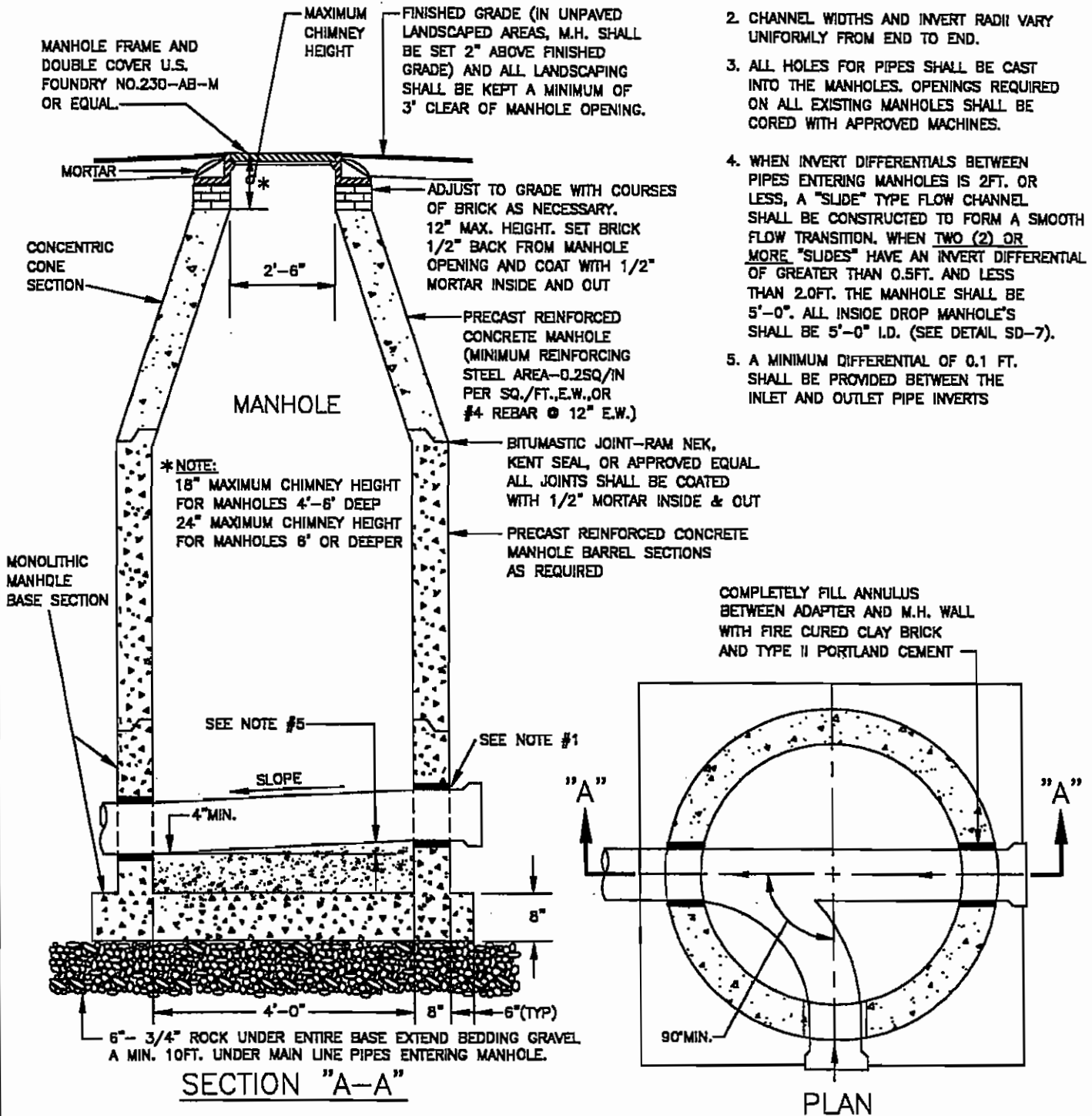
1. EFFECTIVE SIZE OF TRAP 750 GALLONS MINIMUM
2. TANK TO BE DESIGNED TO RESIST FLOTATION WHEN EMPTY
3. TWO-WAY CLEANOUTS WILL BE INSTALLED IMMEDIATELY UPSTREAM AND DOWNSTREAM OF GREASE TRAP IF INSTALLED IN PAVED AREAS, A PROTECTIVE STANDARD CLEANOUT COVER WILL BE PROVIDED
4. WITH PRIOR APPROVAL, FIBERGLASS TANKS WITH TRAFFIC LOADING CERTIFICATION MAY BE SUBSTITUTED FOR REINFORCED CONCRETE TANKS
5. ALL CONCRETE TO BE 3500 PSI MIN.
6. ALL MANHOLE COVERS USED SHALL BE MARKED WITH: "GREASE TRAP" LETTERING.

GREASE/TP

DATE	9/82	SD
REVISION	10/03	
LOXAHATCHEE RIVER DISTRICT		5
GREASE TRAP DETAIL		
		N.T.S.

NOTES:

1. WHEN THE MAIN LINE IS PVC, A DISTRICT APPROVED HEAVY AGGREGATE COATED PVC M.H. ADAPTER (HARCO OR EQUAL) OR FERNCO M.H. ADAPTER SHALL BE USED. CAST IN PLACE RUBBER BOOTS WITH STAINLESS STEEL HARDWARE (LOCK-JOINT MODEL CP8) MAY BE USED AS AN ALTERNATE.
2. CHANNEL WIDTHS AND INVERT RADII VARY UNIFORMLY FROM END TO END.
3. ALL HOLES FOR PIPES SHALL BE CAST INTO THE MANHOLES. OPENINGS REQUIRED ON ALL EXISTING MANHOLES SHALL BE CORED WITH APPROVED MACHINES.
4. WHEN INVERT DIFFERENTIALS BETWEEN PIPES ENTERING MANHOLES IS 2FT. OR LESS, A "SLIDE" TYPE FLOW CHANNEL SHALL BE CONSTRUCTED TO FORM A SMOOTH FLOW TRANSITION. WHEN TWO (2) OR MORE "SLIDES" HAVE AN INVERT DIFFERENTIAL OF GREATER THAN 0.5FT. AND LESS THAN 2.0FT. THE MANHOLE SHALL BE 5'-0". ALL INSIDE DROP MANHOLE'S SHALL BE 5'-0" I.D. (SEE DETAIL SD-7).
5. A MINIMUM DIFFERENTIAL OF 0.1 FT. SHALL BE PROVIDED BETWEEN THE INLET AND OUTLET PIPE INVERTS



PRECSTMH.DWG

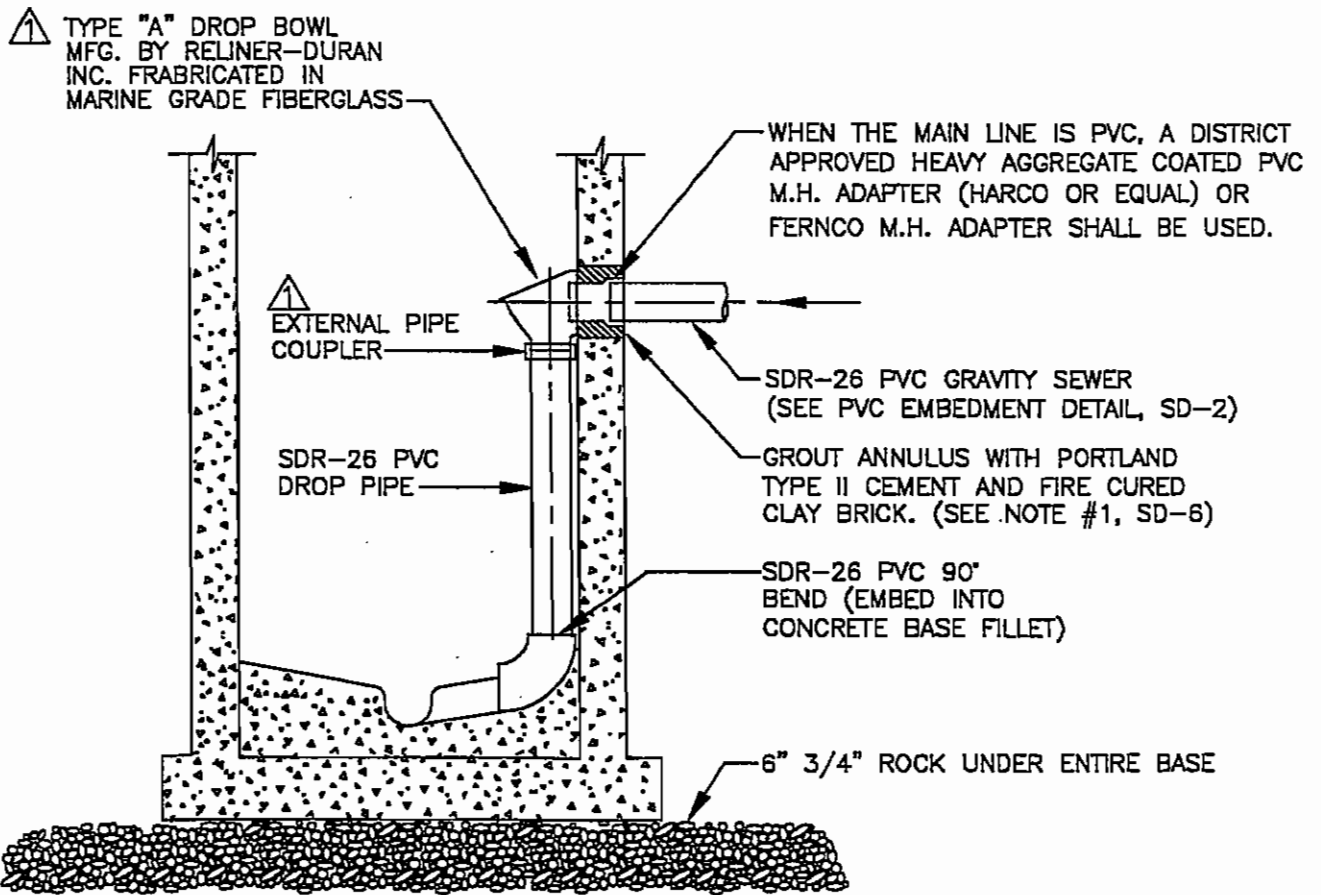
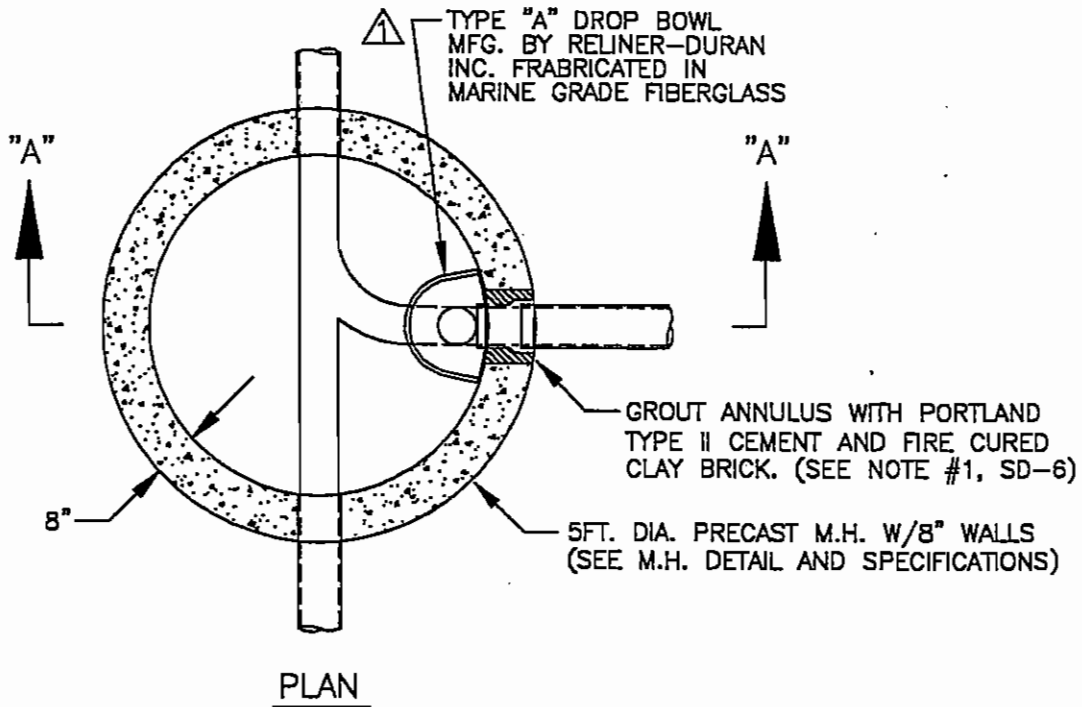
DATE
9/82

LOXAHATCHEE RIVER DISTRICT
PRECAST MANHOLE

SD
6

REVISION
4/03

N.T.S.



INSIDEP

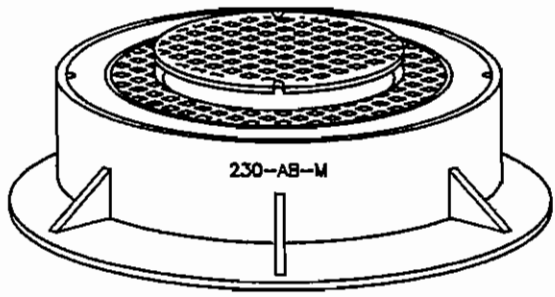
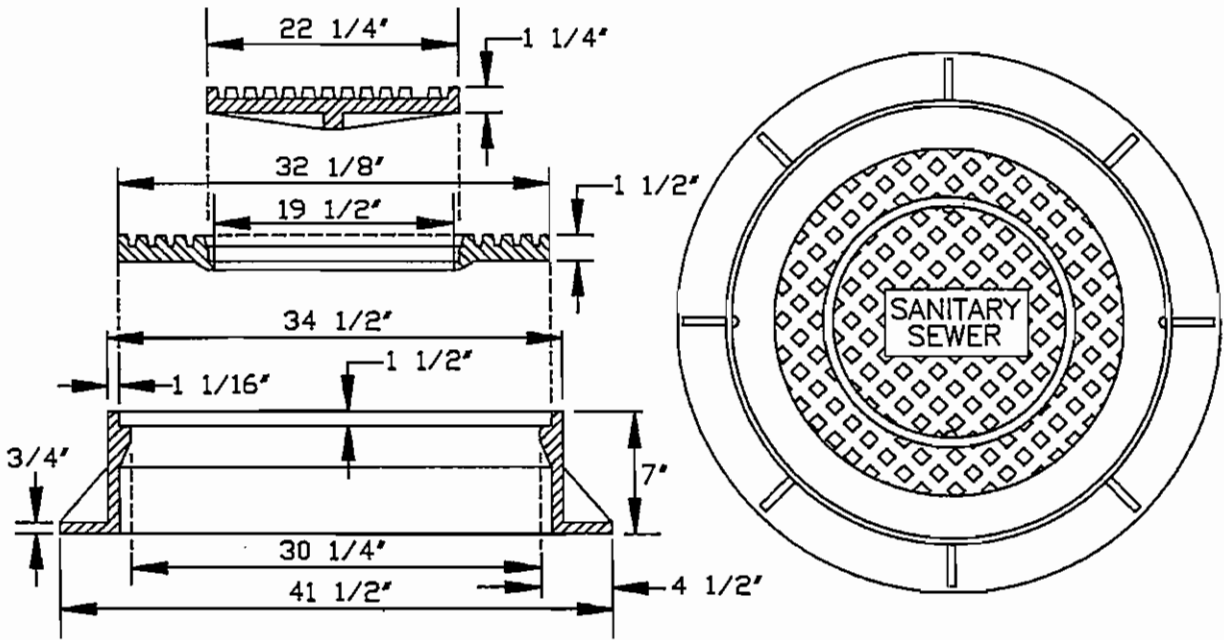
DATE
3/95

REVISION
01/04

LOXAHATCHEE RIVER DISTRICT
GRAVITY SEWER
INSIDE DROP MANHOLE

(N.T.S.)

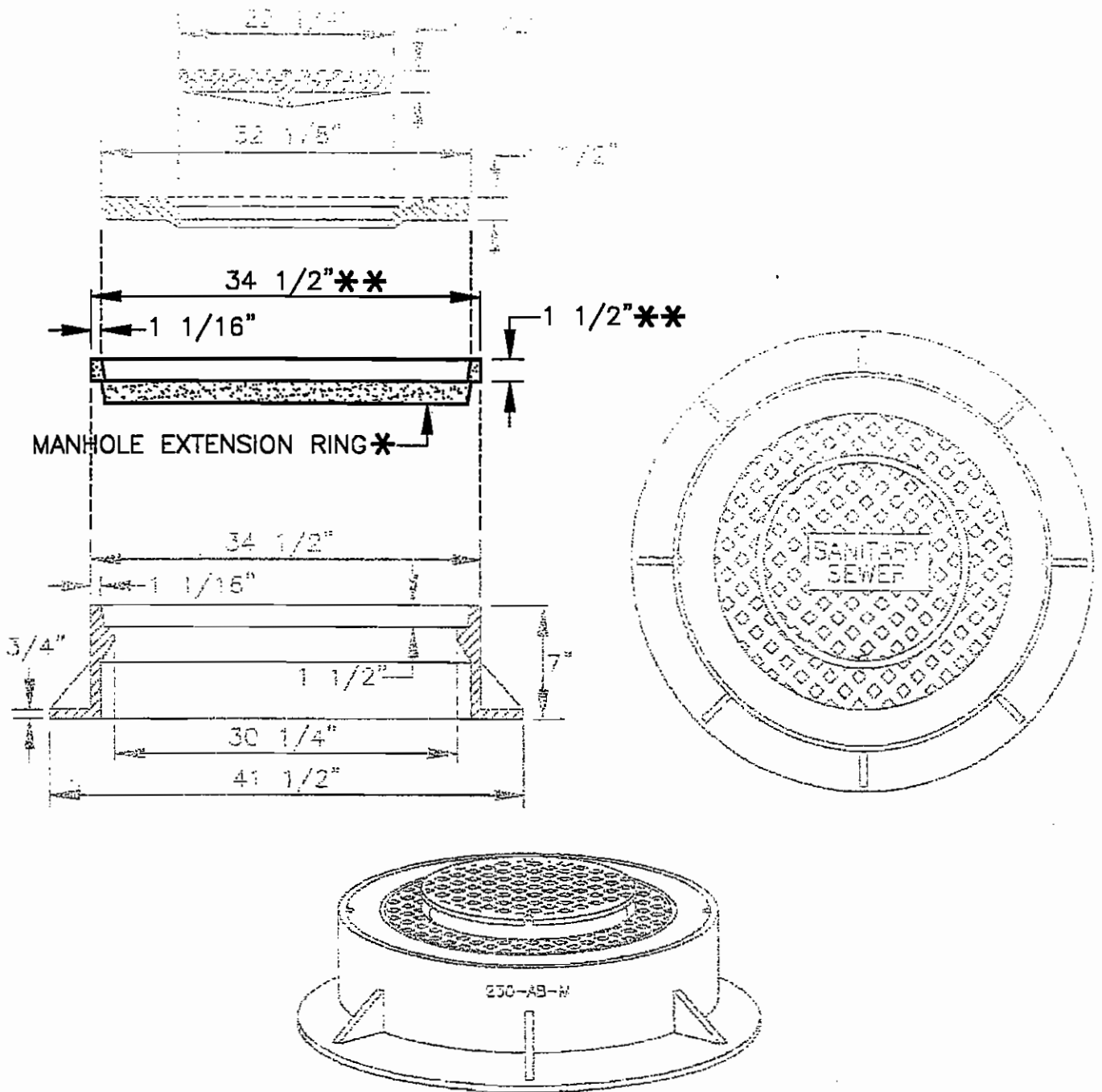
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7



- NOTES: 1. U.S.F. #230-AB-M MANHOLE RING & DOUBLE COVER, APPROXIMATE TOTAL WEIGHT 605 POUNDS
2. IN CASES WHERE A SHALLOW FRAME IS REQUIRED USF MODEL #655 MAY BE SUBSTITUTED FOR MODEL #230-AB-M

MHFRMCOV.DWG

DATE 9/82	LOXAHATCHEE RIVER DISTRICT	SD 8
	MANHOLE FRAME AND COVER	
REVISION 6/98	N.T.S.	



MANHOLE EXTENSION RING*

NOTE: *MANHOLE RING AS MANUFACTURED BY:
 "TURNER COMPANY"
 P.O. BOX 20741
 RALEIGH, NORTH CAROLINA 27619

** RING IS MADE OF POLYPROPYLENE AND FIBERGLASS MIXTURE,
 AND IS AVAILABLE IN VARYING THICKNESSES AND DIAMETERS
 FOR ANY LAYER OF ASPHALT, OR DIAMETER OF MANHOLE.

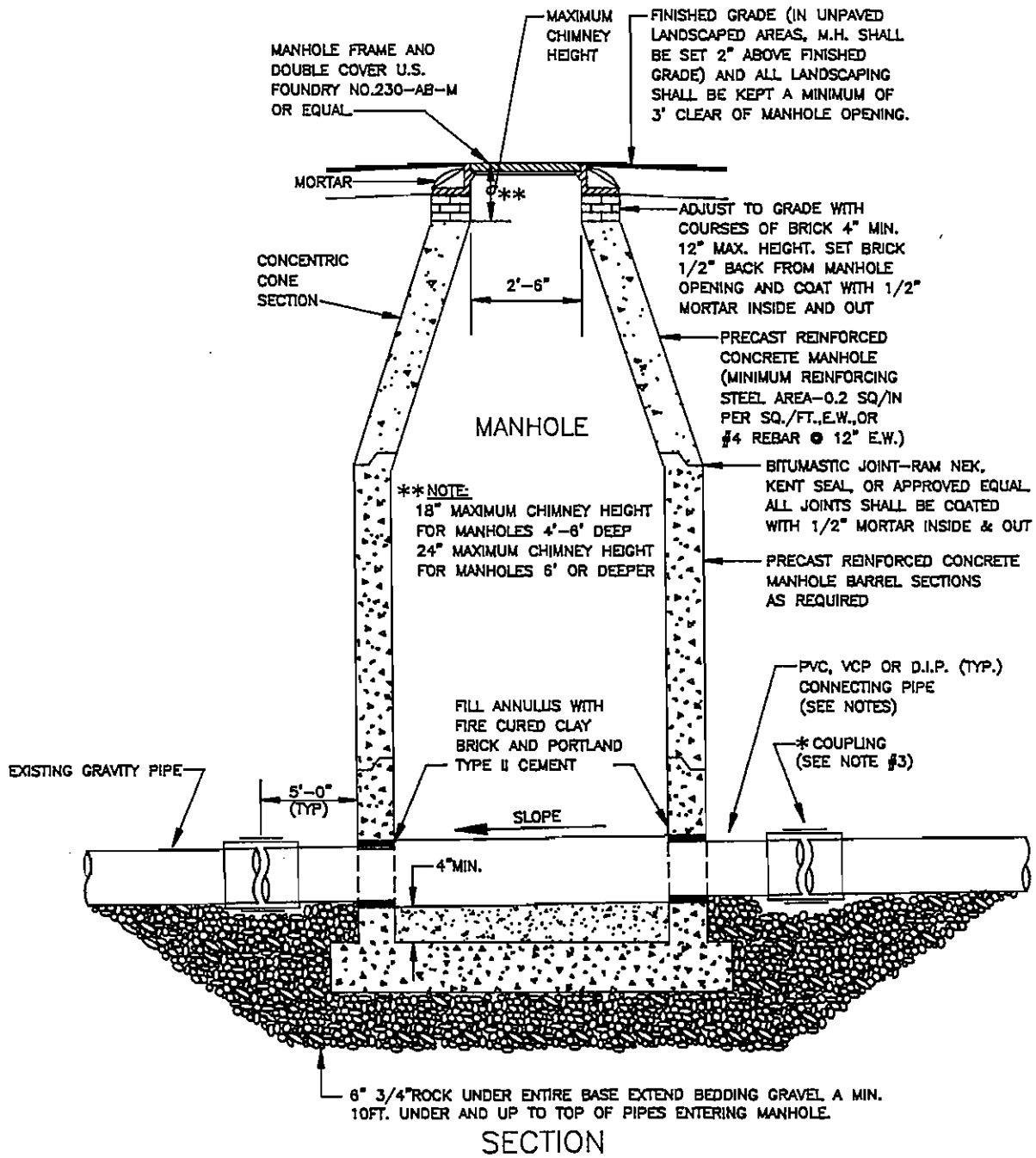
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DATE	4-03
REVISION	

LOXAHATCHEE RIVER DISTRICT
 MANHOLE EXTENSION RING
 N.T.S.

SD
 8A

- NOTES:**
1. WHEN EXISTING GRAVITY PIPE IS VCP OR SDR-35 PVC, SDR26 WILL BE USED TO MAKE CONNECTION. WHEN EXISTING PIPE IS C-900, DIP OR SDR26 USE SIMILAR PIPE TO RECONNECT.
 2. EXISTING SEWAGE FLOWS SHALL BE BY-PASSED BY PUMPING BETWEEN CLOSEST AVAILABLE MANHOLES.
 3. * WHEN EXISTING PIPE IS D.I.P., USE AN APPROVED C-900 COUPLING, WHEN EXISTING PIPE IS V.C.P., USE A FERNCO COUPLING. W/ COPPER WIRE WRAPPED AROUND PIPE AT BOTH ENDS OF FERNCO COUPLING.
 4. WHEN THE MAIN LINE IS PVC, A DISTRICT APPROVED HEAVY AGGREGATE COATED PVC M.H. ADAPTER (HARCO OR EQUAL) OR FERNCO M.H. ADAPTER SHALL BE USED.

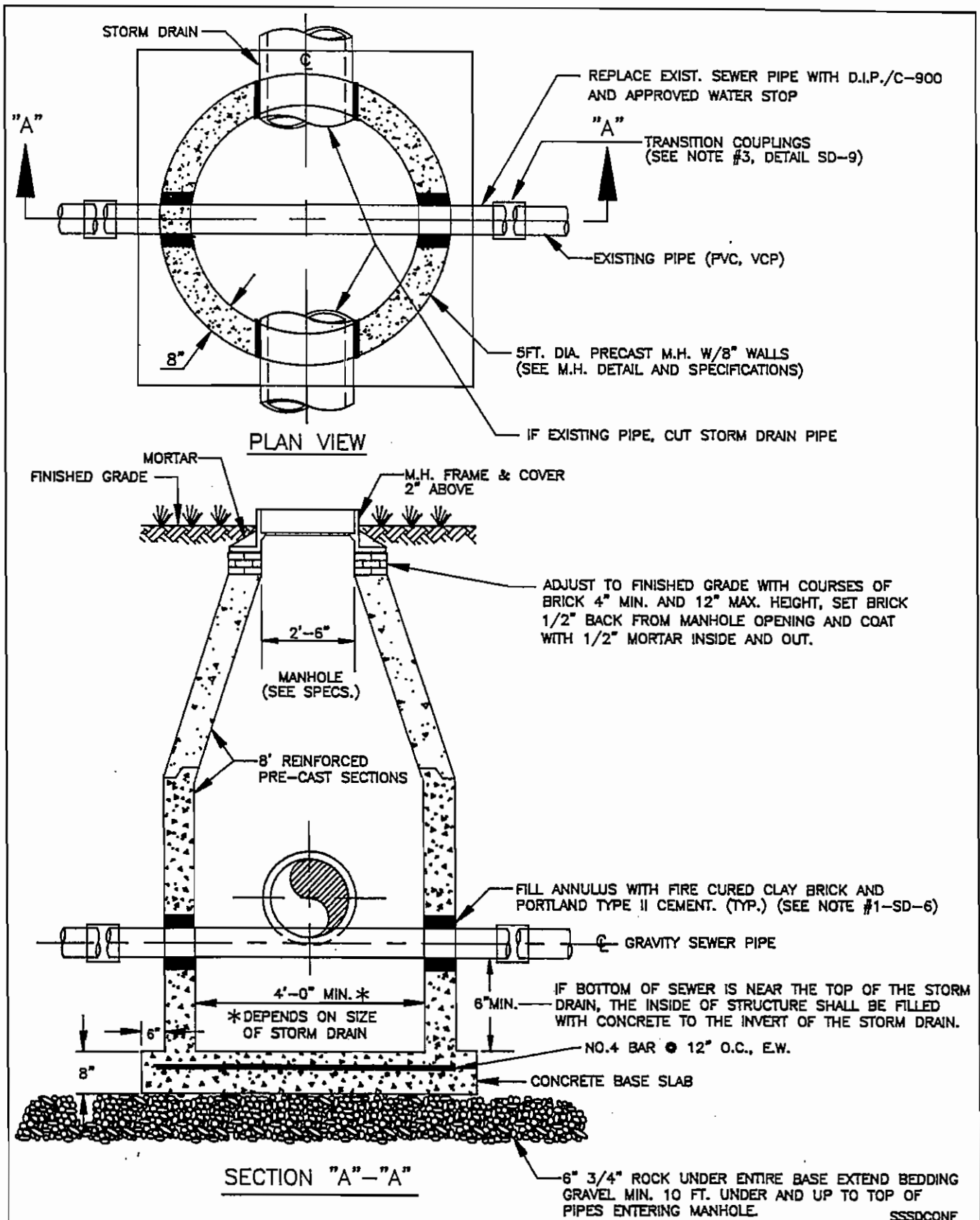


MHTOEXST.DWG

DATE	9/82
REVISION	6/98

LOXAHATCHEE RIVER DISTRICT
 SEWER MANHOLE INSTALLATION INTO
 AN EXISTING GRAVITY SEWER LINE
 N.T.S.

SD
 9



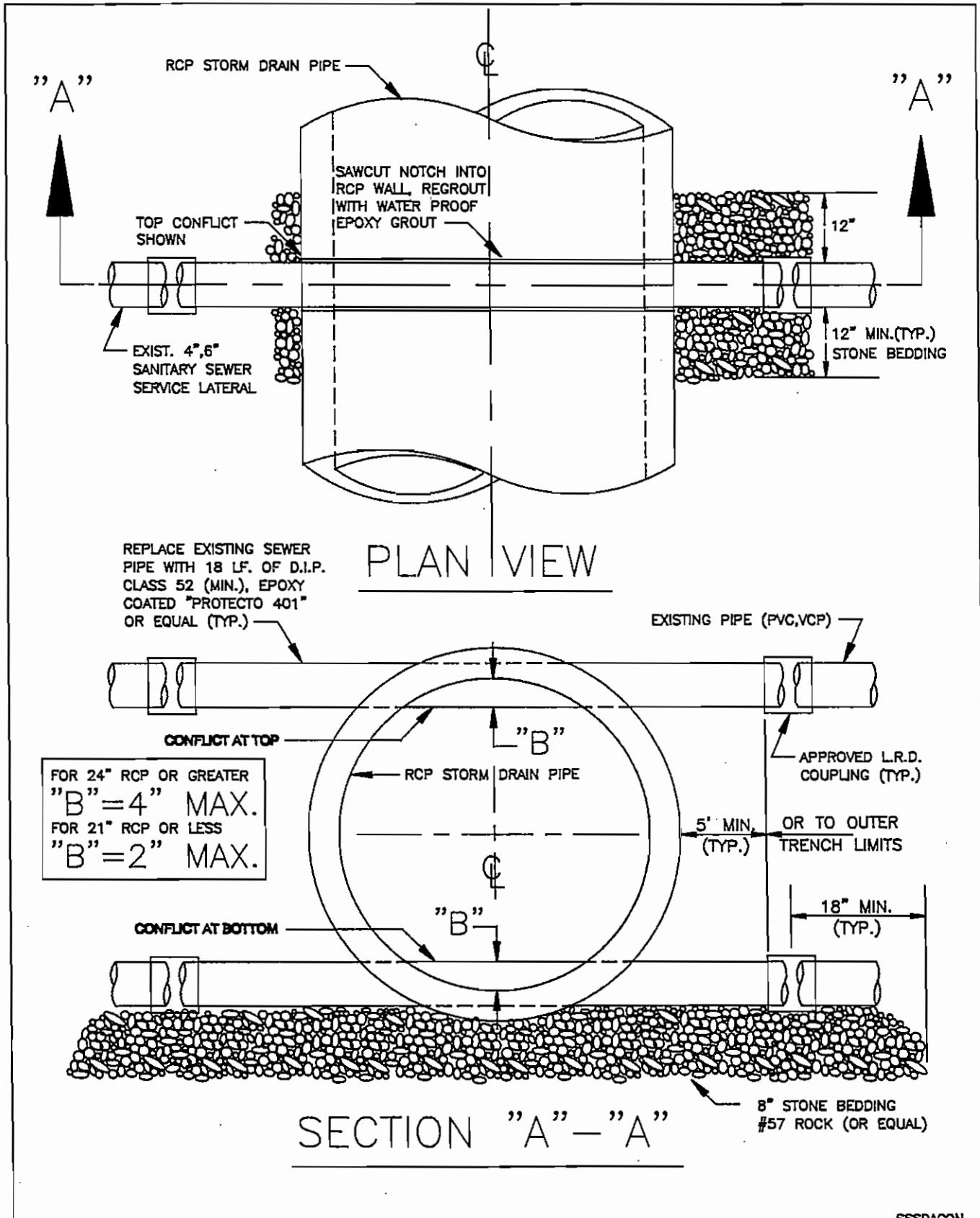
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DATE	2/96
REVISION	6/98

LOXAHATCHEE RIVER DISTRICT
 SANITARY SEWER / STORM DRAIN
 CONFLICT STRUCTURE

SD
 10

(N.T.S.)



SSSDACON

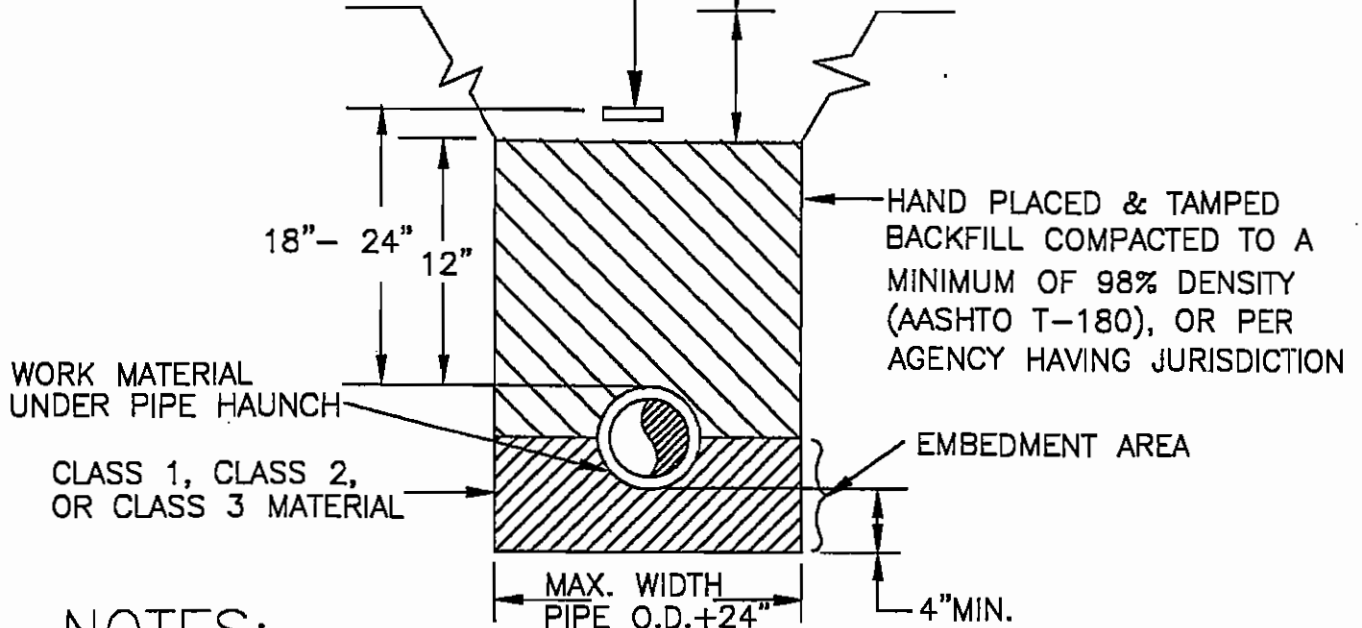
DATE	2/96
REVISION	8/98

LOXAHATCHEE RIVER DISTRICT
SANITARY SEWER / STORM DRAIN
ALTERNATE CONFLICT STRUCTURE
 (N.T.S.)

SD
 10-A

REMAINDER OF BACKFILL MAY BE
 PLACED BY MACHINE AND COMPACTED
 TO A MAXIMUM OF 98% DENSITY
 (AASHTO T-180), OR PER AGENCY
 HAVING JURISDICTION

GREEN FORCE MAIN LOCATOR
 TAPE LABELED "CAUTION FORCE
 MAIN BELOW"



NOTES:

CLASS 1 MATERIAL - ANGULAR 1/4" TO 3/4" GRADED STONE SUCH AS CORAL, CRUSHED STONE, OR CRUSHED SHELLS OR BEDDING ROCK (100% PASSING 1" SIEVE).

CLASS 2 MATERIAL - COURSE SAND AND GRAVEL'S WITH MAXIMUM PARTICLE SIZE OF 3/4-INCH WITH SMALL PERCENTAGE OF FINES COMPACTED TO A MINIMUM OF 90% STANDARD PROCTOR DENSITY.

CLASS 3 MATERIAL - FINE SAND AND CLAYEY GRAVEL'S, INCLUDING FINE SANDS, SAND-CLAY MIXTURES AND GRAVEL-CLAY MIXTURES, COMPACTED TO A MINIMUM OF 90% STANDARD PROCTOR DENSITY. INCLUDED IN CLASS 3 ARE EXISTING SOIL TYPES CLASSIFIED AS SELECT BACKFILL.

IF CLASS 1 MATERIAL IS USED FOR BEDDING, IT MUST BE USED FOR THE ENTIRE EMBEDMENT AREA.

A DRY TRENCH SHALL BE MAINTAINED WHEN USING CLASS 2 AND CLASS 3 MATERIAL.

TYPICAL F.M. COVER WILL BE 30"

DIPFMEMB.DWG

DATE	9/82
REVISION	1/02

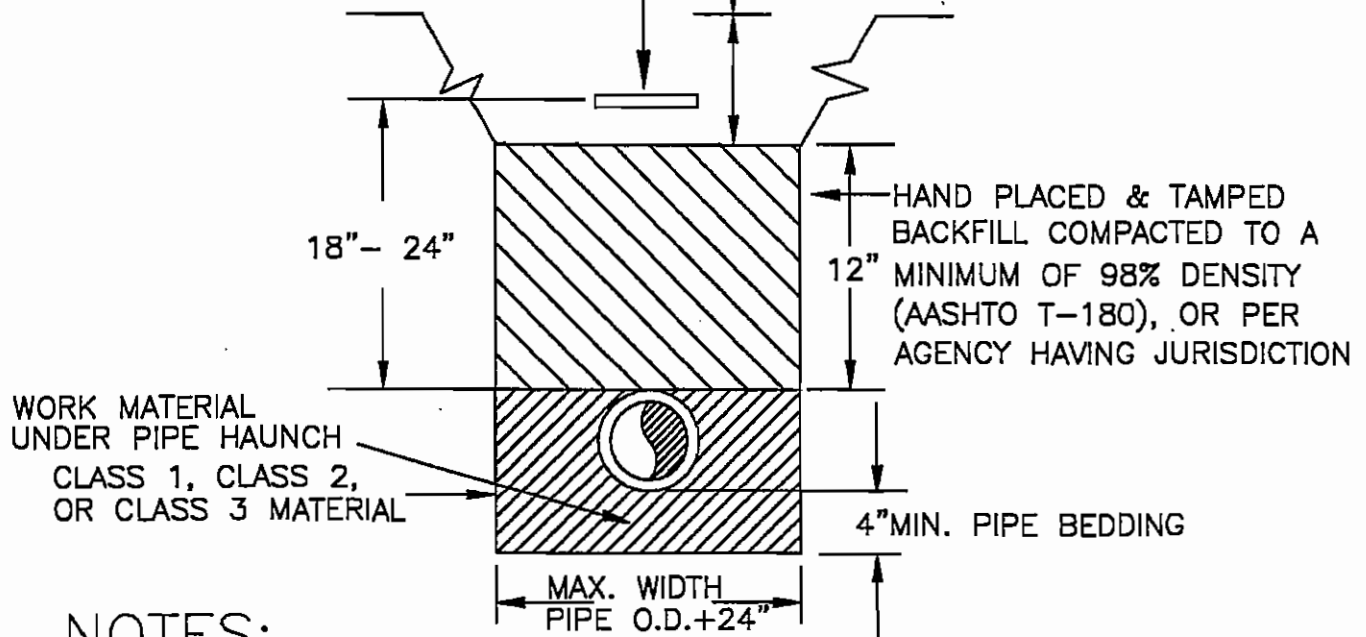
LOXAHATCHEE RIVER DISTRICT
DUCTILE IRON PIPE
FORCE MAIN EMBEDMENT

N.T.S.

SD
 11

REMAINDER OF BACKFILL MAY BE
 PLACED BY MACHINE AND COMPACTED
 TO A MINIMUM OF 90% DENSITY
 (AASHTO T-180), OR PER AGENCY
 HAVING JURISDICTION

GREEN FORCE MAIN LOCATOR
 TAPE LABELED "CAUTION FORCE
 MAIN BELOW"



NOTES:

CLASS 1 MATERIAL - ANGULAR 1/4" TO 3/4" GRADED STONE SUCH AS CORAL, CRUSHED STONE, OR CRUSHED SHELLS OR BEDDING ROCK (100% PASSING 1" SIEVE).

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CLASS 3 MATERIAL - FINE SAND AND CLAYEY GRAVEL'S, INCLUDING FINE SANDS, SAND-CLAY MIXTURES AND GRAVEL-CLAY MIXTURES, COMPACTED TO A MINIMUM OF 90% STANDARD PROCTOR DENSITY. INCLUDED IN CLASS 3 ARE EXISTING SOIL TYPES CLASSIFIED AS SELECT BACKFILL.

IF CLASS 1 MATERIAL IS USED FOR BEDDING, IT MUST BE USED FOR THE ENTIRE EMBEDMENT.

A DRY TRENCH SHALL BE MAINTAINED WHEN USING CLASS 2 AND CLASS 3 MATERIAL.

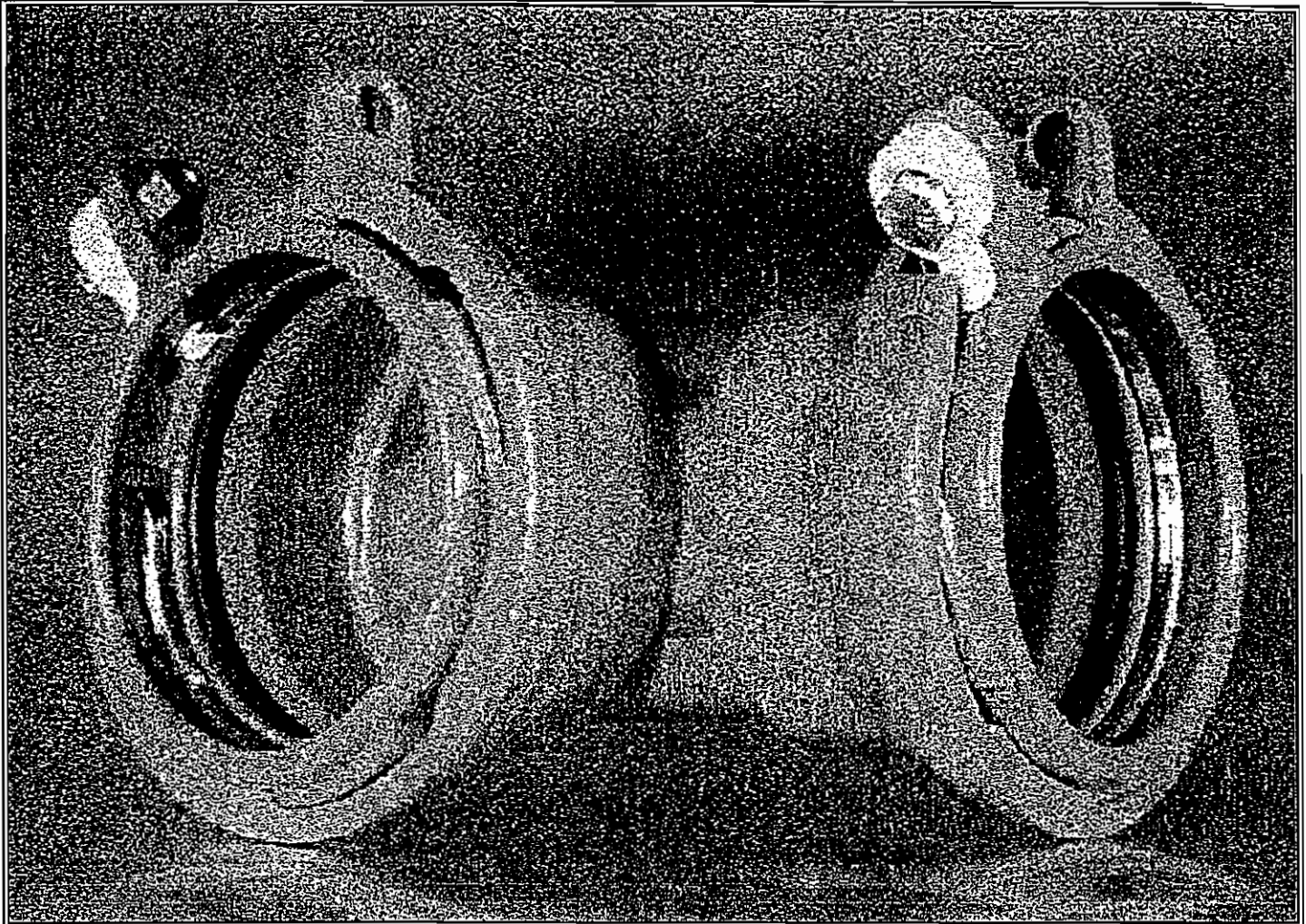
PVCFMEMB.DWG

DATE	9/82
REVISION	1/02

LOXAHATCHEE RIVER DISTRICT
PVC PIPE
FORCE MAIN EMBEDMENT

N.T.S.

SD
 12



**TYPICAL FITTING INDICATING, ONLY ONE BOLT METHOD OF RESTRAINT
(4" 90° BEND SHOWN)**

- NOTE:
1. UTILIZES ONE BOLT METHOD OF RESTRAINT.
 2. FOR USE ON DUCTILE IRON AND PVC PIPE.
 3. DUCTILE IRON EPOXY COATED (INSIDE AND OUTSIDE).
 4. MANUFACTURED IN 90° BEND, 45° BEND, 22 1/2° BEND AND 11 1/4° BEND. (4"-12")
 5. MANUFACTURED IN SLEEVE SIZES: 4", 6", 8", 10", AND 12".
 6. FITTINGS SHALL HAVE AN EMS MARKER INSTALLED AT THE LOCATION.
 7. FITTINGS ARE EQUAL TO THOSE AS MANUFACTURED BY:

ONE BOLT, INC.
169 CAHABA VALLEY PARKWAY
PELHAM, ALABAMA 35124

ONE_BOLT.DWG

DATE

4/03

LOXAHATCHEE RIVER DISTRICT

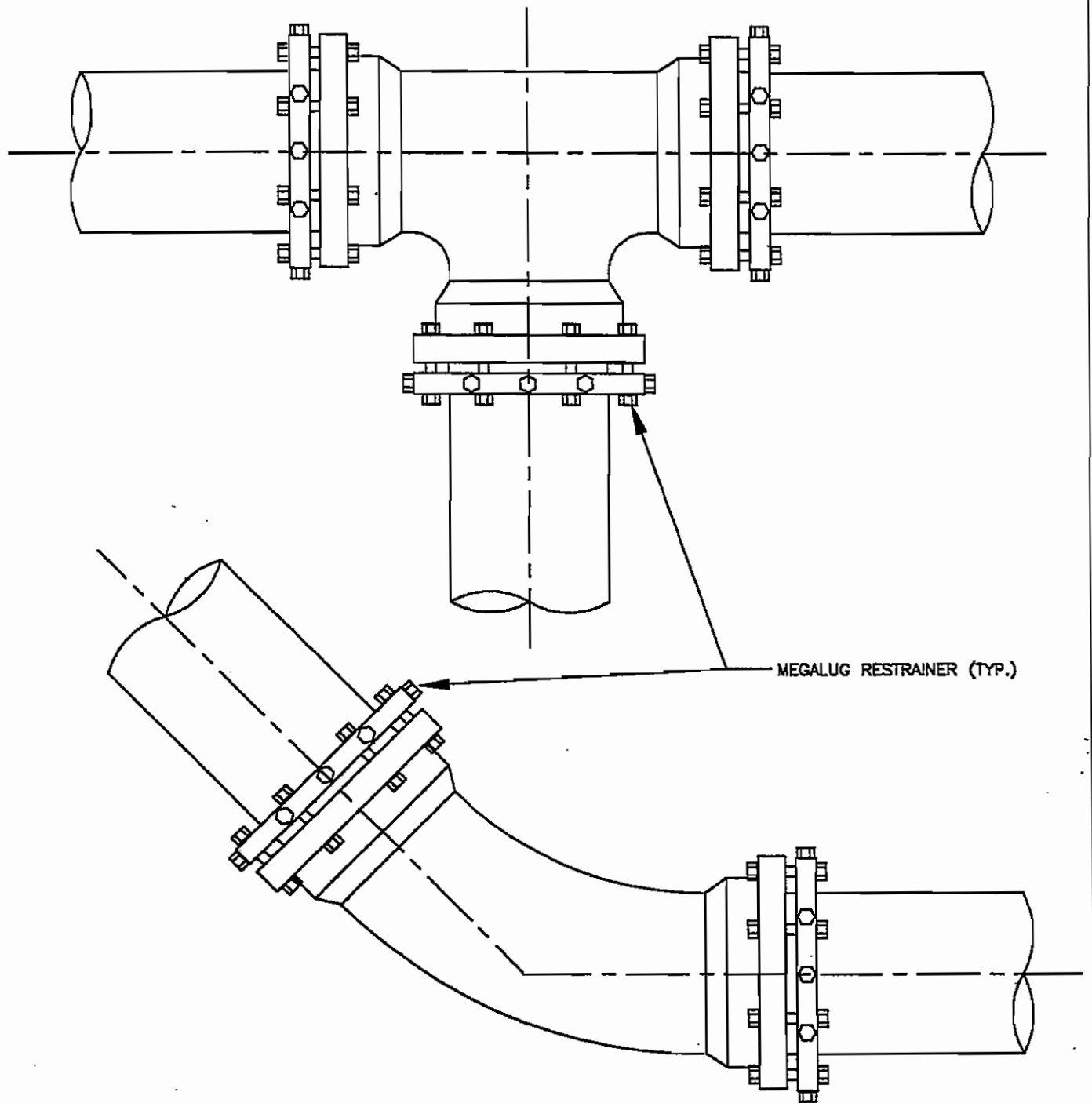
ALTERNATE RESTRAINT FITTING

SD

13

REVISION

(N.T.S.)



- NOTE: 1. RETAINER GLANDS FOR PVC PIPE OR DUCTILE IRON PIPE SHALL BE USED AT BEND'S OR TEE'S; RETAINER GLANDS SHALL BE MANUFACTURED BY UNI-FLANGE CORP., OR "MEGALUG" BY EBAA IRON SALES INC., OR DISTRICT APPROVED EQUAL.
2. THE NUMBER OF JOINTS RESTRAINED EACH SIDE OF ANY FITTING OR VALVE SHALL BE IN ACCORDANCE WITH THE MANUFACTURER RECOMMENDATION.
3. ALL BEND'S & TEE'S SHALL HAVE AN EMS INSTALLED.
4. SEE ALTERNATE RESTRAINT FITTING: SD-13

THRUSTBK

DATE
3/96

LOXAHATCHEE RIVER DISTRICT
FORCE MAIN THRUST RESTRAINT

SD
14

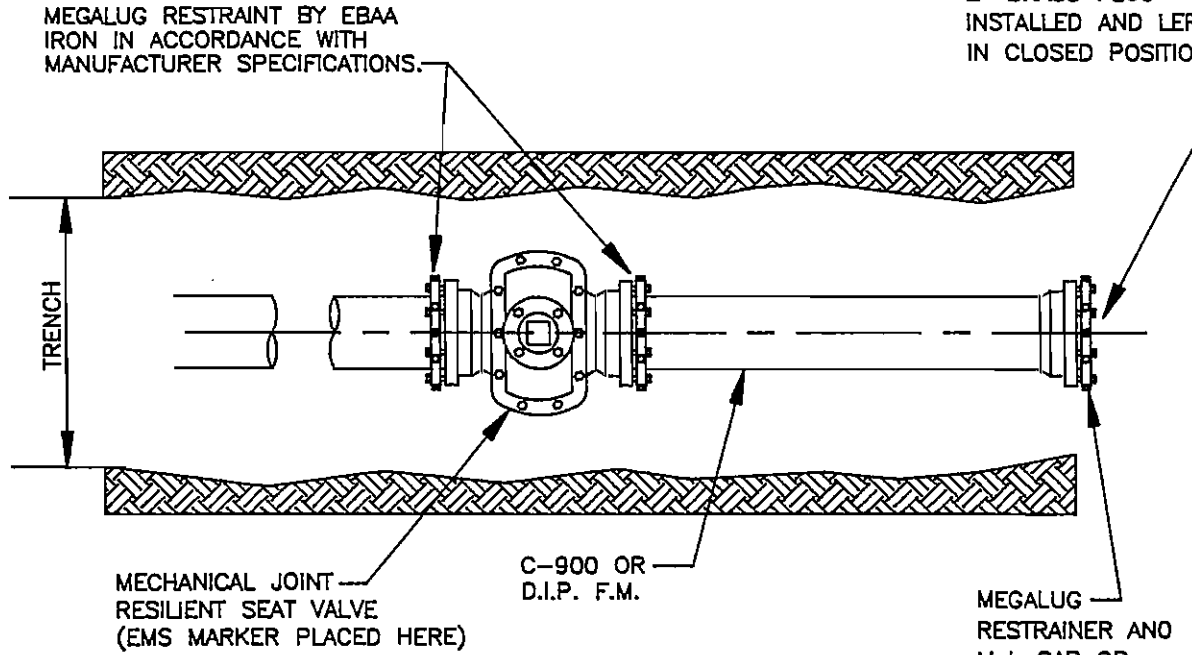
REVISION
4/03

(N.T.S.)

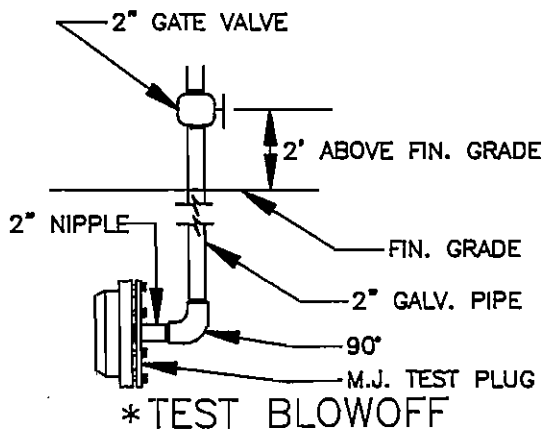
NOTE:

ALL JOINTS WILL BE RESTRAINED BY "MEG-A-LUG" RESTRAINERS AS MANUFACTURED BY EBAA IRON. THE NUMBER OF JOINTS TO BE RESTRAINED SHALL BE BASED ON MANUFACTURER'S RECOMENDATIONS FOR APPLICABLE TEST PRESSURE RATINGS.

*IF TEST BLOWOFF USED IT WILL BE REMOVED PRIOR TO FINAL, M.J. PLUG INSTALLED OR 2" BRASS PLUG INSTALLED AND LEFT IN CLOSED POSITION.



PLAN

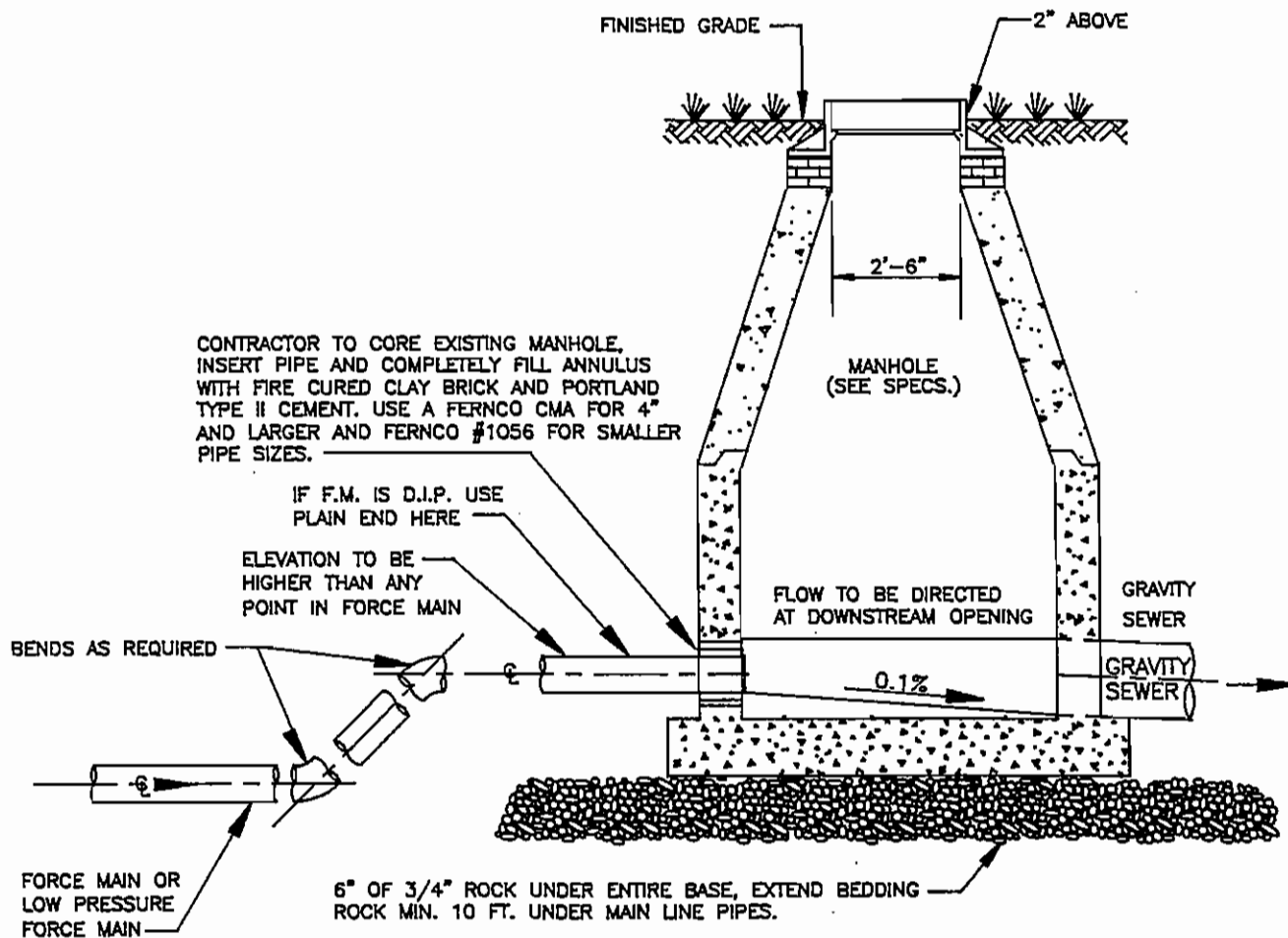


DATE	3/96
REVISION	6/98

LOXAHATCHEE RIVER DISTRICT
FORCE MAIN TERMINAL END DETAIL
 (N.T.S.)

FMTMENDT

SD
15

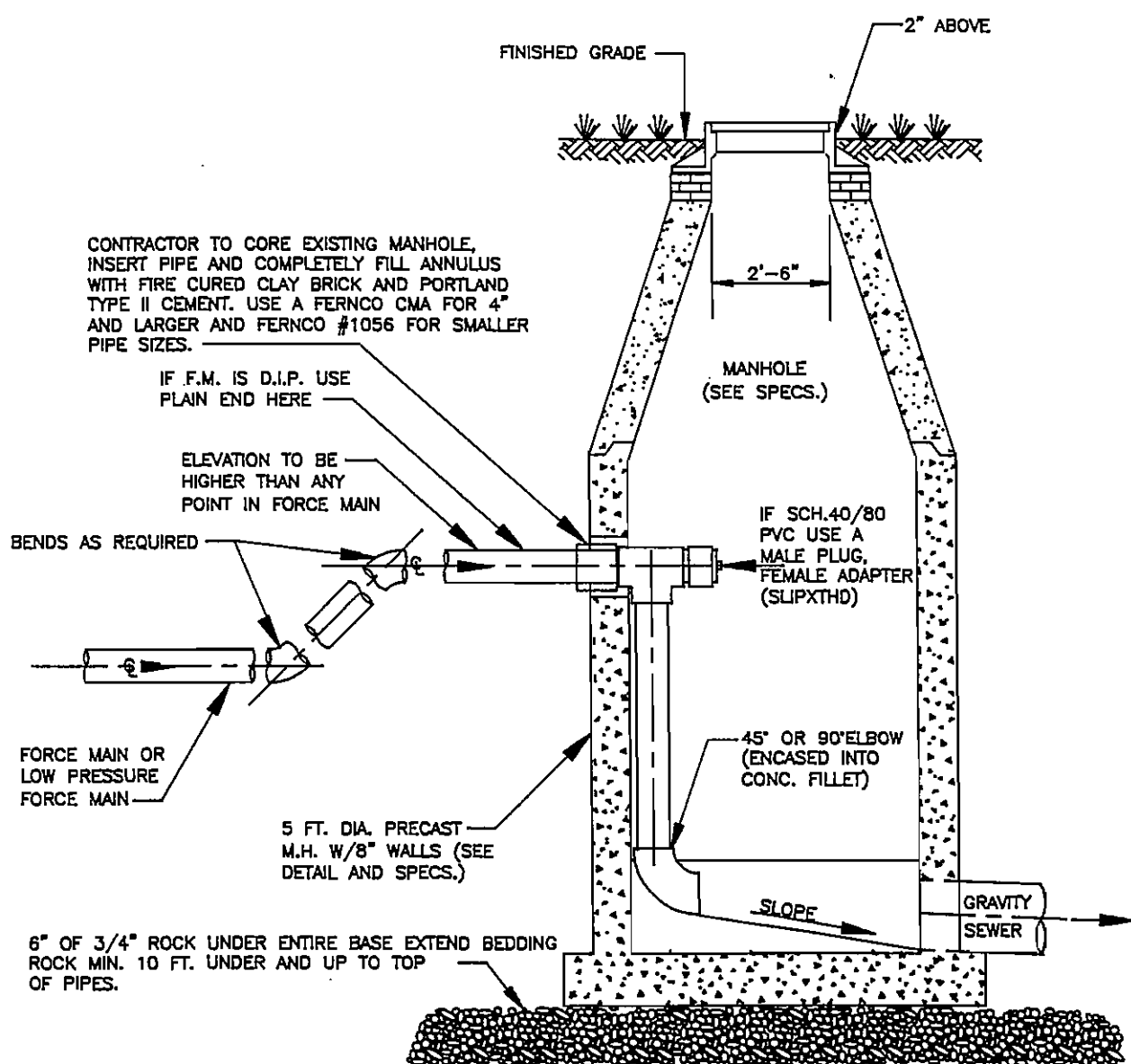


NOTES:

1. WHEN ELEVATION OF FORCE MAIN AT MANHOLE IS HIGHEST POINT OF FORCE MAIN, BENDS CAN BE ELIMINATED.

FMTOSHHM

DATE 3/95	LOXAHATCHEE RIVER DISTRICT	SD 16
REVISION 6/98	FORCE MAIN INTO SHALLOW MANHOLE (N.T.S.)	

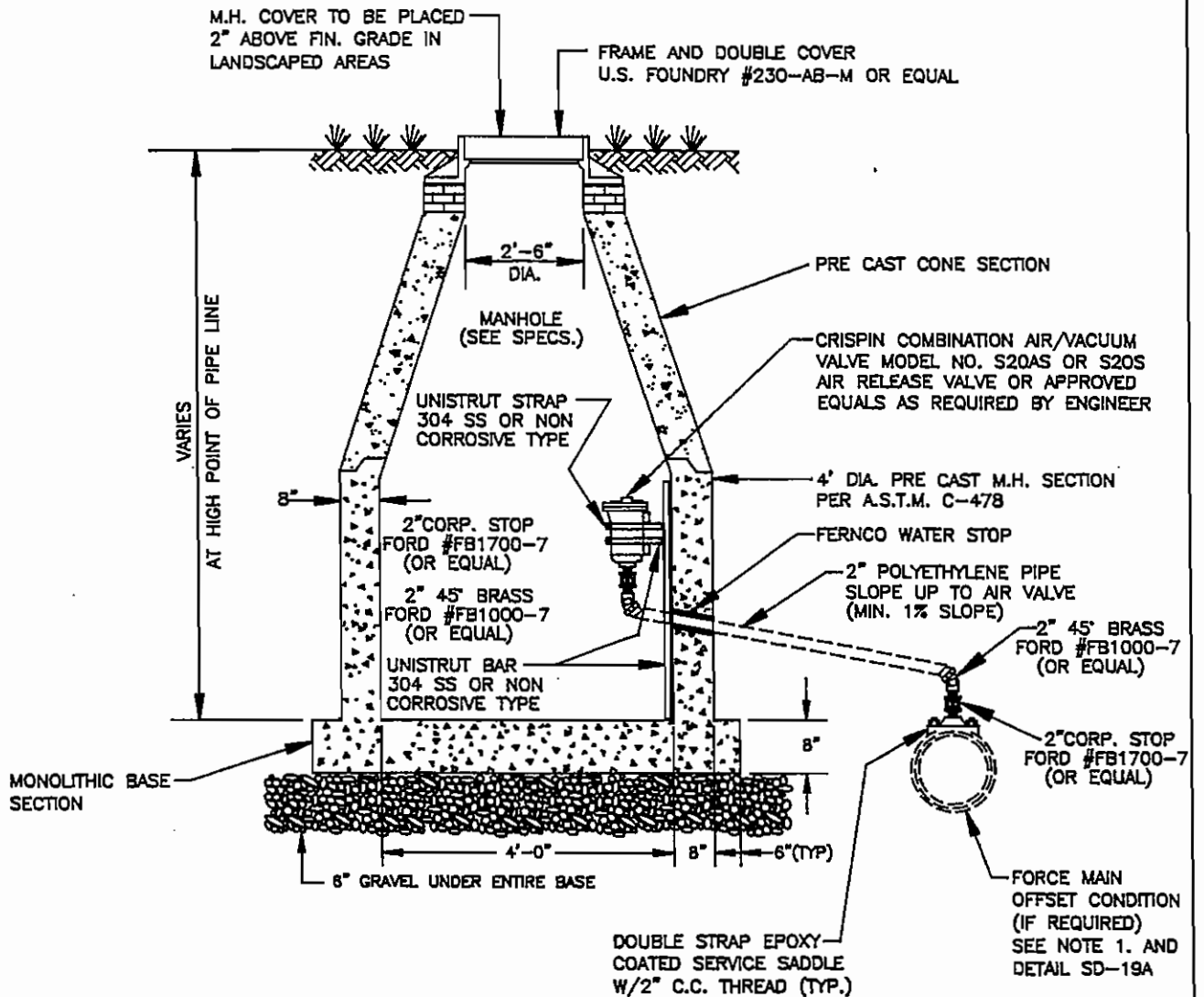


NOTES:

1. ALL DROP PIPING INCLUDING TEE SHALL BE D.I.P., PVC (C-900), OR SCH 40/80 PVC.

FMTODPMH

DATE	3/95	LOXAHATCHEE RIVER DISTRICT	SD
REVISION	6/98		
		FORCE MAIN INTO DEEP MANHOLE	17
		(N.T.S.)	



NOTE

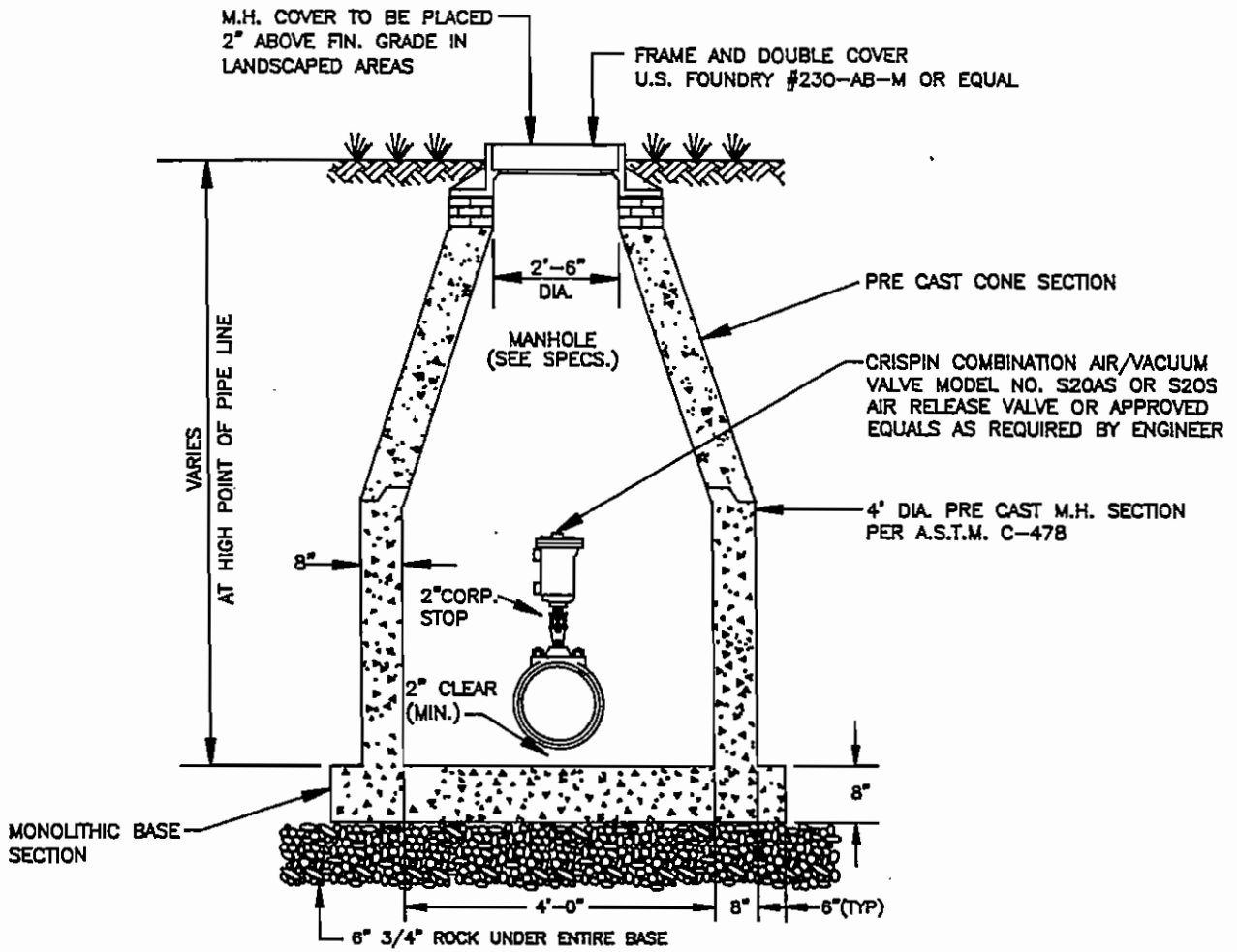
1. FOR OFFSET CONDITION, AIR VALVE IN MANHOLE STRUCTURE SHALL BE ADEQUATELY SUPPORTED ON S.S. UNISTRUT BAR ANCHORED TO THE CONCRETE WALLS OF MANHOLE AND/OR ANCHORED TO THE CONCRETE ON MANHOLE FLOOR.
2. UNISTRUT BARS SHALL BE 304 S.S. OR NON CORROSIVE TYPE, STRAPS ANCHORING A.R.V. TO UNISTRUT TO BE OF SAME TYPE MATERIAL.
3. IN GRASSED OR SWALE AREAS, IN LIEU OF A MANHOLE STRUCTURE, AIR RELEASE VALVE MAY BE PLACED IN A CDR BOX, SEE STANDARD DETAIL SD-19A.

ATORELVL_OFF_SET

DATE	6/98
REVISION	
REVISION	

LOXAHATCHEE RIVER DISTRICT
AUTOMATIC AIR RELEASE VALVE
OFFSET FORCE MAIN CONDITION
 (N.T.S.)

SD
18



NOTE

1. IF OFFSET CONDITION IS UTILIZED, AIR VALVE IN MANHOLE STRUCTURE SHALL BE ADEQUATELY SUPPORTED ON A 4" THICK CONCRETE PAD ON M.H. FLOOR.
2. IN GRASSED OR SWALE AREAS, IN LIEU OF A MANHOLE STRUCTURE, AIR RELEASE VALVE MAY BE PLACED IN A CDR BOX, SEE DETAIL SD-19A.

ATORELVL

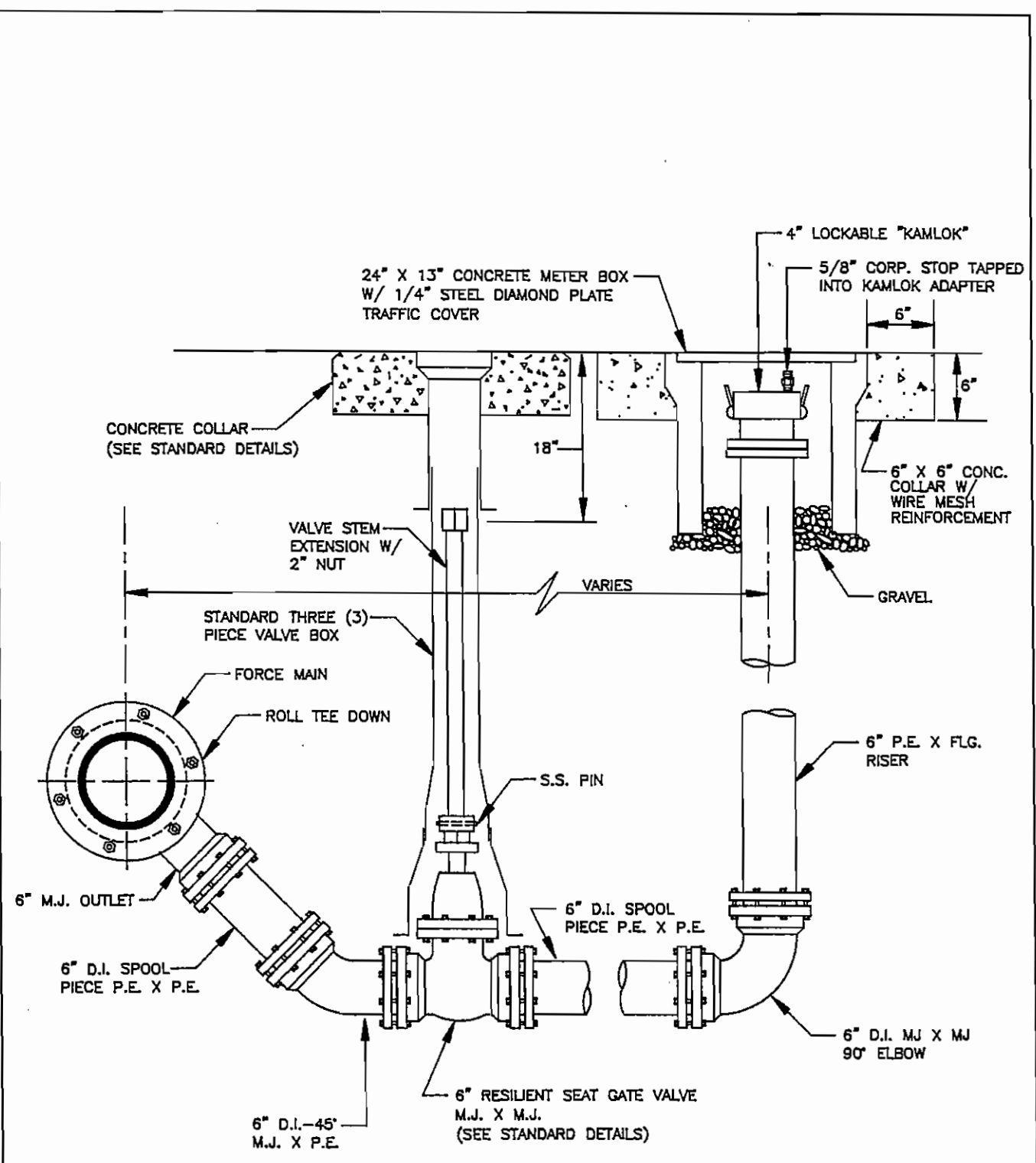
DATE	3/96
REVISION	
	5/97
REVISION	
	6/98

LOXAHATCHEE RIVER DISTRICT

AUTOMATIC AIR RELEASE VALVE

(N.T.S.)

SD
19



NOTES:
 KAMLOK & VALVE BOXES SHALL HAVE E.M.S. MARKERS, (1 AT EACH BOX IF MORE THAN 5' APART)
 ALL MJ FITTINGS TO BE RESTRAINED WITH "MEG-A-LUG" RETAINERS AS MFG. BY EBBA IRON INC.

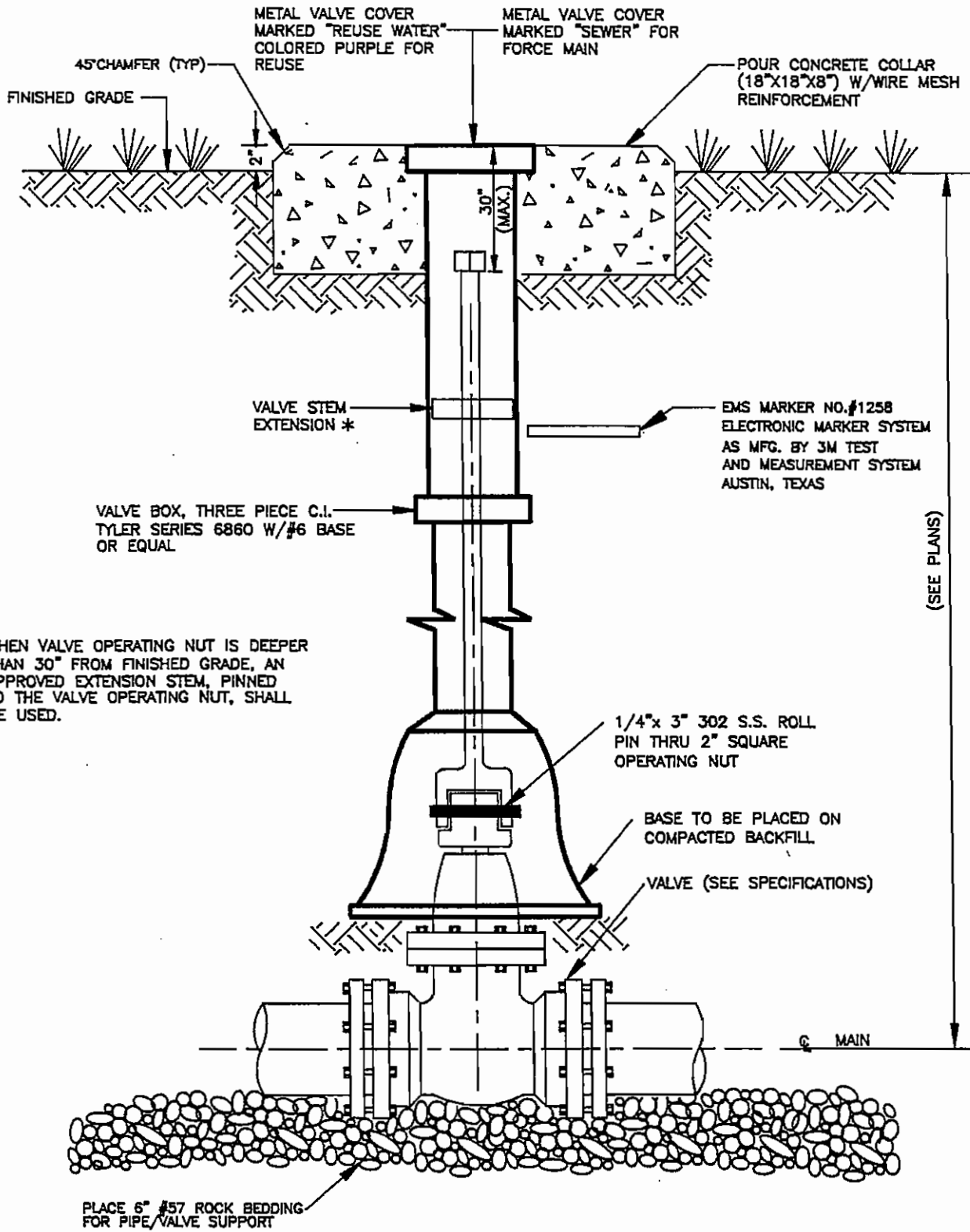
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DATE	3/96
REVISION	
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REVISION	
	6/98

LOXAHATCHEE RIVER DISTRICT
 FORCE MAIN
 LOW POINT DRAIN DETAIL
 (N.T.S.)

SD
 20

FORCE MAIN OR REUSE WATER SYSTEM



* WHEN VALVE OPERATING NUT IS DEEPER THAN 30" FROM FINISHED GRADE, AN APPROVED EXTENSION STEM, PINNED TO THE VALVE OPERATING NUT, SHALL BE USED.

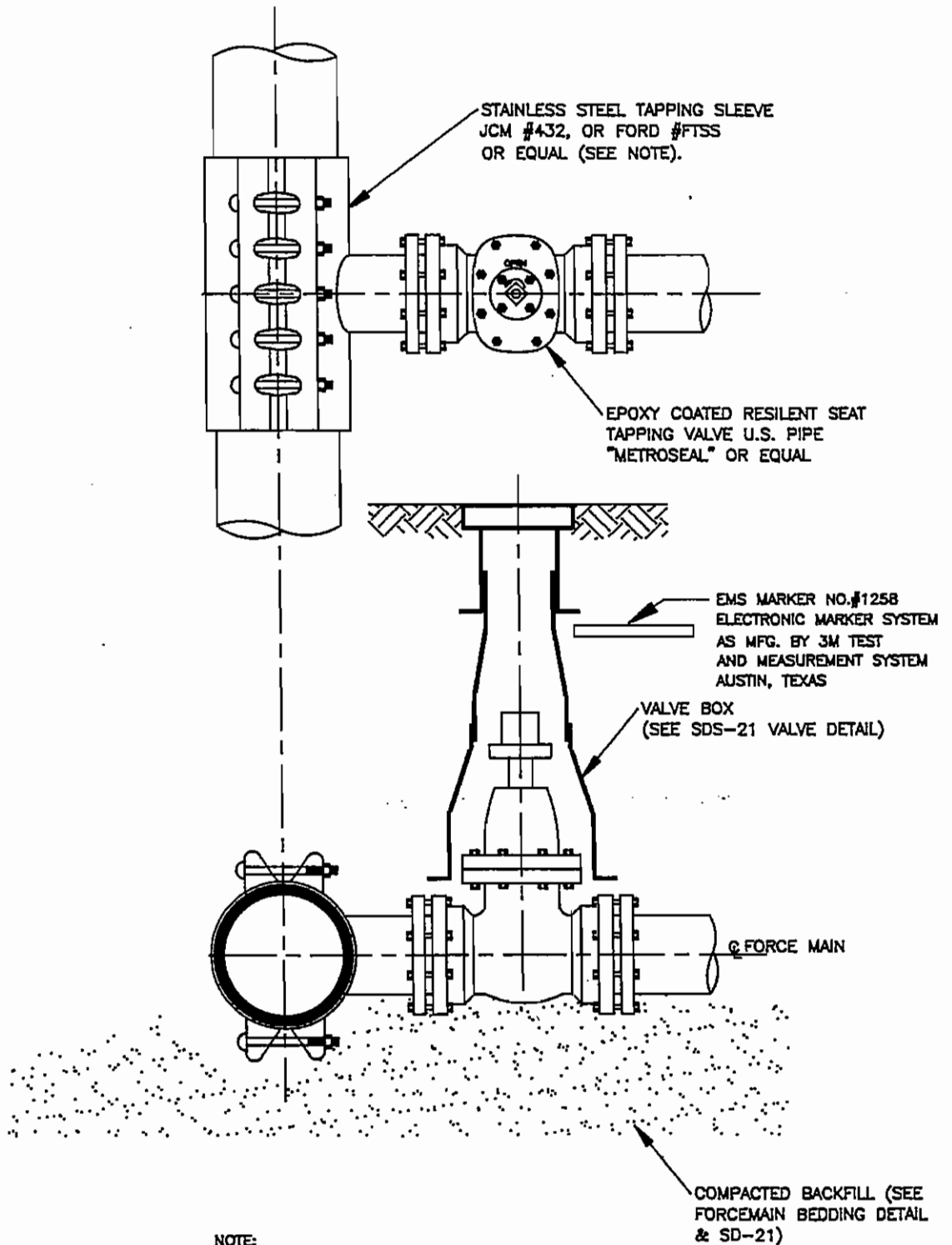
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DATE	3/96
REVISION	
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	6/98

LOXAHATCHEE RIVER DISTRICT
BURIED VALVE DETAIL

SD
21

(N.T.S.)



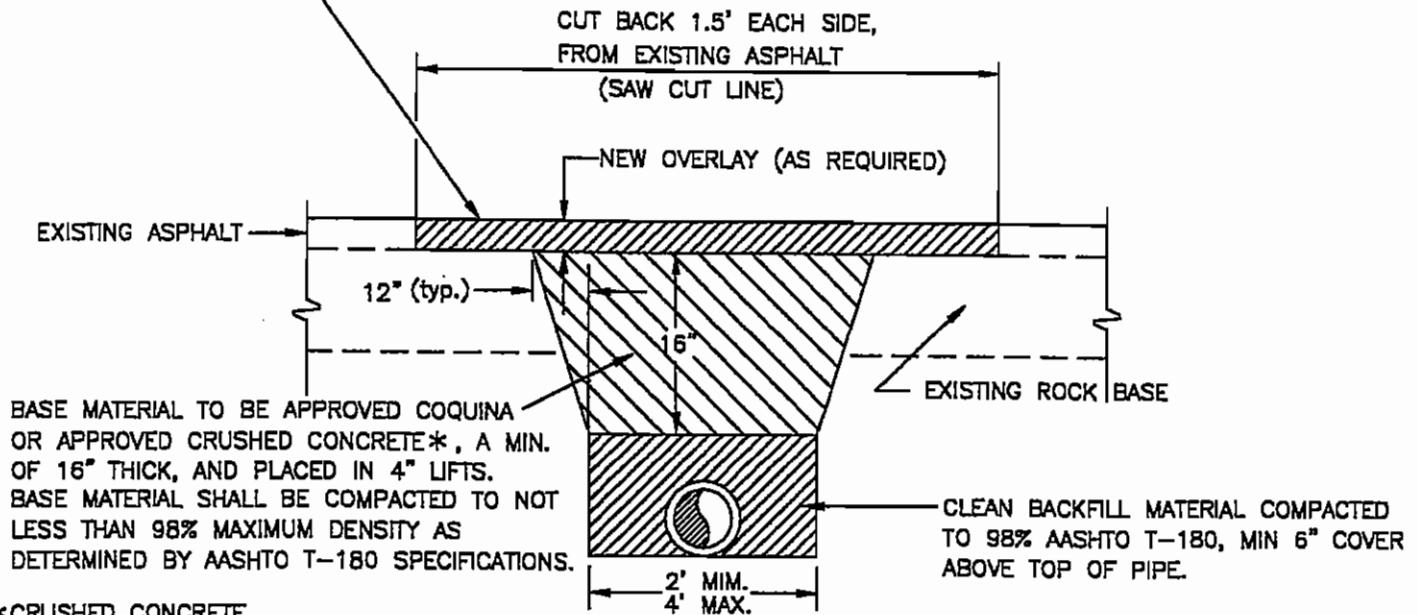
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DATE	3/96
REVISION	
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REVISION	
	11/98

LOXAHATCHEE RIVER DISTRICT
TAPPING FORCE MAIN
 (N.T.S.)

SD
22

REPLACEMENT PAVEMENT (OVERLAY) MUST BE TYPE S-1(MOD.) OR S-3 ASPHALTIC CONCRETE HOT MIX, WITH TACK COAT. IT MUST BE ROLLED OR COMPACTED TO A SMOOTH SURFACE LEVEL WITH EXISTING ROAD SURFACE.



*CRUSHED CONCRETE

97% PASSING 3" SIEVE NOT MORE THAN 20% PASSING #200 SIEVE LBR >100 CONTAIN 60% CARBONATES.

NOTES:

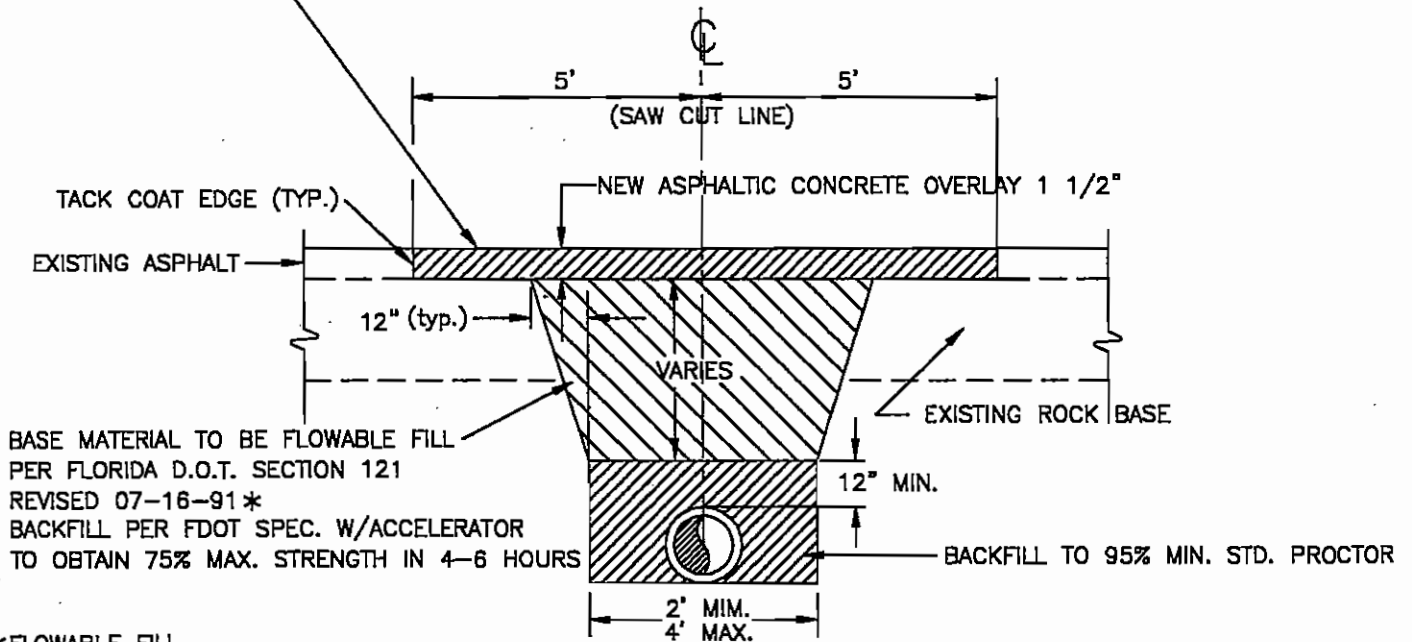
1. ALL CUTS WILL REQUIRE COMPACTION TO DENSITY SPECIFICATIONS.
2. SAW CUT ASPHALT BEFORE EXCAVATING.
3. COMPACTION MUST BE DONE BY A MECHANICAL VIBRATORY COMPACTOR. EACH LIFT MUST RECEIVE 5 PASSES OF THE COMPACTOR OVER ENTIRE SURFACE. BEFORE COMPACTING EACH LIFT, WATER MUST BE APPLIED AT THE RATE OF 1 GAL PER LINEAL FOOT OF THE TRENCH FOR BACKFILL AND 1/2 GAL PER LINEAL FOOT OF TRENCH FOR COQUINA BASE. WATER TO BE SPRINKLED EVENLY OVER TRENCH WIDTH.

DATE	9/82
REVISION	1/02

LOXAHATCHEE RIVER DISTRICT
TYPICAL TRENCH / PAVEMENT RESTORATION DETAIL
 N.T.S.

PAVOVERL.DWG
 SD
 23

REPLACEMENT PAVEMENT (OVERLAY) MUST BE TYPE S-1(MOD.) OR S-3 ASPHALTIC CONCRETE HOT MIX, WITH TACK COAT. IT MUST BE ROLLED OR COMPACTED TO A SMOOTH SURFACE LEVEL WITH EXISTING ROAD SURFACE.



***FLOWABLE FILL**

97% PASSING 3" SIEVE NOT MORE THAN 20%
 PASSING #200 SIEVE LBR >100 CONTAIN 60%
 CARBONATES.

NOTES:

1. ALL CUTS WILL REQUIRE COMPACTION TO DENSITY SPECIFICATIONS.
2. SAW CUT ASPHALT BEFORE EXCAVATING.
3. COMPACTION MUST BE DONE BY A MECHANICAL VIBRATORY COMPACTOR. EACH LIFT MUST RECEIVE 5 PASSES OF THE COMPACTOR OVER ENTIRE SURFACE. BEFORE COMPACTING EACH LIFT, WATER MUST BE APPLIED AT THE RATE OF 1 GAL PER LINEAL FOOT OF THE TRENCH FOR BACKFILL AND 1/2 GAL PER LINEAL FOOT OF TRENCH FOR COQUINA BASE. WATER TO BE SPRINKLED EVENLY OVER TRENCH WIDTH.

SD-24.DWG

DATE	1-01
REVISION	

LOXAHATCHEE RIVER DISTRICT
TYPICAL TRENCH / PAVEMENT
FLOWABLE FILL RESTORATION DETAIL

N.T.S.

SD
 24

RECORD DRAWING SUBMITTAL GUIDE

THE FOLLOWING SHALL BE USED AS A GUIDE FOR SUBMITTAL OF RECORD DRAWINGS TO:
LOXAHATCHEE RIVER DISTRICT

1. TWO (2) SETS OF PRINTS SHALL BE SUBMITTED TO THE DISTRICT FOR REVIEW 48 HOURS PRIOR TO REQUESTING INSPECTIONS SUCH AS, FINAL INSPECTION, PRESSURE TESTS, SANITARY SEWER LAMPING OR ANY OTHER ELEMENT OF THE SYSTEM WHICH IS DETERMINED BY THE DISTRICT TO REQUIRE CLARIFICATION.
2. THE DRAWINGS WILL BE REVIEWED BY THE DISTRICT FOR DEFICIENCIES. DEFICIENCIES WILL BE INDICATED ON ONE (1) SET OF PRINTS WHICH WILL BE RETURNED TO THE E.O.R. FOR NECESSARY CORRECTIVE ACTION.
3. UPON CORRECTION, TWO (2) SETS OF PRINTS (SIGNED AND SEALED BY A FLORIDA REGISTERED ENGINEER) SHALL BE SUBMITTED.
4. NO DISCLAIMERS ON DRAWINGS WILL BE ACCEPTED.

REQUIRED INFORMATION ON RECORD DRAWINGS

THE FOLLOWING LIST OF REQUIRED INFORMATION IS TO BE USED AS A GUIDE FOR SUBMITTAL OF RECORD DRAWINGS TO THE DISTRICT. ADDITIONAL INFORMATION MAY BE REQUIRED BY THE DISTRICT IF IT IS DETERMINED BY THE DISTRICT THAT THE INFORMATION SUPPLIED WOULD BE INSUFFICIENT FOR A UTILITY WORKER, WITH NO SURVEYING EXPERIENCE, TO BE ABLE TO LOCATE MAINS, FITTINGS, ETC.

GENERAL

1. DRAWINGS ON 24" X 36" VELLUM THAT WILL REPRODUCE LEGIBLY
2. LABEL DRAWINGS "RECORD DRAWINGS" WITH DATE.
3. COMPLETE TITLE BLOCK WITH CURRENT FILE NAME.
4. CORRECT STREET/ROAD NAMES AND LOT AND BLOCK NUMBERS.
5. SHOW AS-BUILT CONSTRUCTED SEWER FACILITIES HEAVIED UP, BOLD OR BOXED OUT TO STAND OUT FROM REST OF EACH DRAWING.

GRAVITY SEWER

1. AS-BUILT DISTANCE OF GRAVITY MAIN FROM CENTER LINE OF ROAD OR EASEMENT RIGHT-OF-WAY LINE, BUILDINGS, OR AS DETERMINED BY THE LOXAHATCHEE RIVER DISTRICT. EXTENSIONS OF AN IMAGINARY LINE WILL NOT BE ACCEPTABLE AS REFERENCED POINTS.
 2. TYPE OF MATERIALS INSTALLED - MAINS AND SERVICES.
 3. STATIONING OF EACH MANHOLE.
 4. STATIONING OF EACH SEWER SERVICE FROM SEWER NEAREST MANHOLE AND DISTANCE (OFFSET) FROM SEWER MAIN.
 5. AS-BUILT ELEVATIONS - EACH INVERT.
 6. AS-BUILT RIM ELEVATION.
 7. AS-BUILT SEWER SLOPE.
 8. COMPLETE LIFT STATION DETAILS INCLUDING START UP DATA.
 9. LIFT STATION AND UTILITY EASEMENTS, INCLUDING LOCATION OF F.P.&L SERVICE TO CONTROL PANEL
- #### PRESSURE PIPE
1. AS-BUILT DISTANCE OF MAINS AT 100' INTERVALS FROM CENTER LINE OF ROAD, EASEMENT, RIGHT-OF-WAY LINE, BUILDINGS, SEWER MAINS OR AS DETERMINED BY THE LOXAHATCHEE RIVER DISTRICT. EXTENSIONS OF AN IMAGINARY LINE WILL NOT BE ACCEPTABLE AS REFERENCED POINTS.
 2. STATIONING OF EACH VALVE, FITTING, AIR RELEASE VALVE, SERVICE LINE, TAP, ETC., AND RADIAL DIMENSIONS (TIES) FROM A NEARBY PERMANENT OBJECT WHERE POSSIBLE.
 3. TYPE OF MATERIALS INSTALLED - PIPE AND APPURTENANCES. INDICATE ALL LOCATIONS OF CHANGE OF MATERIAL INCLUDING JOINT TYPE (M.J., SLIP, RESTRAINED).
 4. VALVE TYPE (BUTTERFLY, GATE, PLUG).
 5. AS-BUILT LENGTH OF ALL JACK AND BORE CASINGS INDICATING DISTANCE FROM CENTER LINE OF PAVING TO EACH END OF CASING. THE AS-BUILT INVERT ELEVATION OF EACH END OF CASING, AND AS-BUILT DISTANCE FROM EACH END OF CASING TO LIMITS OF MECHANICAL JOINT PIPE IS ALSO REQUIRED.
 6. AS-BUILT ELEVATIONS AT 100' INTERVALS AS WELL AS ANY MAJOR CHANGES IN DIRECTION AND/OR ELEVATION. ELEVATIONS SHOWN AT THESE INTERVALS AND CHANGES MUST SHOW TOP OF PIPE ELEVATION AND FINISHED GRADE ELEVATION AT THAT LOCATION. SHOW LOCATION OF EMS MARKERS.
 7. UTILITY EASEMENTS SHALL BE CORRECTLY SHOWN AND DIMENSIONED WITH REFERENCED SEWER FACILITY.

DATE

5/96

REVISION

LOXAHATCHEE RIVER DISTRICT

RECORD DRAWING SUBMITTAL GUIDE

PAGE

1

RECORDWG.DWG

* STANDARD WATER AND SEWER SEPARATION STATEMENT

SEPARATION REQUIREMENTS

62-555.314 F.A.C. AUGUST 28, 2003

HORIZONTAL SEPARATION BETWEEN UNDERGROUND WATER MAINS AND SANITARY OR STORM SEWERS, WASTEWATER OR STORMWATER FORCE MAINS, RECLAIMED WATER PIPELINES AND ON-SITE SEWAGE TREATMENT AND DISPOSAL SYSTEMS.

1. NEW OR RELOCATED UNDERGROUND WATER MAINS SHALL BE LAID TO PROVIDE A HORIZONTAL DISTANCE OF AT LEAST THREE FEET BETWEEN THE OUTSIDE OF THE WATER MAIN AND THE OUTSIDE OF ANY OR PROPOSED STORM SEWER, STORMWATER FORCE MAIN, OR PIPELINE CONVEYING EXISTING RECLAIMED WATER REGULATED UNDER PART III OF CHAPTER 62-610. F.A.C.
2. NEW OR RELOCATED UNDERGROUND WATER MAINS SHALL BE LAID TO PROVIDE A HORIZONTAL DISTANCE OF AT LEAST THREE FEET, AND PREFERABLY TEN FEET, BETWEEN THE OUTSIDE OF THE WATER MAIN AND THE OUTSIDE OF ANY EXISTING OR PROPOSED VACUUM-TYPE SANITARY SEWER.
3. NEW OR RELOCATED UNDERGROUND WATER MAINS SHALL BE LAID TO PROVIDE A HORIZONTAL DISTANCE OF AT LEAST SIX, AND PREFERABLY TEN FEET, BETWEEN THE OUTSIDE OF THE WATER MAIN AND THE OUTSIDE OF ANY EXISTING OR PROPOSED GRAVITY- OR PRESSURE-TYPE SANITARY SEWER, WASTEWATER FORCE MAIN, OR PIPELINE CONVEYING RECLAIMED WATER NOT REGULATED UNDER PART III OF CHAPTER 62-610. F.A.C. THE MINIMUM, HORIZONTAL SEPARATION BETWEEN WATER MAINS AND GRAVITY-TYPE SANITARY SEWERS SHALL BE REDUCED TO THREE FEET WHERE THE BOTTOM OF THE WATER MAIN IS LAID AT LEAST SIX INCHES ABOVE THE TOP OF THE SEWER.
4. NEW OR RELOCATED UNDERGROUND WATER MAINS SHALL BE LAID TO PROVIDE A HORIZONTAL DISTANCE OF AT LEAST TEN FEET BETWEEN THE OUTSIDE OF THE WATER MAIN AND ALL PARTS OF ANY EXISTING OR PROPOSED "ON-SITE SEWAGE TREATMENT AND DISPOSAL SYSTEM" AS DEFINED IN SECTION 381.0065(2). F.S. AND RULE 64E-6.002, F.A.C.

VERTICAL SEPARATION BETWEEN UNDERGROUND WATER MAINS AND SANITARY OR STORM SEWERS, WASTEWATER OR STORMWATER FORCE MAINS, RECLAIMED WATER PIPELINES.

1. NEW OR RELOCATED UNDERGROUND WATER MAINS CROSSING ANY EXISTING OR PROPOSED GRAVITY- OR VACUUM-TYPE SANITARY OR STORM SEWER SHALL BE LAID SO THE OUTSIDE OF THE WATER MAIN IS AT LEAST SIX INCHES, AND PREFERABLY 12 INCHES ABOVE, OR AT LEAST 12 INCHES BELOW THE OUTSIDE OF THE OTHER PIPELINE. HOWEVER, IT IS PREFERABLE TO LAY THE WATER MAIN ABOVE THE OTHER PIPELINE.
2. NEW OR RELOCATED UNDERGROUND WATER MAINS CROSSING ANY EXISTING OR PROPOSED PRESURE-TYPE SANITARY SEWER, WASTEWATER OR STORMWATER FORCE MAIN, OR PIPELINE CONVEYING RECLAIMED WATER SHALL BE LAID SO THE OUTSIDE OF THE WATERMAIN IS AT LEAST 12 INCHES ABOVE OR BELOW THE OUTSIDE OF THE OTHER PIPELINE. HOWEVER, IT IS PREFERABLE TO LAY THE WATER MAIN ABOVE THE OTHER PIPELINE.
3. AT THE UTILITY CROSSING DESCRIBED IN PARAGRAPHS 1 AND 2 ABOVE, ONE FULL LENGTH OF WATER MAIN PIPE SHALL BE CENTERED ABOVE OR BELOW THE OTHER PIPELINE SO THE WATER MAIN JOINTS SHALL BE AS FAR AS POSSIBLE FROM THE OTHER PIPELINE. ALTERNATIVELY, AT SUCH CROSSINGS, THE PIPES SHALL BE ARRANGED SO THAT ALL WATER MAIN JOINTS ARE AT LEAST THREE FEET FROM ALL JOINTS IN VACUUM-TYPE SANITARY SEWERS, STORM SEWERS, STORMWATER FORCE MAINS, OR PIPELINES CONVEYING RECLAIMED WATER REGULATED UNDER PART III OF CHAPTER 62-610, F.A.C., AND AT LEAST SIX FEET FROM ALL JOINTS IN GRAVITY- OR PRESSURE-TYPE SANITARY SEWERS, WASTEWATER FORCE MAINS, OR PIPELINES CONVEYING RECLAIMED WATER NOT REGULATED UNDER PART III OF CHAPTER 62-610, F.A.C.

* REQUIRED BY: HRS, STATE OF FLORIDA, PALM BEACH COUNTY PUBLIC HEALTH UNIT

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