

**PALMER LAKE SANITATION
DISTRICT
WASTEWATER COLLECTION
SYSTEM
DESIGN AND CONSTRUCTION
STANDARDS AND
SPECIFICATIONS**



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WASTEWATER COLLECTION SYSTEM
DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS
FOR
PALMER LAKE SANITATION DISTRICT

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***PLSD PROTECTS, PROMOTES AND PRESERVES
A HEALTHY COMMUNITY BY PROVIDING
AN EFFICIENT AND COST EFFECTIVE
WASTE WATER SANITATION SERVICE***

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PART I

WASTEWATER COLLECTION SYSTEM STANDARDS AND SPECIFICATIONS

CHAPTER 1 – GENERAL PROVISIONS:

1.1 All Construction shall be in accordance with the Standards and Specifications of the Palmer Lake Sanitation District. All constructed wastewater infrastructure must be inspected to ascertain compliance with the Standards and Specifications prior to covering the lines or other facilities..

1.2 CONNECTIONS TO THE SEWER MAIN

1.2.1 The use of compound taps or wye (“Y”) taps for sewer or more than one service line for each tap is prohibited unless waived in writing by the District.

1.2.2 No lift stations will be permitted except by prior approval of the District. If approved, ownership will be retained by the owners and in no manner will the District be responsible for maintenance, repairs, legal liability, or anything whatsoever applying to such lift station. Under no circumstances will a lift station be approved if service can be provided by gravity flow.

1.2.3 The materials and joints of sewer service pipes shall possess the strength and durability to prevent the escape of solids, liquids, and gases therefrom under all known adverse conditions such as corrosion, strains due to settlement, temperature changes, vibration and superimposed loads.

1.2.4 A District representative will inspect all sewer taps and service line installations. Inspection does not imply any warranty to the property owner or contractor for workmanship, materials or installation.

1.2.5 No tapping of a District main will commence after 5:00 P.M. without specific approval by the Board of Directors, or by the inspector.

1.2.6 Inspections are to be scheduled 24 hrs in advance. An additional charge will be added to the customer account for each additional inspection.

1.2.7 All construction must be in accordance with the District Construction Specifications.

1.3 PRIVATE SERVICE LINES

1.3.1 Property owners must use the minimum four-inch plastic pipe of a gage approved for sewer lines to include ASTM 3212; Bell and spigot, push-on with single rubber gasket joint from their collection point to the sewer main. Materials other than plastic will be approved by the District on a case by case basis. The construction of all service lines from the property owner's collection point to the sewer main of the District shall be inspected by a duly authorized representative of the District and approved by said representative. Inspection does not imply any warranty for workmanship, material, or installation to the owner. No back fill shall be commenced before inspection and approval is complete. The size and slope of the property owner's service lines shall be subject to the approval of the inspector, but is not a warranty that the tap connection will work. All construction must be in accordance with the District Specifications. The property owner owns the service line. The owner/contractor is responsible for fall and slope in the line and installing the line in accordance with the District's construction specifications.

1.3.2 Cleaning of service lines shall be the responsibility of the property owner. The property owner will keep the service line between the unit connected and the Sewer main of the District clean and clear of any obstruction and keep said lines in good repair at all times, so there is no improper infiltration of water through said line or accumulation of septic wastewater therein. In case of the failure of the property owner to properly maintain or clear said line, the same may be done by the District after forty-eight (48) hours written notice to the property owner or occupant, and the cost of the same charged to the owner of the property and shall constitute a lien on said property until paid.

1.3.3 When stoppage or other trouble occurs in service lines on private property, it is the responsibility of the property owner to verify the condition of his service lines before

requesting the District to uncover and check District mains. If the District is requested to service its lines by the property owner and no deficiency of the District equipment is found, all costs of the service on the District main will be billed to the property owner requesting such service.

1.4 CONSTRUCTION OF DISTRICT WASTEWATER INFRASTRUCTURE

- 1.4.1** All construction must be in accordance with the adopted standards that are contained in the Palmer Lake Sanitation District Wastewater Collection System Standard Specifications.
- 1.4.2** Plans must be submitted prior to the start of any construction. These plans will be reviewed by the District's engineer and the District and are subject to the District approval. All costs associated with review of plans and on site construction inspections by the District's engineer shall be borne by the developer/contractor.
- 1.4.3** A pre-construction meeting with the District and the District engineer is required before any construction commences. The District will determine the time and location of the meeting.
- 1.4.4** All work must be inspected by a District representative prior to backfilling the pipe or around the manhole. Inspections of work are for the benefit of the District and does not imply any assurance to the developer/contractor as to workmanship, materials, installation or that the installation will work as designed.
- 1.4.5** All work within the District shall be warranted by the developer/contractor for a minimum of two (2) years. The warranty period will begin upon the date of written acceptance of the work by the District and extend thereafter for a period of two (2) calendar years. Any work required to be accomplished under provisions of the warranty shall be determined by the District and accomplished by the developer/contractor within a period of no less than 30 calendar days following receipt of written notice of such required warranty work. The work accomplished under the terms of the warranty shall continue to be subject to the remaining original warranty period.

CHAPTER 2 – DISCONNECTION OF SERVICE

- 2.1** Upon request to the District, the District will grant a disconnect certificate to anyone making the request for the demolition of a building. The service connection must be capped off completely. The property will be billed at its regular monthly service charge. The owner must apply for a tap permit before reconnecting will be allowed. New structures or additions to existing structures on this tap will be subject to Appendix A, Section 4-1 and 4-2 of the District's Rules and Regulations.

CHAPTER 3 – ENFORCEMENT

- 3.1** Any person found to be violating any provision of these Construction Specifications shall be served with written notice stating the nature of the violation and providing a reasonable time limit for satisfactory correction thereof. Any person who shall continue any violation beyond the time limit provided above shall immediately be disconnected until such time as said person shall be in compliance with Construction specifications. During the period of disconnection, all persons shall continue to pay their service charge as previously required and shall pay all charges for the disconnection and connection of service.
- 3.2** Any person violating any of the provisions of these Construction Specifications shall become liable to the District for any expense, loss, or damage occasioned by reasons of such violation.
- 3.3** Any cost incurred by the District in enforcing compliance of the Construction Specifications shall be reimbursed to the District and are subject to Article 7, Section 7-6 of the Rules & Regulations and other rights the District may have.

DATE OF ADOPTION _____

SECRETARY, BOARD OF DIRECTORS _____

CORPORATE SEAL

PART II

WASTEWATER COLLECTION SYSTEM STANDARD SPECIFICATIONS

CHAPTER 1 – GENERAL

- 1.1** **AUTHORITY:** These Construction Specifications are promulgated by the Palmer Lake Sanitation District. The interpretation, enforcement, and revision of these Specifications is hereby delegated to the District Manager of the District.
- 1.2** **EFFECTIVE DATE OF SPECIFICATIONS:** These Construction Specifications shall be in effect immediately upon adoption by the District Board and shall supersede all former standard specifications for installation of sanitary sewer mains within the District.
- 1.3** **REVISIONS, AMENDMENTS OR ADDITIONS:** These Construction Specifications may be revised, amended or added to. Such revisions, amendments and additions shall be binding and in full force and effect when adopted in the manner set forth in Section **1.2**.
- 1.4** **DISTRICT CONTROL:** These Construction Specifications will apply to the installation, operation and maintenance of all wastewater collection facilities under the control of the Palmer Lake Sanitation District.
- 1.5** **ORGANIZATION AND INTERPRETATION OF SPECIFICATIONS:** These Construction Specifications are composed of design criteria and provisions, material specifications, installation specifications and standard drawings. The interpretation of any chapter/section or of differences between chapter/sections, when appropriate, shall be made by the District Manager of the District and his/her interpretation shall be binding and controlling in its application.

1.6 **DEFINITIONS:** As used in these Construction Specifications or in any of the drawings where these Construction Specifications govern, unless the context shall otherwise require, the following words defined shall have the meanings herein ascribed:

1.6.1 District Manager or Manager: The Manager of the Palmer Lake Sanitation District or his/her designated representative.

1.6.2 Engineer: The Engineer or consultant of the District, acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties entrusted to them.

1.6.3 Collection System: Sewer mains, together with all appurtenant and necessary manholes, clean outs, taps, service pipes, and associated materials, easements, property and equipment collecting sanitary sewage from individual customers.

1.6.4 Wastewater Main or Sanitary Sewer Main: That portion of the wastewater system which collects wastewater from users and conveys it to the District wastewater treatment plant, excluding service lines.

1.6.5 Service Line: The sewage collection pipeline extending from the premises down to and including the connection to the wastewater or sanitary sewer main.

1.6.6 Applicant for System Extension: Any person, association, corporation, entity or government agency desiring sanitary sewer service for premises under their control, often a sub-divider, a developer or an owner.

1.6.7 Main Extension: Extensions to the existing collection system network.

1.6.8 Contractor: In the context of these Construction Specifications a person or persons, partnership or corporation employed by an applicant for the purpose of installing wastewater system extensions or replacements.

1.6.9 Inspector: The authorized representative of the District assigned to the project.

1.6.10 Standard Drawings: District Standard Drawings are a part of these Construction Specifications.

1.6.11 District: The Palmer Lake Sanitation District responsible for overseeing the wastewater system's operation.

1.7 ABBREVIATIONS: All references to documents or Construction Specifications shall be the latest edition or revision thereof.

1.7.1 ASTM American Society for Testing and Materials

1.7.2 ANSI American National Standards Institute

1.7.3 AWWA American Water Works Association

1.7.4 NSF National Sanitation Foundation

1.7.5 OSHA Occupational Safety and Health Act

1.7.6 USGS United States Geological Survey

1.7.7 DIP Ductile Iron Pipe

1.7.8 PVC Polyvinyl Chloride Plastic Pipe

CHAPTER 2 – DESIGN PROVISIONS

2.1 PLANNING CONSIDERATIONS: The land use and population densities approved for the District shall be used to determine wastewater facility design parameters. Where approved master plans do not exist, the following criteria shall be used unless specific approval for other criteria has been given by the District.

2.1.1 **Design Period:** The sewer systems shall be designed for the estimated ultimate tributary population. The tributary areas shall be studied to determine the area for each projected land use.

2.1.2 **Population Densities Including Public Use Land:**

- 1) Single-family units at 3.2 persons per unit.
- 2) Multi-family and condominiums at 2.5 persons per unit.
- 3) Four (4) single-family units per acre.
- 4) Sixteen (16) multi-family cluster housing or condominiums per acre.

2.1.3 **Per Capita Flows:** Sewer systems shall be designed on the basis of not less than the following unless other values are specifically authorized by the District.

- 1) One hundred (100) gallons per person per day.
- 2) Three hundred (300) gallons per capita per day peak flow for sub-mains and laterals.
- 3) Two hundred fifty (250) gallons per capita per day peak flow for main trunk, interceptor or outfall sewer mains.
- 4) Infiltration of 100 gallons per day per inch of diameter per mile per manhole run for new systems. New system installations which will service a portion of the existing collection system will require an infiltration allowance as established by the District.
- 5) Commercial land uses at 1400 gallons per acre per day with a peak factor of 2.
- 6) Industrial land uses at 1600 gallons per acre per day with a peak factor of 3.

- 7) Public use, park and open space at 1000 gallons per day with a peak factor of 2.

2.2 **MINIMUM SIZE:** No public sewer shall be less than 8 inches in diameter. No service line shall be less than 4 inches in diameter.

2.3 **MINIMUM DEPTH:** In general, sewers shall be designed deep enough to drain basements and to prevent freezing. No public mains shall be less than 5 feet deep measured from the top of pipe unless special protection is required. Special protection shall consist of:

2.3.1 Less than 5 feet but more than 3 feet of cover requires ductile iron, cast iron, reinforced concrete encasement or arch.

2.3.2 Less than 3 feet of cover requires ductile iron or cast iron with reinforced concrete encasement. No building sewer shall be less than 5 feet deep in traffic areas without similar special protection listed above except that concrete driveways may be substituted for protection of service lines.

2.4 **MINIMUM SLOPES:** All sewers shall be designed to transport average sewage flows at a minimum mean velocity of 2 feet per second based on a Manning's roughness factor of 0.013. The slope between manholes shall be uniform. In no case shall the slope be less than the following for sewer mains and services:

MINIMUM GRADE TABLE	
Services	
Pipe Diameter	Slope
4 inches	2% or ¼ inch per foot
4 inches	ductile iron or cast iron pipe – 1% or ⅛ inch per foot
6 inches	1% or ⅛ inch per foot
Mains and Services	
8 inches	0.40%
10 inches	0.35%
12 inches	0.26%
15 inches	0.20%
18 inches	0.15%

2.5 **HIGH VELOCITY PROTECTION:** In the case of sewers where the slopes are such that over 15 percent grades are attained, special provisions as determined by the District shall be made to prevent excessive erosion of material surfaces or displacement by impact. Such high velocity protection shall be shown on detail drawings and approved by the District on a case-by-case basis.

2.6 **ALIGNMENT:**

2.6.1 **Sewers In Streets:** When the sewers are placed in streets, they shall be placed as follows:

- 1) Collection system sewers shall be placed on the centerline of street sections located midway between curb and gutter on each side of the traveled surface.
- 2) On streets running north and south where it is not possible to locate the pipe on centerline, the sewer line shall be placed no more than 10' (ten feet) west of the centerline of the street.
- 3) On streets running east and west where it is not possible to locate the pipe on centerline, the sewer line shall be placed no more than 10' (ten feet) south of the centerline of the street.
- 4) On streets shaped as a "U" or on streets having unusually sharp turns, the sewer line will conform to the above specifications as near as is practical, but the final locations shall be as determined by the Engineer or other District representative. Curvilinear sewer mains shall not be allowed without prior approval of the District. Designs must maximize the operability and maintainability of the collection system.
- 5) In no case shall the sewer line be installed closer than five (5) feet to the lip of the pan or gutter.

2.6.2 Sewers in Easements: In areas where sewer lines are placed in easements, all sewer lines shall be located within the easements shown on the contract drawings. All sewer easements must be minimum of thirty (30) feet in width, and must be prepared in accordance with Article 4, part 4-4.2 of the District's Rules & Regulations. No sewer shall be located less than five (5) feet from the edge of the easement.

2.7 **PIPE ALIGNMENT IN MANHOLES:**

2.7.1 Intersections: All pipes shall have free discharge into the collection system. Where possible, the flow line of the intersecting pipe shall be the spring line (horizontal center of pipeline) of the collection sewer. All manhole inverts shall be designed with no less than 0.1 foot drop except for changes in alignment in excess of 30 degrees shall have a 0.3 foot drop in the invert through the manhole. Changes in direction at intersections shall not be greater than 90 degrees.

When the intersecting pipe is smaller in diameter than the pipe exiting the manhole, the crown or inside-top of the intersecting pipe shall match the crown or inside-top of the main pipe entering the manhole. In no case shall the difference in elevation between the flowline of the pipe exiting the manhole and the flowline of the intersecting sewer be less than 0.3 feet.

2.7.2 Increasing Size: When sewers are increased in size with no intersecting sewers, the invert of the larger sewer shall be lowered sufficiently to maintain the same energy gradient.

2.8 **MANHOLE LOCATION:** Manholes shall be installed at the end of each line, at all pipeline intersections, changes in grade, size, alignment and at intervals not greater than 400 feet. Manholes must be located to allow unassisted and unrestricted access by District maintenance vehicles. Lines and manholes located in areas where access, in the opinion of the District, is not possible, will not be approved for construction.

2.9 **MANHOLE DETAILS:**

2.9.1 **Manhole Sizes:** The inside diameter of the manhole shall not be less than 5 feet on lines 8 inches through 30 inches in diameter; not less than 6 feet on lines in excess of 30 inches in diameter for standard design manholes (see standard drawings for standard manholes design).

2.9.2 **Drop Manholes:** External drop manholes will be permitted only in extreme and special conditions where approval has been granted by the District. As a general criteria, a minimum difference in elevation of 1.5 feet between the inlet and outlet is required before considering use of external drop manhole design. The maximum amount of vertical drop allowable in a drop manhole shall be 10 feet. The external drop sections must be totally encased in reinforced concrete and placed on an adequate foundation (see standard drawing for standard drop manhole design). A cleanout must be placed in the manhole at the level of the main sewer line. All drop manholes must be completely lined with coal tar epoxy 45 mils thick or an acceptable form of protective coating.

2.9.3 **Manhole Channels:** The flow channel shall be made to conform to the slope and shape of the sewer pipe entering and exiting the manhole. The channel shall be formed from cast-in-place concrete to a cross-section matching the circular pipes. The channel shall be constructed with vertical walls from a point one-half the pipe diameter above the channel flow line as shown in the standard drawings. At intersections with other lines, channels shall be formed with a curve to minimize turbulence. The flow channel shall be constructed to have a minimum depth equal to the pipe diameter. Refer to standard drawings.

2.9.4 **Manhole Gaskets:** The pipes entering and exiting the manhole shall be equipped with a manhole gasket placed around the pipe and cast in the base. If a precast base is used, a watertight seal shall be obtained by use of a pre-manufactured rubber gasket in the precast base section equal to a Kor-N-Seal boot.

2.9.5 Rings and Covers: The ring and cover shall be constructed of cast iron for traffic bearing and non-traffic bearing conditions. All manholes located outside of dedicated street or alley rights-of-way will be designed and constructed with a locking type cover and the ring bolted to the concrete cone. Grade adjustment rings or blocks between the ring and cover and the concrete cone cap shall not exceed 12 inches in total height.

2.9.6 Water tightness: Precast concrete manhole joints shall be made watertight. Manholes of brick or segmented block shall not be used in the sanitary sewer system.

- 1) Each precast manhole segment shall be joined with a rubber “O” ring, Ram-Nek, Con-Seal or similar approved material.
- 2) All exterior concrete manhole surfaces shall be coated with coal tar epoxy damp-proofing material. Where ground water is present or, in the opinion of the District, ground water could be present, the exterior concrete manhole surfaces shall be coated with coal tar epoxy.
- 3) Damp-proofing materials shall be applied to clean, dry surfaces in accordance with the coating manufacturer’s written instructions / recommendations and the following:
 - a) Preparation:
 - (1) Examine surfaces to receive damp-proofing to assure conditions are satisfactory for application of materials.
 - (2) Remove dirt, dust, sand, grit, mud, oil, grease and other foreign matter.
 - (3) Brush down surfaces to remove all loose scale, dust, etc.
 - (4) Complete surface preparation in accordance with manufacturer’s recommendations.

b) Application:

(1) General

- i Apply in three (3) coats with high pile rollers or by spray equipment. Minimum air pressure: 90 psi,
- ii Provide adequate forced ventilation when applying Coating in enclosed spaces.
- iii Do not use benzoyl or other volatile solvents for thinning coating.

(2) First Coat

- i Apply only when surface of concrete is dry and at a suitable temperature for adequate penetration.
- ii Thin as recommended by manufacturer.
- iii Apply for maximum penetration.
- iv Absorbed by concrete within 5 to 30 minutes of application so no continuous film remains on surface.

(3) Second coat: Cover surface with 5 mil film.

(4) Third coat: Produce a high gloss 5 mil film.

(5) Cure material as recommended by manufacturer.

(6) Do not cover with backfill until installation is accepted by inspector.

- 4) All exterior joints shall be wrapped with an external elastomeric concrete joint wrap no less than 12 inches in width with manufacturer's standard primer and adhesive.

2.9.7 **Stub Outs From Manholes:** Stub outs from manholes shall not exceed 40 feet except for lines which will be extended in the future. Whenever practical, designs to complete the manhole run shall be submitted to the District Manager for review to insure proper grade and alignment for future construction. Future extension of stub outs shall be of like material using the same grade and alignment.

2.9.8 **Design Features for Deep Manholes:** Manholes which are more than sixteen (16) feet from the finished cover to the pipe invert shall be considered deep manholes

subject to special design. The items given below shall be given special attention and subject to approval by the District.

- 1) Intermediate platforms constructed with manhole shaft offsets shall be governed by the OSHA regulations. Regardless of the application of OSHA regulations, an offset intermediate platform will be required on any manhole greater than 24 feet in depth at no more than 12 foot intervals.
- 2) Structural integrity of precast or cast-in-place concrete structures shall be verified and certified by the responsible design professional for all manholes in excess of 16 feet in depth. Specific attention shall be given to concrete thickness, reinforcing design and concrete strength.

2.9.9 Underdrain: Where an underdrain must be used, the underdrain must be carried under or around the manhole base. In no case shall any underdrain, sump pump or trench drain be connected to the public sewer main.

2.9.10 Service Connection to Manholes: In general, sewer service lines will not be allowed to connect to manholes. Certain exceptions, however, may be made by the District. No sewer service shall connect to the main line closer than 5 feet to the uphill manhole.

2.10 RELATION TO WATER MAINS AND WATER SUPPLIES: Sewer lines shall be located a minimum of 10 feet horizontally from existing or proposed water mains (outside of pipe to outside of pipe) and the sewer lines shall be a minimum of 18 inches clear distance vertically below the water main. If this clear distance is not feasible, the crossing must be designed and constructed so as to protect the water main from potential cross connections and minimize the potential for structural damage to either pipeline. Minimum protection shall consist of the installation of an impervious and structural sewer as follows:

2.10.1 Where the sewer pipe is above the water main, regardless of separation dimension, the sewer shall be installed in accordance with the Colorado Department of Public Health and Environment (CDPHE) Design Criteria. The sewer main shall be installed in a pipe casing extending no less than 9 feet each side of the water main

center line. The casing shall be a single section of steel or ductile iron pipe. (See standard drawings for placement of sewer pipe in casing pipe).

2.10.2 Where the sewer pipe is beneath the water main, but less than 18 inches clear distance vertically, the sewer pipe shall be installed in accordance with the Colorado Department of Public Health and Environment (CDPHE) Design Criteria. The sewer main shall be installed in a pipe casing extending no less than 9 feet each side of the water main centerline. The pipe casing shall be of water-tight material with no joints. The casing pipe may be steel, ductile iron, fiberglass, fiberglass-reinforced polymer mortar (FRPM) or polyvinyl chloride (PVC) with suitable carrier pipe supports and casing pipe end seals. Alternatively, reinforced concrete encasement of the carrier pipe extending no less than 10 feet each side of the water main centerline may be used. Encasement shall be at least 6 inches thick and extend a distance of 10 feet on either side of the water main crossing. Reinforcing shall consist of a minimum of four No. 4 bars placed at quarter points around the pipe being encased. The above described protection from potential cross connections shall apply to service lines as well as sanitary sewer mains where the above described protection and special installation is required.

2.10.3 There shall be no physical connection between a public or private potable water supply system and a sewer or appurtenance thereto which would permit the passage of any sewage or polluted water into the potable supply.

2.10.4 While no general statement can be made to cover all conditions, it is generally recognized that sewers must be kept remote from public water supply wells or other water supply sources and structures in accordance with the applicable Health Department and Colorado Division of Water Resources Standards.

2.11 **STREAM AND DRAINAGE CHANNEL CROSSINGS:**

2.11.1 All stream and drainage channel crossings shall be ductile iron pipe encased in reinforced concrete where the installation is below the flow line of the stream or drainage channel.

2.11.2 Crossings less than 4 feet below existing or proposed channel bottoms shall be supported by reinforced concrete caissons constructed in accordance with the approved special design.

2.11.3 Where the pipeline crossing will be above the stream or drainage channel flow line, special approval and design will be required by the District. All details of the design shall be submitted to the District for review and approval.

2.12 RAILROAD, HIGHWAY AND STREET CROSSINGS:

2.12.1 All work shall be accomplished in accordance with the appropriate permit issued by the responsible agency having jurisdiction over the work.

2.12.2 Crossings under railroads, highways, and streets shall consist of polyvinyl chloride (PVC), ductile iron or epoxy coated steel pipe (carrier pipe) laid inside a steel pipe conduit (casing pipe), which is placed beneath the track or roadway. The steel conduit pipe (casing pipe) shall be jacked horizontally through the ground on substantially the grade of the sewer, with due allowance for the bells or joints of the carrier pipe. As the pipe is jacked along, the earth shall be excavated from the face and removed so that it will not be necessary to force the pipe through solid ground. Specifications for materials and installation of the railroad or highway agency shall govern.

2.12.3 The District reserves the right to require a casing pipe be placed when crossing under a county, town, or city street.

2.12.4 The casing pipe diameter for 16 inch and smaller carrier pipes shall be a minimum of 8 inches larger than the carrier pipe and the casing pipe diameter for larger than 16 inch diameter carrier pipe shall be a minimum of 12 inches larger than the carrier pipe.

2.12.5 After the conduit has been completed, the carrier pipe shall be placed inside and blocked in exact position and grade with a support at least every 8 feet and behind each bell or coupling. A minimum of three blocks or other points of support shall be installed to prevent displacement by floating.

2.12.6 Each end of the casing pipe shall then be plugged tight around the carrier pipe and inside the casing pipe. The plug may consist of a prefabricated rubber boot with stainless steel tightening bands specifically for sealing casing pipe ends.

2.13 **SERVICE LINES (Building Sewers):**

2.13.1 Service lines and stub outs from main sewers shall be extended to each property at a point 5 feet inside the property line and generally 5 feet above the low lot corner.

2.13.2 Stub outs from a sewer main may be made to an unoccupied lot provided it is part of an officially platted and recorded subdivision. Such stubs shall be extended to 5 feet inside the property line and plugged with a watertight and airtight cap or plug insert. Plugging or capping shall be sufficient to perform air testing of the pipeline. Records of the depth and location of the end of the service stub shall be recorded by the party responsible for construction and submitted to the District for future reference.

2.13.3 Four inch diameter service lines shall have a maximum length of 250 feet. A 4 inch diameter cleanout shall be installed on the service lines where the total length exceeds 100 feet and at 100 foot intervals thereafter up to a maximum of 250 feet in length and at each horizontal directional change. The cleanout shall have a proper waterproof cap. For cleanout access, a prefabricated formed wye with a riser pipe shall be installed to the finished grade. A minimum of 10 inch long cast iron riser box with "Sewer" cast in the lid shall be placed over the cleanout access, flush with finished grade. Service lines projected to be longer than 250 feet in length shall have pipe six (6) inches in diameter or as otherwise required by the District. Provisions for cleanouts shall also apply to pipelines six (6) inches in diameter.

2.13.4 No service line within the District's service area will serve more than one property or customer. Each house, building or business shall have an individual connection to the sewer main and service line from the main to the structure being served.

2.13.5 All service lines for commercial buildings or multi-family buildings shall be no less than six (6) inches in diameter.

2.13.6 A cleanout shall be installed on private sewer services at all changes in direction requiring bends.

2.13.7 Service line connections to a sewer main shall be located at intervals of no less than three (3) feet measured center to center along the main.

2.13.8 Service line design and construction shall be accomplished to provide a horizontally and vertically straight, consistent alignment between the wye connection at the public wastewater pipeline and the building being served. Should it be necessary to construct bends to avoid existing underground obstructions or conflicting utilities, a maximum of three pipe bend fittings may be used to adjust horizontal and/or vertical alignment, each bend having no more than a 45 degree deflection. Where two 45 degree bend fittings are required to be installed to attain the required alignment and have been approved by the District, a cleanout shall be constructed between the two bend fittings. All cleanouts shall be installed upstream of each bend allowing access to the service line in the direction of flow. Other applicable District specifications may also dictate the installation of cleanout fittings.

2.14 **ENCASEMENT and CASINGS:**

2.14.1 General: Concrete encasements shall be installed under the following conditions:

- 1) Where sewer lines are at a depth too shallow to sustain traffic load or any other load to which they are subjected. The depth may range from 0 to 3 feet, depending on the loading conditions.
- 2) At all locations where infiltration is likely to be high.
- 3) At locations where horizontal movement of the sewer line may be experienced, such as in stream beds with less than 5 feet of cover.
- 4) At potable water supply crossings.

- 5) At any location designated by the District Engineer.

2.14.2 Design Considerations:

- 1) All concrete encasements shall be reinforced in accordance with the District's standard details and shall be of a length to completely span the condition encountered.
- 2) Unless so designed, encasements are for the purpose of pipeline protection and are not to be considered a structural beam. Therefore, special attention to a good foundation and compaction effort for the encasement must be provided.

2.14.3 Pipe Casings:

- 1) Pipe casing shall be used where bores are required under rights-of-way by the governing agency. All pipe casings shall be constructed to conform with the District's standard details, the Colorado Department of Transportation Standards, and the requirements of any other applicable approving agency.

2.15 PUMP STATION DESIGN PARAMETERS: Design of pump stations within the District's collection system shall be accomplished on a case by case basis. Pump stations shall not be used wherever gravity sewer service is available. Preliminary considerations and a rationale for the need of the pump station shall be reviewed in detail with the District's Manager prior to proceeding with preliminary and final design. As general guidelines for planning purposes, any pump station consideration by the District must include, but is not necessarily limited to the following design features:

- 1) Dry pit or wet well mounted pumping equipment.
- 2) Multiple pumps.
- 3) Standby power generation or dual source of power supply.
- 4) Ventilation, heating and dehumidification equipment.

- 5) Automatic Controls.
- 6) Remote alarm system for operating functions.
- 7) Emergency overflow storage

2.16 OWNER/DEVELOPER COSTS:

2.16.1 Plans and Specifications: All costs associated with the design of sanitary sewer mains and services in accordance with District Rules and Regulations for undeveloped property shall be at the expense of the Owner/Developer.

2.16.2 Construction: All costs associated with the furnishing and installation of sanitary sewer mains and services in accordance with District Rules and Regulations shall be at the expense of the Owner/Developer.

2.16.3 Plan Review and Construction Administration: The Owner/Developer of property shall pay all District costs including administrative, legal, and engineering fees in regard to plan review, preconstruction and construction progress meetings, field inspections, installation compliance, punch list preparation and all other construction expenses related to the development of the property.

2.16.4 All Owner/Developer costs associated with this section 2.16 are subject to lien rights as outlined in paragraph 7-7 of the Rules and Regulations of the Palmer Lake Sanitation District.

2.17 SANITARY SEWERAGE PLAN SUBMITTAL REQUIREMENTS:

2.17.1 Plans and Specifications: Three (3) copies of all plans and specifications for facilities to be installed under these construction specifications shall be furnished to the District. One (1) copy will be returned to the applicant when approved by the District and bear evidence of such approval or comments requiring correction.

2.17.2 Plan Content: As a minimum, the following information shall be required on all plans.

- 1) Plan View: The view shall show streets, alleys, rights-of-way and utility easements with the location and size of the sewers, locations and distance between manholes, the slope and other appurtenances indicated. It is desirable for plans to show the proposed size and location of service stubs and the location of all existing or proposed underground utilities and structures located within 20 feet horizontally or vertically, of the centerline of the proposed sewer extension. (The scale is optional; however, 1"=50' is commonly used).
- 2) Profile View: The profile view with vertical and horizontal grids shall show the existing ground surface (dotted) and proposed surface (solid). The profile view should also show the proposed sewer with elevations of manhole rims and inverts, the distance and grade between manholes and elevations of utility crossings.
- 3) Detail Drawings: Special detail drawings, made to scale, shall clearly show the nature of design and construction of the following:
 - a) Special sewer appurtenances such as non-standard manholes and elevated sewers.
 - b) Special joints and utility or storm sewer crossings.
 - c) Stream and drainage channel crossings with elevations of normal high and low water levels.

2.17.3 Supporting Data: Submit with the plans and specifications all necessary supporting data to fully describe the proposed installation. This data shall include, but not necessarily be limited to, a copy of the recorded plat of the subdivision in which the improvements are proposed to be installed and copies of dedicated rights-of-way and easements in which improvements are proposed to be installed. Submit copies of necessary permits from other governmental or private agencies having jurisdiction in the area of the proposed work.

Should a site application for a collection system extension be required by the Colorado Department of Public Health and Environment, the individual party responsible for construction of the facility shall also be responsible for obtaining this site approval.

2.17.4 Upon completion of construction and prior to acceptance by the District, two (2) copies of “as- built” plans and one (1) set of electronic data files of the plans shall be submitted to the District for record. The two (2) copies shall be complete with all “as-built” information together with a certification by the party responsible for construction that all data thereon is accurate and represents actual “as-built” conditions. One (1) copy shall be a transparency suitable for blueprint reproduction. “As-built” plans shall be submitted within two weeks of completion of the sanitary sewer construction in any identifiable phase of a development. No authorization to connect to the system or discharge to the system will be allowed until the “as-built” documents have been received and accepted by the District.

2.17.5 All plans, specifications and supporting documents shall be prepared by or under the direct supervision of a professional engineer registered to practice in the State of Colorado. All plans and specifications shall bear the seal and signature of said registered professional engineer.

2.18 SEWAGE SYSTEM AND TRENCH AND FOUNDATION DRAINS:

2.18.1 In no case shall any trench drains, foundation drain or other drainage fixture be connected to the District’s system which may introduce any wastewater other than sanitary sewage into the system.

2.18.2 All PVC piping material incorporated into the District’s sanitary sewage system shall be green in color. All trench or foundation drainage piping shall be white to preclude accidental cross-connection of the drainage systems.

CHAPTER 3 – PIPE AND MANHOLE MATERIALS

3.1 PVC PIPE AND FITTINGS (Polyvinyl Chloride)

3.1.1 Conformance: ASTM 3034; Standard Dimension Ratio (SDR) shall be maximum of 35.

3.1.2 Joints: ASTM D3212; Bell and spigot, push-on with single rubber gasket joints. Jointing of dissimilar pipe materials shall be accomplished with a specially manufactured rubber connection with stainless steel tightening bands (Mission Rubber Company, Fernco or equivalent).

3.1.3 Length of Joints: The length of joints for flexible conduits shall not exceed 14 feet for grades less than one percent.

3.1.4 Criteria for Acceptance: Pipe which has any of the following visual defects will not be accepted.

- 1) Improperly formed pipe such that pipe intended to be straight has an ordinate, measured from the concave side of the pipe, exceeding 1/16 inch per foot of length.
- 2) Pipe which is out-of-round to prohibit proper jointing.
- 3) Improperly formed bell and spigot ends or bells which are less than 1-1/2 inches in length.
- 4) Pipe which is fractured, cracked, chipped or damaged in any manner.
- 5) Pipe that has been damaged during shipment or handling.
- 6) Pipe or fittings not properly marked as required by the following specifications.

3.1.5 Marking of Material: The following shall be clearly shown on the exterior of the pipe:

- 1) Manufacturer's name.
- 2) Appropriate ASTM designation.
- 3) Appropriate SDR number of 4 inch and 6 inch pipe.
- 4) Homemark.

3.1.6 Material Handling and Storage: Avoid damage to pipe from impact, bending, compression or abrasion during handling and storage. Store pipe on flat surface which provides even support for the pipe barrel with bell end overhanging. Do not stack pipe higher than 5 feet. Do not store pipe and fittings in direct sunlight for extended periods (greater than two to three weeks). Any discoloration of the pipe material shall be evidence of ultraviolet damage and shall be reason for rejection and removal from the project. Ship rubber gaskets in cartons and store in a clean area away from grease, oil, ozone-producing motors, heat and the direct rays of the sun. Use only nylon protected sling to handle pipe. The use of hooks, bare cables or chains will not be permitted. For pipe slopes less than one percent, the maximum pipe joint length shall be fourteen (14) feet.

3.1.7 All PVC pipe installed in the District's sanitary sewer system including mains and services shall be green in color. Trench and foundation drain piping used in the District shall be white to better assure that there is no accidental connection between the two separate drainage systems.

3.1.8 PVC pipe shall not be installed at depths in excess of fourteen (14) feet without specific approval of the District.

3.2 DUCTILE IRON PIPE:

3.2.1 Conformance: ANSI 21.51/AWWA C151: ASTM A536, Grade 60-42-10; Thickness Class 50, unless otherwise required for internal or external loading. Fittings shall conform to ANSI 21.10 for flanged, mechanical joints and push-on joints (AWWA C110 or C153).

3.2.2 Joints:

- 1) Mechanical Joint: ANSI A21.11
- 2) Push-On: ANSI A21.11
- 3) Flanged: ANSI B16.1, 125 lb drilling
- 4) Rubber Gaskets: AWWA C111 (ANSI A21.11)

3.2.3 Protective Coatings and Linings:

- 1) Exterior Coating: Manufacturer's standard bituminous coating approximately 1 mil thick.
- 2) Interior Lining:
 - (a) Ceramic epoxy lined.
Thickness: 40 mil dry film thickness.
 - (2) Application: Lining for all pipe and fittings
 - (3) Design Basis: US Pipe, PROTECTO 401 or equivalent.

3.2.4 Polyethylene Wrapping: All ductile iron pipe shall be installed with an 8 mil thick polyethylene wrapping. The polyethylene wrapping shall conform to AWWA C105 latest revision.

3.2.5 Criteria for Acceptance: In addition to any deficiencies covered by the reference specifications above, any of the following visual defects will not be accepted.

- 1) Improperly formed pipe such that pipe intended to be straight has an ordinate, measured from the concave side of the pipe, exceeding 1/16 inch per foot of length.
- 2) Pipe which is out-of-round to prohibit proper jointing.
- 3) Pipe which is fractured, cracked, chipped or damaged in any manner.
- 4) Pipe that has been damaged during shipment or handling.
- 5) Pipe which has lining which is fractured, cracked, chipped or damaged in any manner and would not provide satisfactory service under the conditions intended.

3.2.6 Marking of Material & Certification of Manufacturer: All materials shall be marked with the name of the manufacturer of origin. Manufacturer will provide a certification to the District that all products supplied to the project site are in conformance with these construction specifications.

3.2.7 Material Handling and Storage: Handle pipe fittings and accessories using lifting hoist or skidding to avoid shock or damage. Do not drop such materials. Do not allow pipe unloaded on skidways to be slid or rolled into pipe previously unloaded. Protect the pipe coatings and linings from damage during delivery and handling.

3.3 **MANHOLES:** Except as otherwise specifically approved by the District, manholes shall be precast concrete and manufactured in accordance with the referenced specifications.

3.3.1 Conformance: Precast concrete in conformance with ASTM C478.

3.3.2 Size of Manholes:

Size of Sewer Main	Inside Diameter of Manhole
8 inches through 30 inches	5 feet
greater than 30 inches	6 feet

3.3.3 Cement:

- 1) All cement used in manhole construction shall be Type II or Type IILA.
- 2) All concrete shall have a 28 day compressive strength of at least 3,000 pounds per square inch (psi).
- 3) Rubber gasketed joints for pre-cast manhole sections shall be an R-4 joint and designed in accordance with ASTM C443.
- 4) Manhole joints may be joined with flexible plastic/rubber gaskets constructed of Ram-Nek, Rubber-Nek, Con-Seal or equivalent.

3.4 **CAST-IN-PLACE CONCRETE:** All cast-in-place concrete utilized in sanitary sewer construction shall have a minimum compressive strength of 3,000 psi at 28 days unless specifically required otherwise by the project.

3.4.1 Aggregates: Conform to ASTM C33, Maximum size shall be 3/4 inch nominal diameter.

3.4.2 Cements: Portland Cement in accordance with ASTM C150, Type II or Type IILA will be used for all concrete.

3.4.3 Admixtures: Air entraining admixtures will be permitted in conformance to ASTM C260. Maximum entrained air shall be 6.5% and minimum shall be 5.0%. Water reducing and retarding admixtures may be utilized with the specific approval of the District. Such admixtures shall be in conformance with ASTM C493. Flyash or calcium chloride are not permitted for use.

3.4.4 Water/Cement Ratio: Maximum water cement ratio shall be 0.45.

3.4.5 Slump: Maintain within the following limits:

1" minimum, 3" maximum for all concrete to be incorporated in sanitary sewerage facilities.

3.5 **CASTINGS:**

3.5.1 Cast Iron:

- 1) Conformance: ASTM A48
- 2) Applicable Items: Manhole rings and covers with non-slip surface with "SEWER" cast in the cover. Combined weight will not be less than 310 pounds. Ring shall be a minimum of 4 inches in height and 24" minimum diameter clear opening.

3.6 **STEPS:** All manholes shall have steps at a maximum of 12 inches vertical spacing unless otherwise specifically directed by the District.

3.6.1 Material: Plastic (co-polymer polypropylene) with ½" diameter Grade 60 steel reinforcement as manufactured by M. A. Industries, Inc.

3.6.2 Design Equipment: PS-2-PFS Manhole Step with non-skid grooves and safety nosing's or drop front design.

3.6.3 Width: 12 inches

3.6.4 Capacity: 1000 pounds at 6 inches from wall, 1500 pounds at 4 inches from wall.

3.7 **CEMENT MORTAR:**

3.7.1 Conformance: ASTM A270, Type M.

3.8 **CEMENT GROUT:**

3.8.1 Cement: Portland Cement in accordance with ASTM C150, Type II or IILA

3.8.2 Sand: Clean, well graded, natural sand in accordance with ASTM C33.

3.8.3 Proportioning: One part Portland Cement, 2 ½ parts sand, by weight, with minimum water required for placement and hydration.

3.9 **NON-SHRINK GROUT:**

3.9.1 Approved commercial factory mix product made especially for intended use.

3.9.2 Utilize non-metallic chemical grout for non-shrink applications.

3.10 **DAMPPROOFING MATERIAL:**

3.10.1 Coal tar epoxy coating:

- 1) TNEMEC Series 46 – 465 H.B. TNEMECOL or similar approved material.
- 2) Where ground water is present: TNEMEC Series 46H – 413 HI-BUILD TNEME-TAR® or similar approved material.

3.10.2 External concrete joint wrap; elastomeric protective film wrap; 12" width; Henry Company Sealants Division, "Rub-R-NEK External Concrete Joint Wrap" or similar approved material.

CHAPTER 4 – PIPE INSTALLATION

4.1 **SUBGRADE PREPARATION:** See Part III of the Construction Specifications.

4.2 **GENERAL REQUIREMENTS:**

4.2.1 A pre-construction meeting must be arranged by the contractor and held prior to the start of any work. The District Engineer, Contractor, and Owner or Owner's Engineer must be represented at this meeting, which shall be held at the office of the District.

4.2.2 All contractors must notify the District at least 24 hours prior to start construction.

4.2.3 Approved plans and a copy of these Construction Specifications must be kept on the job site by the contractor at all times.

4.3 **PIPE LAYING:**

4.3.1 Prior to the start of any work where sewer mains to be installed tie into existing District sewer systems, the nearest manhole to the point of tie-in shall be plugged with a plumber's plug on the outlet side by the contractor. This plug shall remain in place until final acceptance by the District. Its purpose is to prevent any mud, water, or other materials from entering the existing line during construction. The contractor shall be responsible for pumping and cleaning these manholes and removing the plug when so instructed by the District Engineer.

4.3.2 Begin pipe laying at the lowest point, unless directed otherwise by the District, and install the pipe with the spigot ends pointing in the direction of flow.

4.3.3 Unless required or directed otherwise by the District, lay all pipe straight between changes in alignment and at uniform grade between changes in grade or slope.

4.3.4 As each length of pipe is placed in the trench, the joint shall be completed in accordance with the pipe manufacturer's recommendations and the pipe shall be brought to the correct line and grade. The offset at the invert shall be less than 1% of the inside pipe diameter.

4.3.5 If approved, the length of joints for curvilinear sewer shall be determined by the radius using radius of curvature not exceeding the manufacturer's recommendations, three degree couplings or a combination of both.

4.3.6 Secure the pipe in place with imported Class B bedding material tamped under and around the pipe. Do not walk on small diameter conduit or otherwise disturb any conduit after jointing has been completed.

4.3.7 All foreign matter or soil shall be removed from the inside of the pipe before it is lowered into its position in the trench and shall be kept clean at all times during and after laying. All openings along the line of the sewer shall be securely closed and during suspension of work at any time, suitable pipe plugs or closures shall be placed to prevent water, soil or other materials from entering the pipe.

4.4 **FITTINGS, COUPLINGS, WYES AND SADDLES:**

4.4.1 Fittings, couplings, wyes and saddles shall be the same material as the pipeline or as specifically manufactured for a particular installation.

4.4.2 Jointing of dissimilar materials shall be permitted only with approval of the District Manager or District Engineer. Jointing of such dissimilar materials shall be through the use of fittings, couplings, wyes, saddles, adapters or adhesives specifically manufactured for such transitions.

4.5 **SERVICE LINES:**

4.5.1 Prepare subgrade in accordance with Part III of these Construction Specifications.

4.5.2 Installation of any and all service lines whether from the main line to the property line or from property line to the building, must be inspected by the District Manager or District Engineer, who shall be notified by the contractor at least 24 hours prior to installation.

4.5.3 The type of service line connection fitting to be utilized when connecting to the main line shall be at the discretion of the District.

4.5.4 Connect all service lines to new mains with an in-line, prefabricated wye or tee fitting and all service lines to existing mains with wye or tee saddle. All service lines shall connect into the top one-half of the sewer main. Connections to be made in the lower half or at mid-point of the main shall only be accomplished with prior approval of the District and may require the installation of a backflow prevention device.

4.5.5 Connection of Service Lines to Mains:

- 1) Wye or tee saddles with rubber gaskets shall be used for connection to the main line of pipe, secured in place with stainless steel bands.
- 2) Connection to the main line piping with a wye or tee shall be made by cutting a hole using the appropriate hole template, tapping machine or hole saw no more than 1/4" larger in diameter than the template outline.
- 3) A 45 degree or 22 ½ degree bend shall be used from the wye or tee fitting to attain the desired alignment and slope for the service line piping.
- 4) The in-line wye/tee or wye/tee saddle shall be furnished with an integral rubber gasketed bell.
- 5) All service line piping between the main line and the property line of the property to be serviced shall be piped in accordance with these Construction Specifications with SDR 35 integral rubber gasketed push-on joints.
- 6) In general, no change in horizontal alignment will be permitted between the connection at the main line and the property line of the property being serviced.

4.5.6 Service line connections shall be separated by a minimum of three (3) feet measured center to center along the main.

- 4.5.7** Plug all service line stubs with water and air tight cap or plug unless the service line will be immediately connected to a building sewer.

Where new street construction is proposed immediately following construction of sanitary sewer facilities, extend the service line to 5 feet inside the property line, install the appropriate plug and mark with a vertical wood marker extending above the surface and having dimensions of 2" x 4" minimum.

- 4.5.8** Conform to the installation requirements for sewer mains for the installation of sewer service lines in the public right-of-way or easement. Imported Class B bedding shall be required.

- 4.5.9** The Contractor and/or Developer shall provide complete "as-built" information on each service line connection installed within his/her work. As a minimum this information shall include the location of the connection to the main referenced to the nearest manhole or other permanent improvement, the location of the end of the service line stub, the direction of the service line as it relates to surrounding permanent surface improvements, the size, the material of construction and the date and name of the installer. All such information shall be provided to the District Manager or District Engineer for incorporation into the District's permanent records. (See Chapter 2, Section 2.17.4 for "as-built" plan submittal requirements).

- 4.5.10** Connection of service lines and service line construction shall be accomplished by experienced, qualified personnel with adequate equipment. The District Manager or District's Engineer shall have authority to reject work and may not permit work to be accomplished unless done by qualified personnel.

- 4.5.11** Inspection by the District representative shall be required of each service connection prior to commencing any backfill.

- 4.5.12** All sanitary sewer service lines shall be field identified by marking an "S" in the top of the curb where service lines pass under the curb and gutter.

- 1) Neatly mark 3 inch high letter in the concrete.
- 2) Neatly remove concrete to depth of 1/16 inch with hand or power tools to form letter in hardened concrete.

4.6 MANHOLES:

4.6.1 Precast Base:

- 1) Prepare subgrade and place 12 inches of 3/4 inch rock under base section.
- 2) Place base section to the design elevation.
- 3) If ground water or an unstable subgrade is encountered, the contractor shall:
 - a) Notify the District Manager or District Engineer.
 - b) Dewater as necessary.
 - c) Remove any unstable subgrade material.
 - d) Install 2 inch to 4 inch stabilization rock as necessary to stabilize the subgrade prior to placement of 3/4 inch rock and base section.

4.6.2 Cast-in-Place Concrete Manhole Base:

- 1) Prepare the subgrade and excavation in accordance with the specifications
- 2) Provide reinforcing, grade 60 reinforcing bar, No. 4 at 12 inches on center each way for manholes 12 feet or less in depth. Place steel at 8 inches on center each way on manholes in excess of 12 feet in depth.
- 3) Place concrete against undistributed soil to the depth, thickness and other dimensions shown on detailed drawings.
- 4) Finish and cure the cast-in-place concrete for a minimum period of 24 hours prior to placing precast manhole sections on the cast-in-place base.

- 5) Maintain ground water below the bottom of the cast-in-place concrete for a minimum period of 24 hours following placement of concrete by maintaining pumping equipment in operation below the subgrade of the manhole base.
- 6) Concrete shall contain a minimum of 564 lbs of Type 2 Portland Cement per cubic yard (6 sacks mix), be placed with a minimum slump of 2 inches with maximum size coarse aggregate of 3/4 inch (ASTM C33).

4.6.3 Precast Barrel Sections: Provide segmental precast concrete barrel sections a maximum of 4 feet in length with preformed flexible gasket material between each barrel section as jointing material or install rubber gaskets in precast R-4 joint grooves per manufacturer's recommendations.

4.6.4 Provide Dampproofing of All Manhole Joints:

- 1) Provide dampproofing in accordance with the requirements of Section 3.10.
- 2) Install joint wrap on all external joints, 12" in width.

4.6.5 Provide one, one (1) foot high barrel section beneath a reducing ring or cone cap to bring the manhole ring and cover to within 6 inches of desired grade.

4.6.6 Provide precast concrete/cast iron 2 inch high grade adjustment rings to bring the ring and cover to desired grade. A minimum of two (2), 2 inch adjustment rings are required with a maximum of six (6) grade adjustment rings being permitted. A maximum dimension of 1.5 feet shall be permitted between the manhole ring and the top manhole step.

4.6.7 Where the manhole base is constructed from cast-in-place concrete, the sewer pipes entering the base shall be cut to length to match the inside of the manhole barrel and set to grade. Manhole gaskets shall be placed over the pipe and centered between the end of the pipe and the outside of the cast-in-place base. The cast-in-place base shall then be constructed to the lines and grades required by the

District's standard construction specifications and the accepted plans. Sewer pipe shall not be laid through the manhole base and the concrete base and/or invert placed around the pipe.

Where preformed rubber "boots" such as Kor-N-Seal boots are used in precast manhole bases, manhole gaskets on the pipe are not required.

4.6.8 Where intersecting pipelines or pipelines requiring deflections at manholes require that the invert of the manhole be shaped to match the pipe cross sections, such construction shall be accomplished in accordance with the detail drawings of these construction specifications. Form the flow line configuration of intersecting pipes to allow for free uninterrupted flow of sanitary sewage through and out of the manhole. All channel inverts shall be finished smooth by steel troweling. All inverts shall be placed and finished with a single pour of cast-in-place concrete. Placement of grout and/or other material to repair and/or reshape the manhole invert shall not be permitted unless specifically approved by the District Manager and/or District Engineer.

4.6.9 Cast-in-place bases for manholes shall be constructed in a manner to provide for a smooth level surface on which vertical barrel sections shall be placed. Completely watertight joints shall be made utilizing preformed flexible gasket material or a precast concrete base section may be utilized. The manhole shall be constructed such that no single section varies from true vertical by more than two percent of the section length.

4.6.10 All manholes constructed in the District shall have the ring and cover elevations set at final street grades or at a point not more than 6 inches above the existing ground in non-traffic areas unless directed otherwise by the District. The Developer/Contractor shall be responsible for adjusting the manhole rings and covers to the final elevations.

4.6.11 In areas where street paving will be placed, the manhole ring adjustment shall be accomplished in a two-step process prior to placement of pavement. The manhole ring shall be constructed 1/2 inch below finished pavement surface elevation.

Pavement shall then be placed in accordance with the applicable rules, regulations and specifications. Following completion of paving, the sanitary sewer manhole rings will be raised by the Developer/Contractor to finished grade in accordance with the Construction Specifications of the District.

4.6.12 The ring shall be adjusted with precast concrete rings a maximum of 12 inches in height. Cement grout shall be placed to adjust the ring to conform to the surface. A concrete collar shall be placed around the adjusting rings and the ring of the manhole up to a point 2 inches below finished grade. Paving material shall then be placed over the concrete and match the surrounding pavement surface. Tack coat material shall be placed between new and existing asphalt/concrete surfaces, the manhole casting and the concrete collar.

CHAPTER 5 – TESTING OF PIPELINES AND APPURTENANCES:

5.1 **INFILTRATION:** Use where ground water may be above the pipeline invert.

5.1.1 Infiltration tests shall be conducted on each segment of the sanitary sewer system where it could be anticipated that ground water may rise above the flow line of the pipeline. Tests shall be conducted by placing an approved calibrated V-notch weir in the line just above the next lower manhole and plugging the line just above the next higher manhole. Sufficient time will be allowed to permit the water level behind the weir to stabilize before reading. Any foreign material hanging to the weir will be dislodged before reading. Successive readings shall be taken until consistent results are obtained.

5.1.2 The maximum allowable infiltration shall be 100 gallons per day per inch of pipe diameter per mile of pipe.

5.1.3 Each segment of pipeline between manholes or other major appurtenances must satisfy and pass the infiltration tests.

5.1.4 Should it be determined that the infiltration rate is in excess of that permitted by these construction specifications, any repair and/or replacement of pipelines,

manholes or other appurtenances shall be at the Contractor's and/or Developer's expense. Satisfactory repair and replacement shall be accomplished prior to the consideration of acceptance of any facility by the District.

5.1.5 The Contractor and/or Developer will furnish all labor, equipment and materials required to accomplish such testing.

5.2 **AIR TEST:** All segments of sanitary sewer mains shall be subjected to an air pressure test. Where ground water levels are above the conduit, increase the test pressures given below to compensate for the pressure on the conduit from the ground water.

5.2.1 **Initial Test:** The Contractor/Developer may conduct an initial air test of the sewer main line after compaction of the backfill, but prior to the installation of any service lines. Such tests shall be considered for the Contractor's/Developer's convenience in quality control of the project construction. Final consideration for acceptance of the sanitary sewer by the District shall be based on satisfactory completion of testing with all service line stubs installed.

5.2.2 **Preparation of Tests:** Flush and clean the sewer line prior to testing in order to wet the pipe surfaces and produce more consistent results. Plug and brace all openings in the main sewer line and the upper end of any connections. Check all pipe plugs with a soap solution to detect any air leakage. If leaks are found, release the air pressure, eliminate the leaks and start the test procedure over again.

5.2.3 **Procedure of Test:** Add air until the internal pressure of the sewer line is raised to approximately 4.0 psi gage at which time the flow of air shall be reduced and the pressure maintained between 3.5 and 4.5 psi gage for a sufficient time to allow the air temperature to come to equilibrium with the temperature of the pipe.

5.2.4 **Pressure Stabilized:** After the temperature has stabilized the pressure shall be permitted to drop to 3.5 psi gage at which time a stop watch or a sweep second hand watch shall be used to determine the time lapse required for the air pressure to drop to 3.0 psi gage.

5.2.5 Time Lapse Less: If the time lapse is less than that shown in the table, the Contractor/Developer shall make the necessary corrections to reduce the leakage to acceptable limits.

5.2.6 Time Lapse Exceeds: If the time lapse exceeds that shown in the table, the pipe shall be presumed to be within acceptable limits for leakage.

Pipe Dia.(in.)	Minimum Time (min:sec)	Length For Minimum Time (ft.)	Time for Longer Length (L, ft.) (sec)	LENGTH (ft.)			
				100	200	300	400
4	1:53	597	0.190L	1:53	1:53	1:53	1:53
6	2:50	398	0.427L	2:50	2:50	2:50	2:51
8	3:47	298	0.760L	3:47	3:47	3:48	5:04
10	4:43	239	1.187L	4:43	4:43	5:56	7:54
12	5:40	199	1.709L	5:40	5:42	8:33	11:24
15	7:05	159	2.671L	7:05	8:54	13:21	17:48
18	8:30	133	3.846L	8:30	12:49	19:14	25:38
21	9:55	114	5.235L	9:55	17:27	26:11	34:54
24	11:20	99	6.837L	11:24	22:48	34:11	45:35
27	12:45	88	8.653L	14:25	28:51	43:16	57:42

5.2.7 Safety: The air test may be dangerous if proper precautions are not taken. All plugs must be sufficiently braced to prevent blowouts and the pipeline must be completely vented before attempting to remove plugs.

As a safety precaution, pressurizing equipment shall be provided with a regulator setting of 5 psi to avoid over-pressurizing and damaging an otherwise acceptable line.

5.3 ALIGNMENT TESTING:

5.3.1 Unless the pipeline has been installed using a laser for alignment, each section of pipeline on a linear alignment between manholes will be subject to testing by

lamping by the District's Engineer's to determine where proper alignment has been accomplished and whether any displacement of the pipe has occurred during construction.

The Contractor/Developer shall provide suitable assistance to the District's Engineer in accomplishing this work. The Contractor/Developer shall be responsible for repairing any alignment, displaced pipe or other defects discovered during this testing in accordance with these construction specifications.

5.3.2 For pipelines installed at grades less than 1%, a minimum of 90% of the full pipe cross section shall be visible at the opposite end of the segment being observed.

5.3.3 For pipelines installed at grades greater than 1%, a minimum of 75% of the full pipe cross section shall be visible at the opposite end of the segment being observed.

5.3.4 The determination of the acceptability of the pipeline alignment by lamping shall rest solely with the District Manager or District Engineer and his/her decision shall be final.

5.3.5 Pipelines not meeting the requirements of the alignment tests shall be completely excavated, removed and re-laid on prepared bedding material, backfilled and compacted in accordance with these specifications and then subjected to infiltration, air pressure and alignment testing.

5.4 **DEFLECTION TESTS:**

5.4.1 Proper construction in accordance with these construction specifications and the manufacturer's recommendations should result in a vertical deflection of the pipe less than 5% of the internal diameter. At the option of the District, the Contractor/Developer may be required to perform testing to determine conformance with this requirement.

5.4.2 Should the District determine that deflection testing is required, the Contractor/Developer shall provide all necessary equipment, labor and other facilities. Data

supplied by the pipe manufacturer's representative for dimensional quality shall be utilized.

5.4.3 Should the vertical deflection of the pipe be found to exceed 5% of the internal diameter, the Contractor/Developer will remove the pipe, install proper bedding, replace the pipeline material and properly place and compact all backfill material in accordance with these Construction Specifications. Any areas removed and replaced shall be subject to infiltration, air pressure and alignment testing.

5.5 **MANHOLE VACUUM TEST:**

5.5.1 All manholes shall be subjected to a vacuum test prior to acceptance by the District.

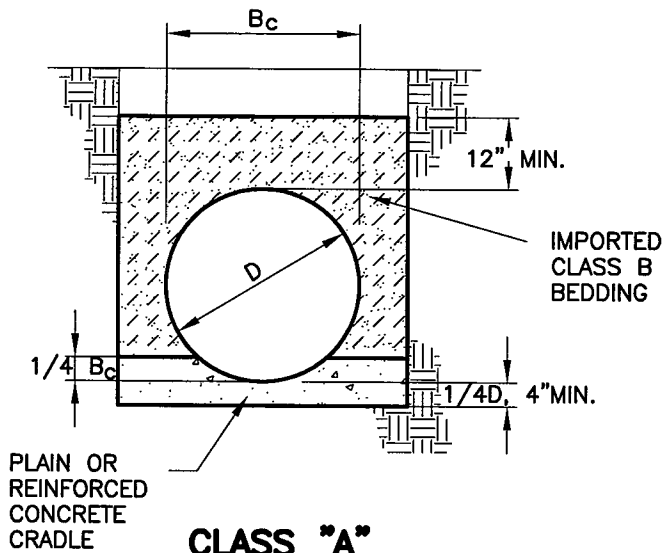
5.6 **INTERNAL VIDEO INSPECTION:**

5.6.1 All sewer main construction in the District shall be inspected with internal video camera and recording equipment.

- 1) Sewer mains shall be professionally cleaned prior to any internal video inspection.

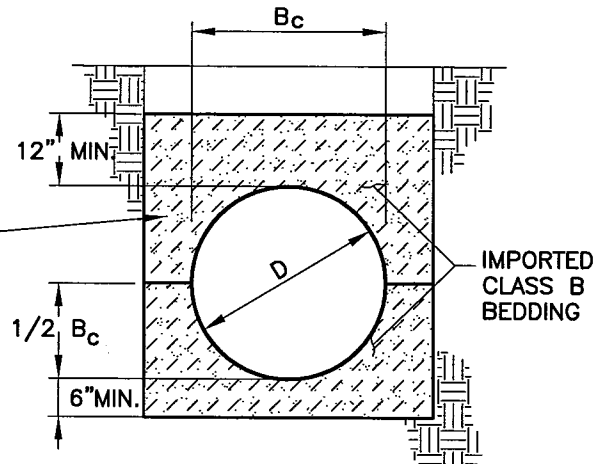
5.6.2 All costs of the internal video inspection shall be borne by the Contractor/Developer.

5.6.3 The individual and/or company and permanent video tape recording shall be subject to the acceptance and approval of the District.



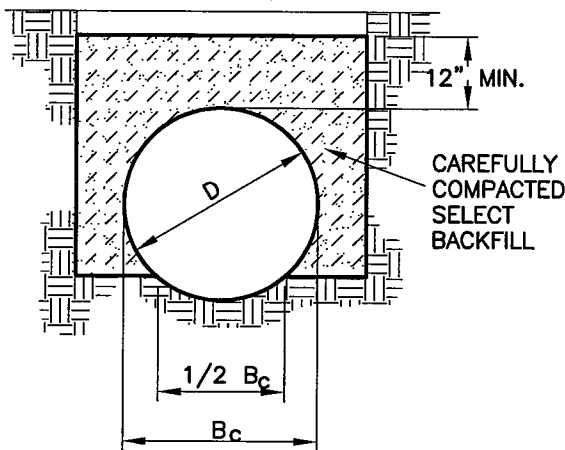
CLASS "A"
(CONCRETE CRADLE)

L.F.=2.8



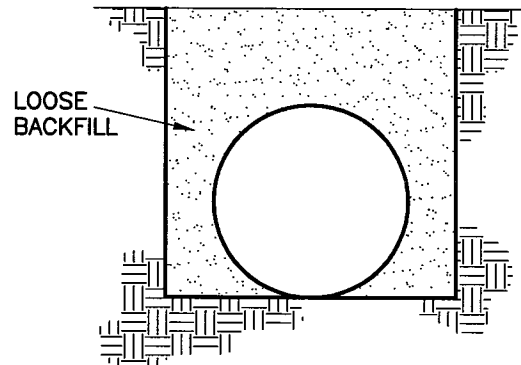
CLASS "B"
(GRANULAR BASE)

L.F.=1.9



CLASS "D"
(SHAPED BOTTOM)

L.F.=1.5



CLASS "D"
(FLAT BOTTOM)

L.F.=1.1

NOTES:

1. FOR ROCK OR OTHER INCOMPRESSIBLE MATERIALS, THE TRENCH SHALL BE OVEREXCAVATED A MINIMUM OF 6" AND REFILLED WITH GRANULAR BEDDING MATERIAL AS DEFINED BY CLASS "B" BEDDING.
2. L.F. = LOADFACTOR
3. CLASS "D" BEDDING WILL NOT BE ACCEPTABLE UNDER ANY CONDITION.
4. MINIMIZE DENSITY FOR CAREFULLY COMPACTED SELECT BACKFILL SHALL BE 95% OF STD. PROCTOR DENSITY OR AS SPECIFIED FOR THE TRENCH BACKFILL, WHICHEVER IS GREATER.

**Palmer
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Sanitation
District**

PIPE BEDDING

DRAWN: MWR

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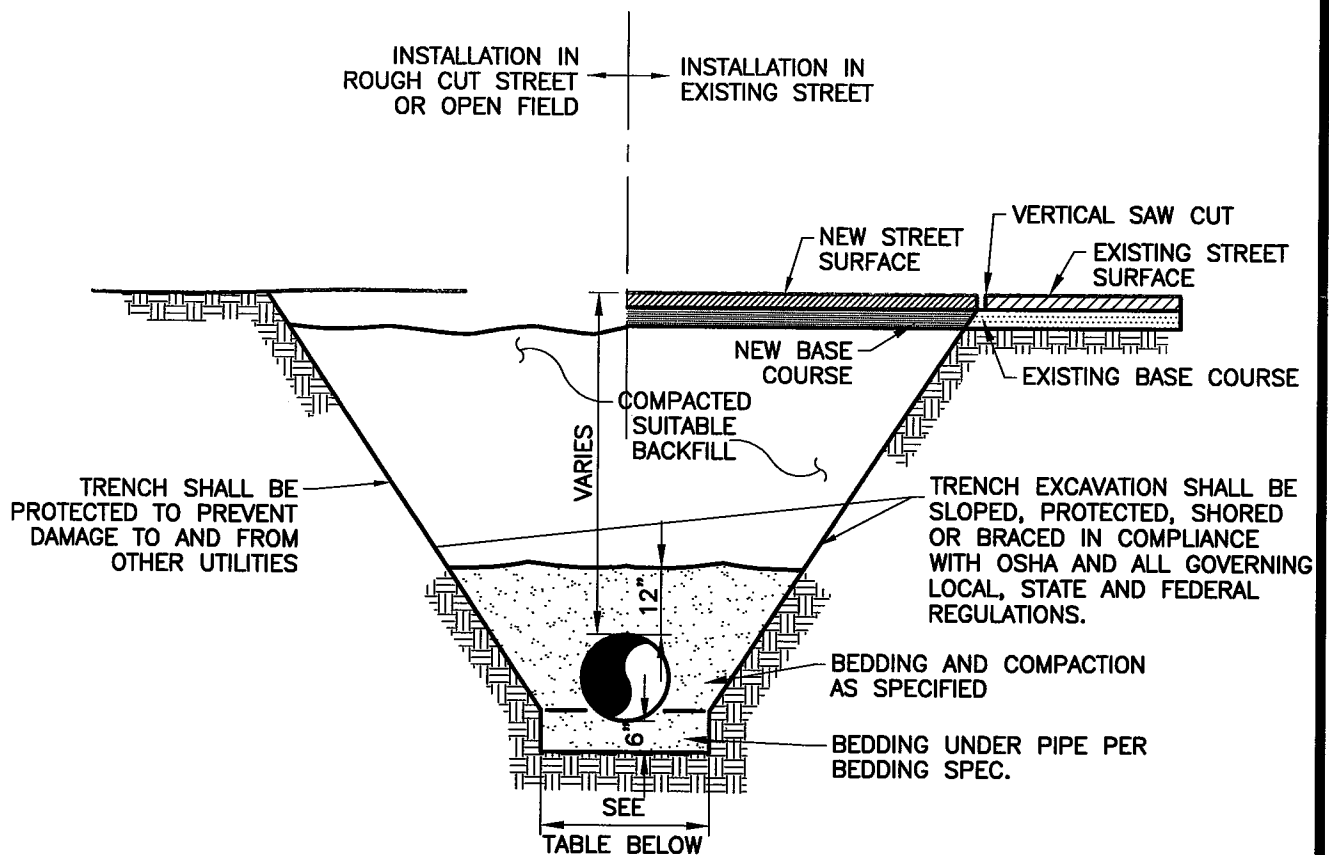
DATE: JUNE 2009

REVISED:

SCALE: NONE

REVISED:

DWG-01



BOTTOM OF TRENCH WIDTH		
PIPE DIAMETER	MINIMUM WIDTH	MAXIMUM WIDTH
4"	1'-5"	3'-9"
6"	1'-7"	3'-11"
8"	1'-9"	4'-1"
12"	2'-1"	4'-5"
16"	2'-6"	4'-9"
20"	2'-10"	5'-2"
24"	3'-2"	5'-6"

ALL PIPE EMBEDMENT SHALL BE IMPORTED CLASS B BEDDING UNLESS OTHERWISE DIRECTED.

AN OVER EXCAVATED TRENCH SHALL BE REFILLED AND THOROUGHLY COMPACTED UNDER THE DIRECTION OF THE PALMER LAKE SANITATION DISTRICT.

UNDER NO CIRCUMSTANCES WILL PIPE BE LAID IN A PROPOSED FILL AREA PRIOR TO IT BEING COMPLETELY FILLED. THE FILL WILL BE PLACED FIRST TO PROPOSED GRADE AND COMPACTED AS REQUIRED. A TRENCH THEN WILL BE EXCAVATED AND THE PIPE INSTALLED IN THE USUAL MANNER.

**Palmer
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Sanitation
District**

TYPICAL TRENCH CROSS SECTION

DRAWN: MWR

REVISED:

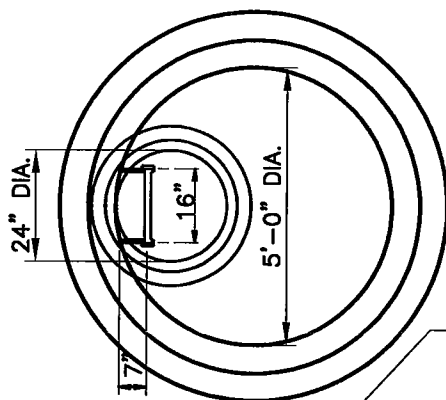
DATE: JUNE 2009

REVISED:

SCALE: NONE

REVISED:

DWG-02



24" C.L. MH RING & COVER (SEE DETAIL) LID TO HAVE NO PROTRUSIONS ABOVE MANHOLE RIM LEVEL.

CEMENT GROUT OR MORTAR

2" PRECAST CONCRETE ADJUSTING RINGS (2 MIN., 6 MAX)

ECCENTRIC CONE

REINFORCEMENT ASTM C-478

12" O.C. NO STAGGER

COAL TAR DAMP-PROOFING OR EPOXY (SEE NOTE 8.)

PRECAST MANHOLE BARREL

GASKET OR RUBBERNECK

INVERT TO BE FORMED

#4@ 12" O.C. E.W. OR 2 LAYERS OF 6"x6" W5.5 X W5.5 OR 4"x4" W4 X W4

1. MANHOLE BARREL MINIMUM DIAMETER SHALL CONFORM TO TABLE.

2. SHAPING FOR SMOOTH MANHOLE INVERTS MUST BE DONE BY FORMING/SHAPING CONCRETE BASE.

3. THE MANHOLE STEPS SHALL BE SIMILAR AND EQUAL TO COPOLYMER ENCAPSULATING A 1/2" GRADE 60 REINFORCING ROD.

4. PRECAST SECTIONS TO CONFORM TO ASTM C-478.

5. STUB-OUTS SHALL EXTEND 12"-18" PAST MANHOLE O.D. AND BE SATISFACTORILY PLUGGED.

6. CONCRETE MANHOLES MAY BE POURED IN PLACE ONLY WITH PRIOR DESIGN AND INSPECTION APPROVAL.

7. ALL MORTAR GROUT SHALL BE MIXED WITH TYPE V CEMENT.

8. APPLY COAL TAR DAMP-PROOFING TO ALL EXTERIOR CONCRETE SURFACES. APPLY COAL TAR EPOXY IF MANHOLE IS PLACED WHERE GROUND WATER IS PRESENT OR MAY BE PRESENT.

9. CENTER REINF. OR WIRE MESH IN BASE POUR BELOW PIPE O.D. AT FL.

10. THE TOP MANHOLE STEP SHALL BE BETWEEN 24" AND 30" BELOW THE FINISHED SURFACE OF THE MANHOLE RING AND COVER.

PIPE I.D.	MANHOLE I.D.
48" & SMALLER	5'-0"
54"	6'-0"
60" & LARGER	SPECIAL DESIGN

Palmer
Lake
Sanitation
District

PRECAST MANHOLE

DRAWN: MWR

REVISED: JUNE 2014

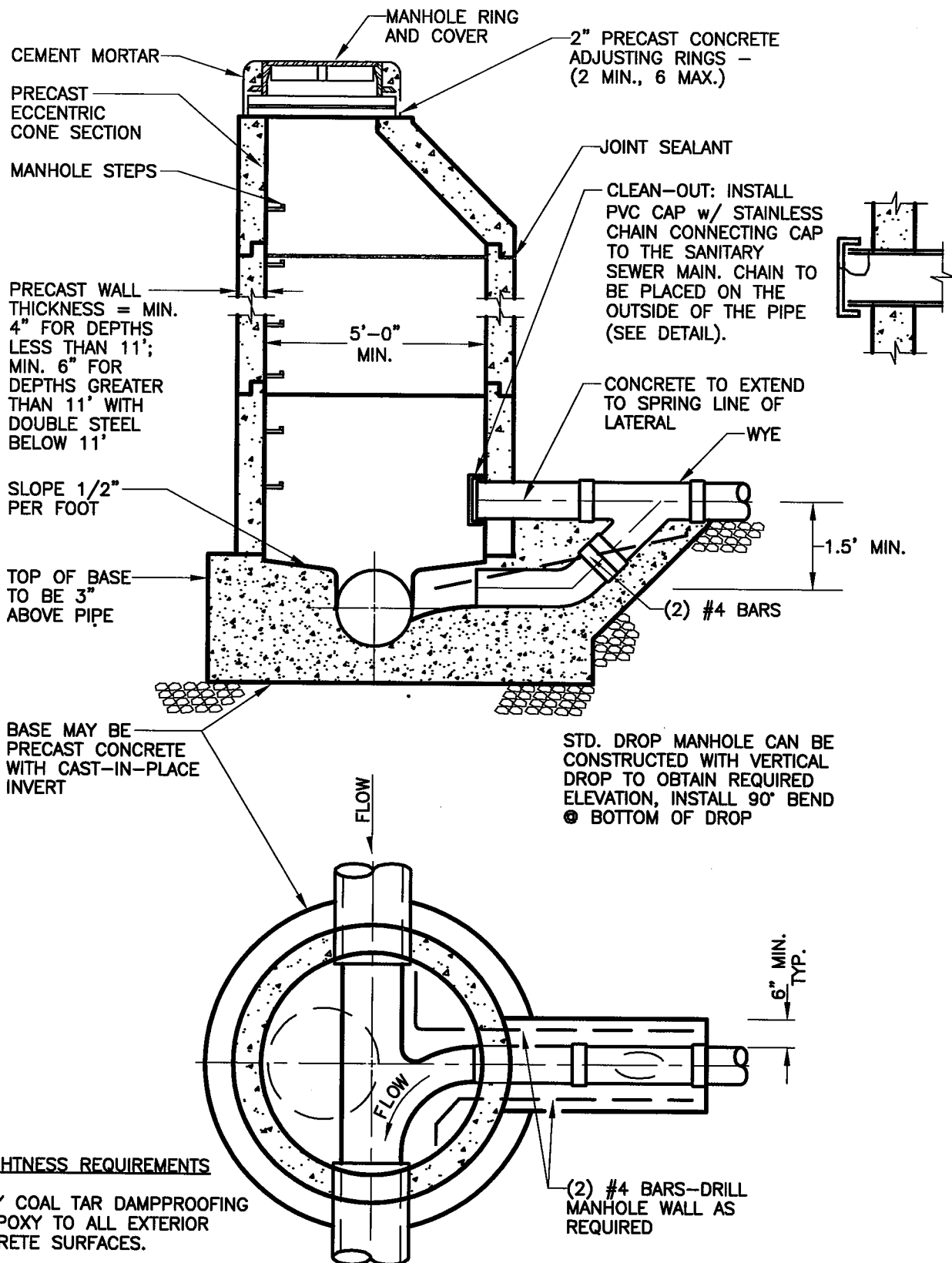
DATE: JUNE 2009

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SCALE: NONE

REVISED:

DWG-03



WATER TIGHTNESS REQUIREMENTS

1. APPLY COAL TAR DAMPPROOFING OR EPOXY TO ALL EXTERIOR CONCRETE SURFACES.
2. APPLY JOINT WRAP ON ALL EXTERIOR JOINTS.

**Palmer
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Sanitation
District**

SANITARY SEWER DROP MANHOLE DETAIL

DRAWN: MWR

REVISED: JUNE 2014

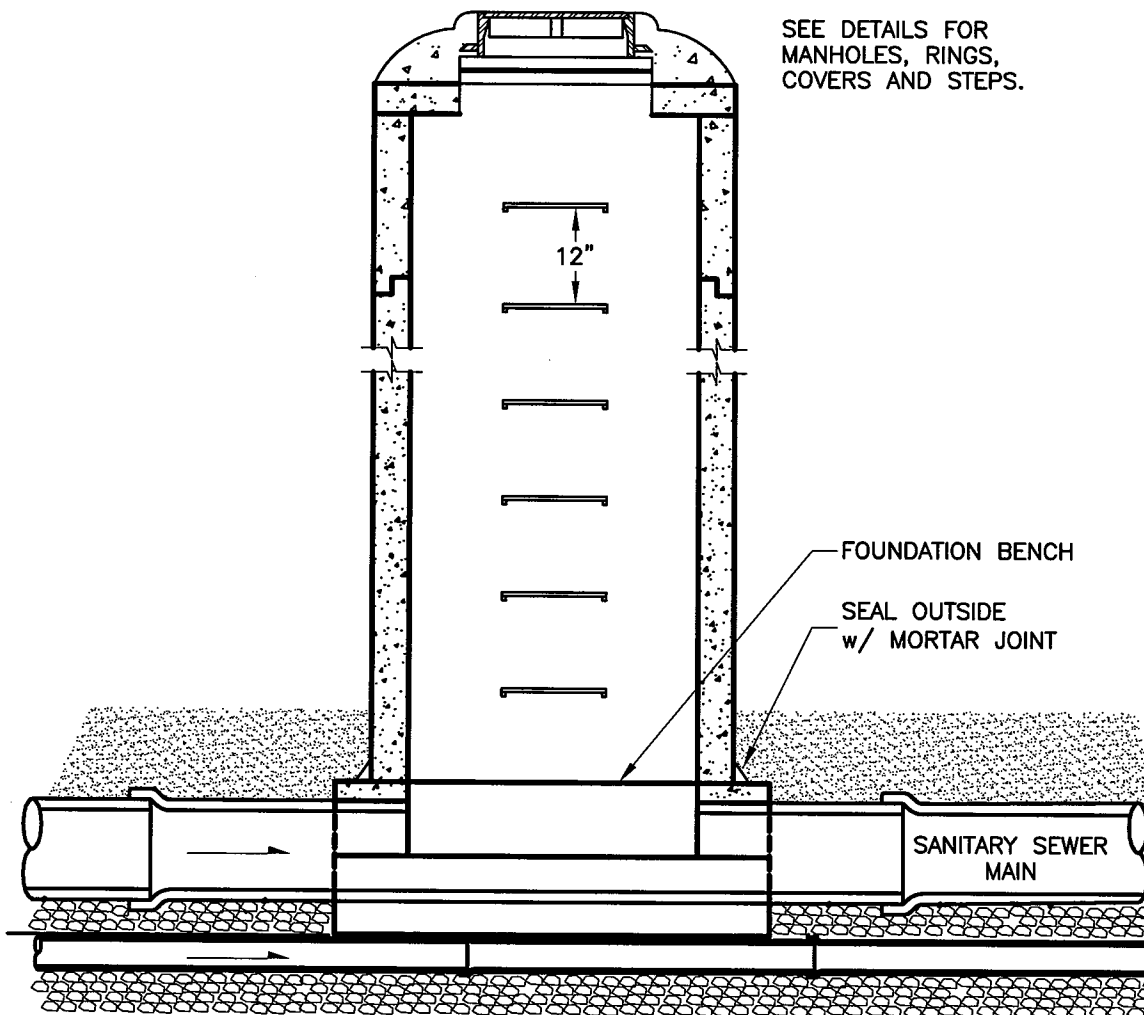
DATE: JUNE 2009

REVISED:

SCALE: NONE

REVISED:

DWG-05



SEE DETAILS FOR
MANHOLES, RINGS,
COVERS AND STEPS.

FOUNDATION BENCH

SEAL OUTSIDE
w/ MORTAR JOINT

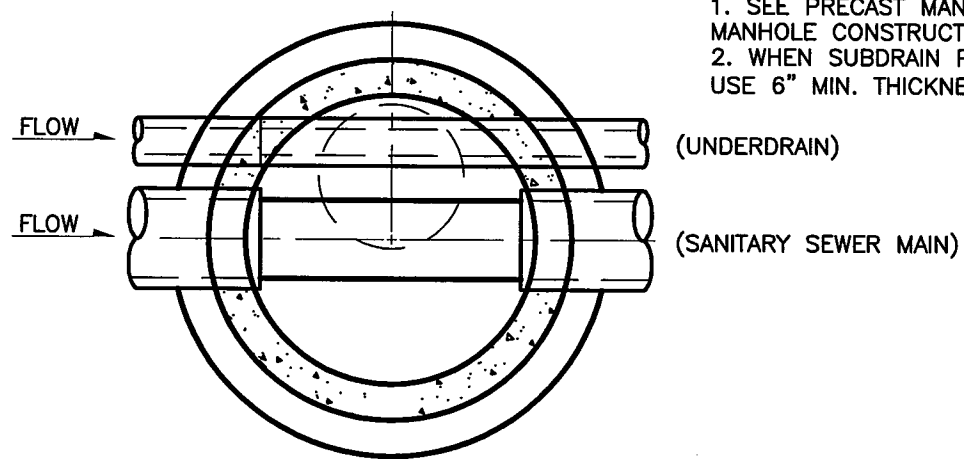
SEE BEDDING
DETAIL FOR
SUB-DRAIN

SANITARY SEWER
MAIN

SUB-DRAIN
PIPE SHALL BE
SLOTTED OR
PERFORATED

NOTES:

1. SEE PRECAST MANHOLE DETAILS FOR
MANHOLE CONSTRUCTION.
2. WHEN SUBDRAIN PIPE NOT REQUIRED
USE 6" MIN. THICKNESS OF 3/4" ROCK.



(UNDERDRAIN)

(SANITARY SEWER MAIN)

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Sanitation
District**

MANHOLE WITH UNDERDRAIN DETAIL

DRAWN: MWR

REVISED:

DATE: JUNE 2009

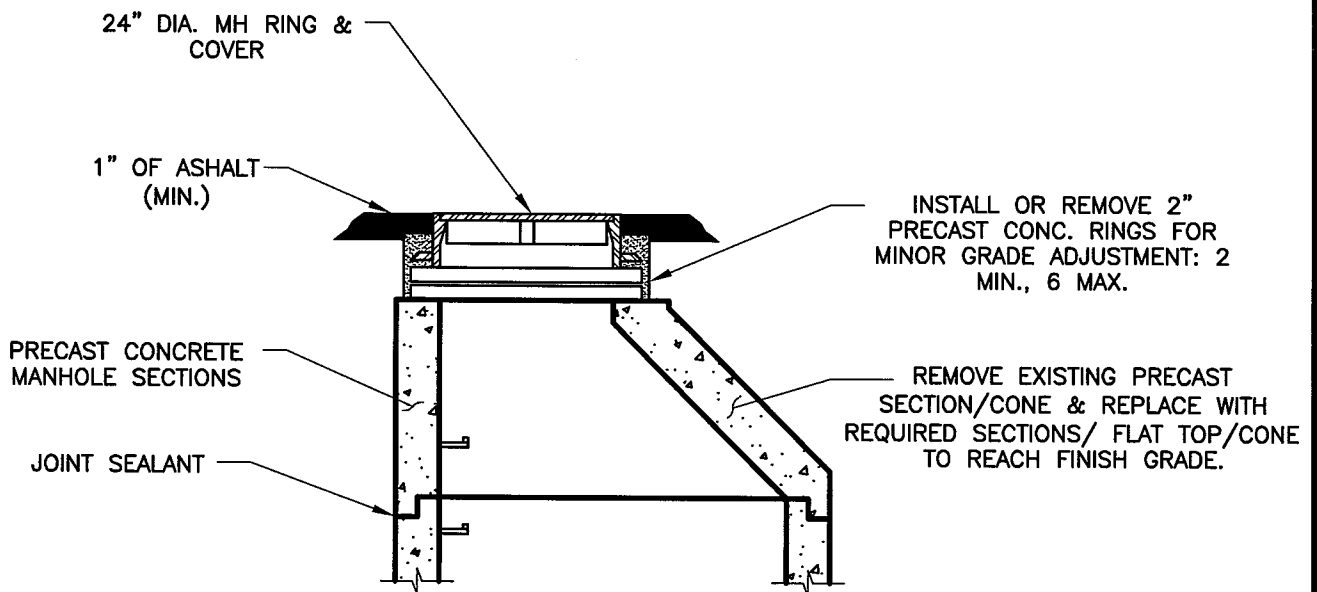
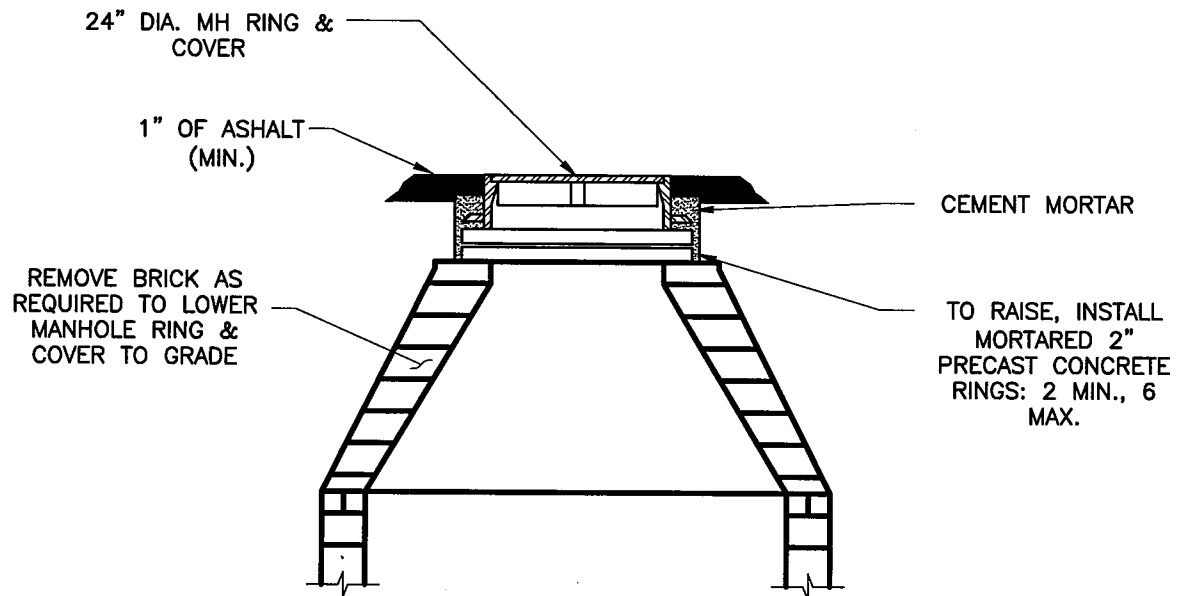
REVISED:

SCALE: NONE

REVISED:

DWG-06

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**Palmer
Lake
Sanitation
District**

MANHOLE ADJUSTMENT DETAIL

DRAWN: MWR

REVISED:

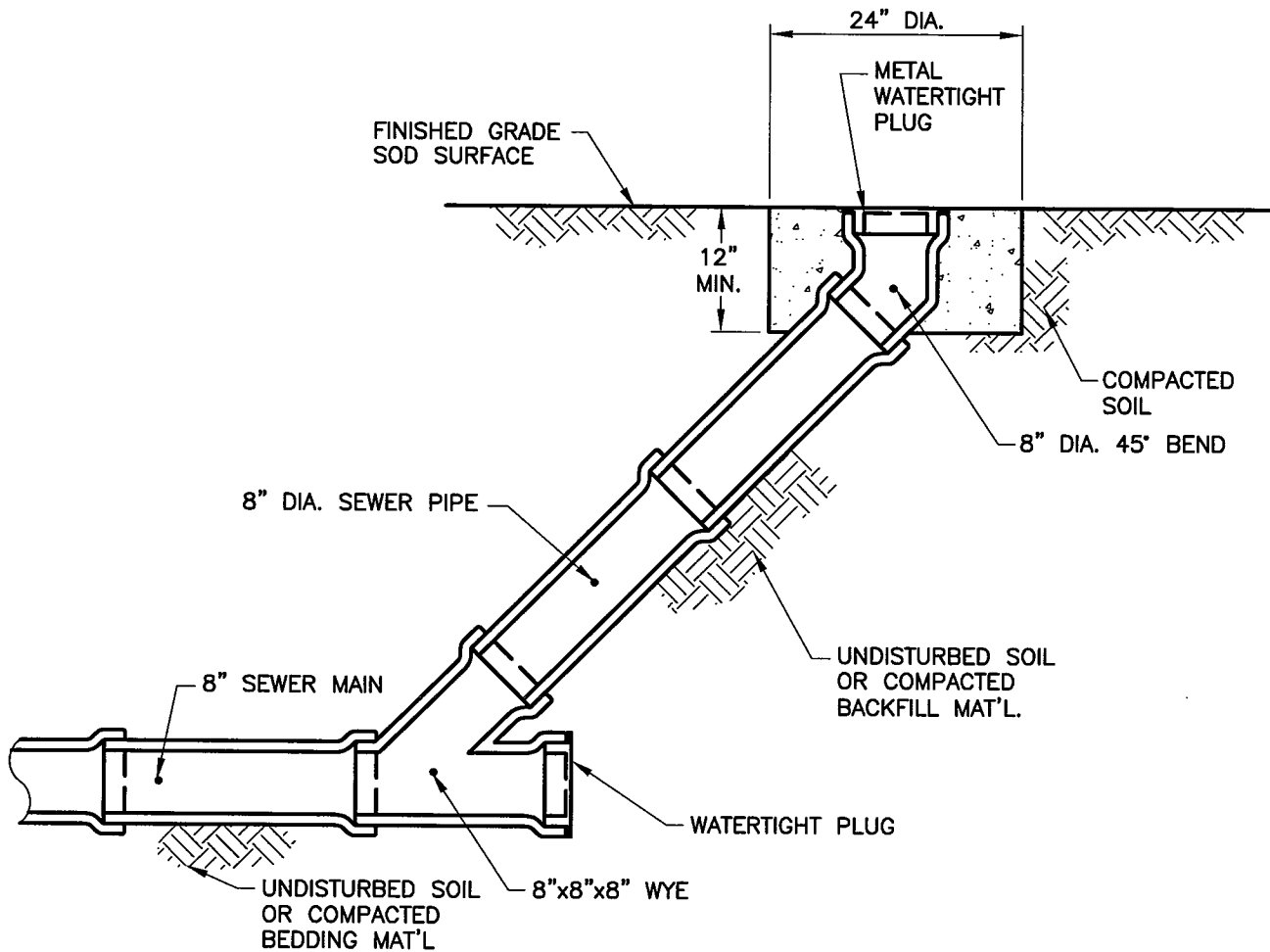
DATE: JUNE 2009

REVISED:

SCALE: NONE

REVISED:

DWG-07



NOTE:
SERVICE LINE CLEANOUTS SHALL BE
PLACED 2" BELOW GRADE WITH A 10"
LONG RISER BOX PLACED AT GRADE
WITH "SEWER" CAST IN THE LID.

**Palmer
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Sanitation
District**

SEWER MAIN CLEAN OUT DETAIL

DRAWN: MWR

REVISED:

DATE: JUNE 2009

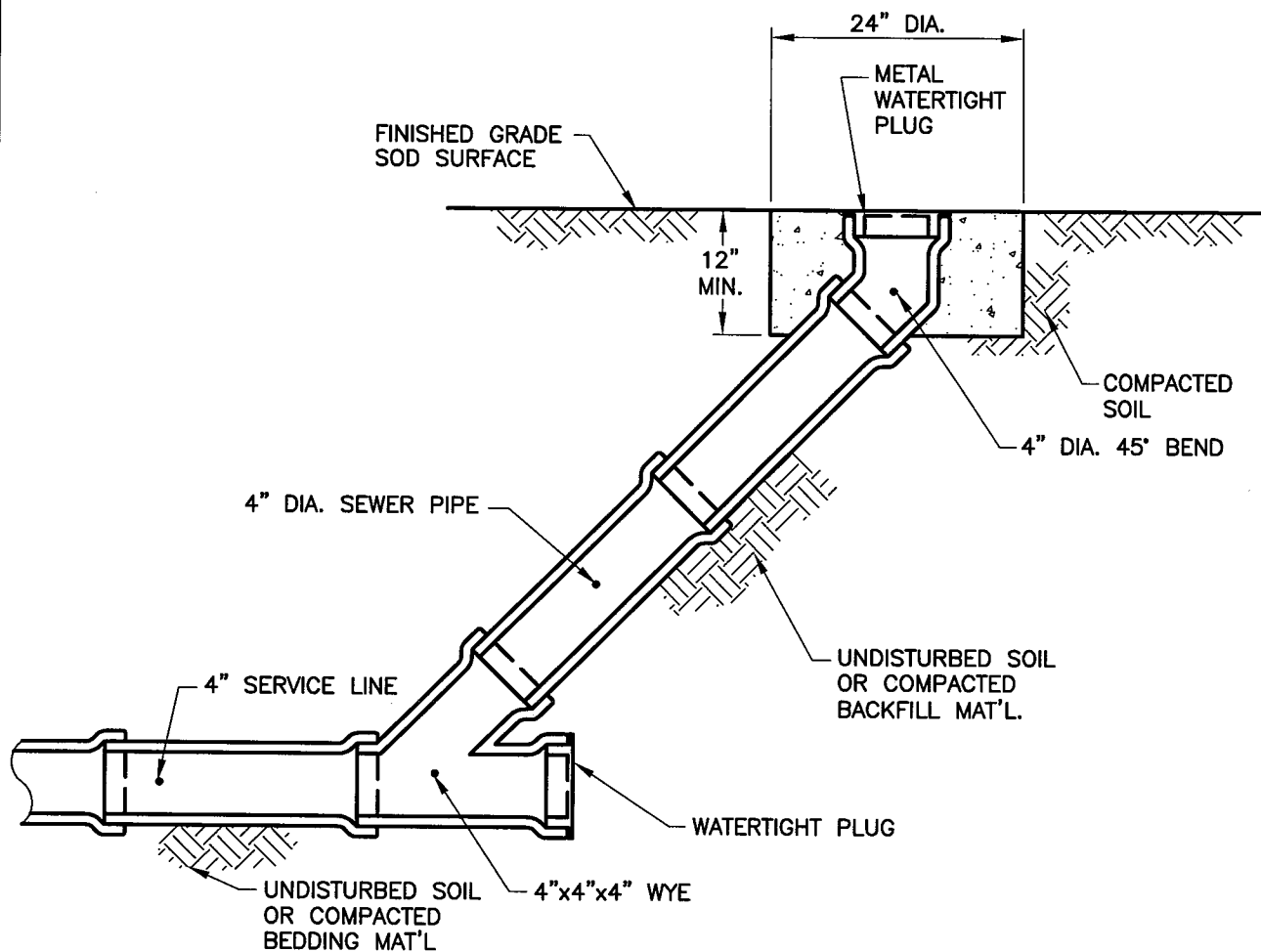
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SCALE: NONE

REVISED:

DWG-08

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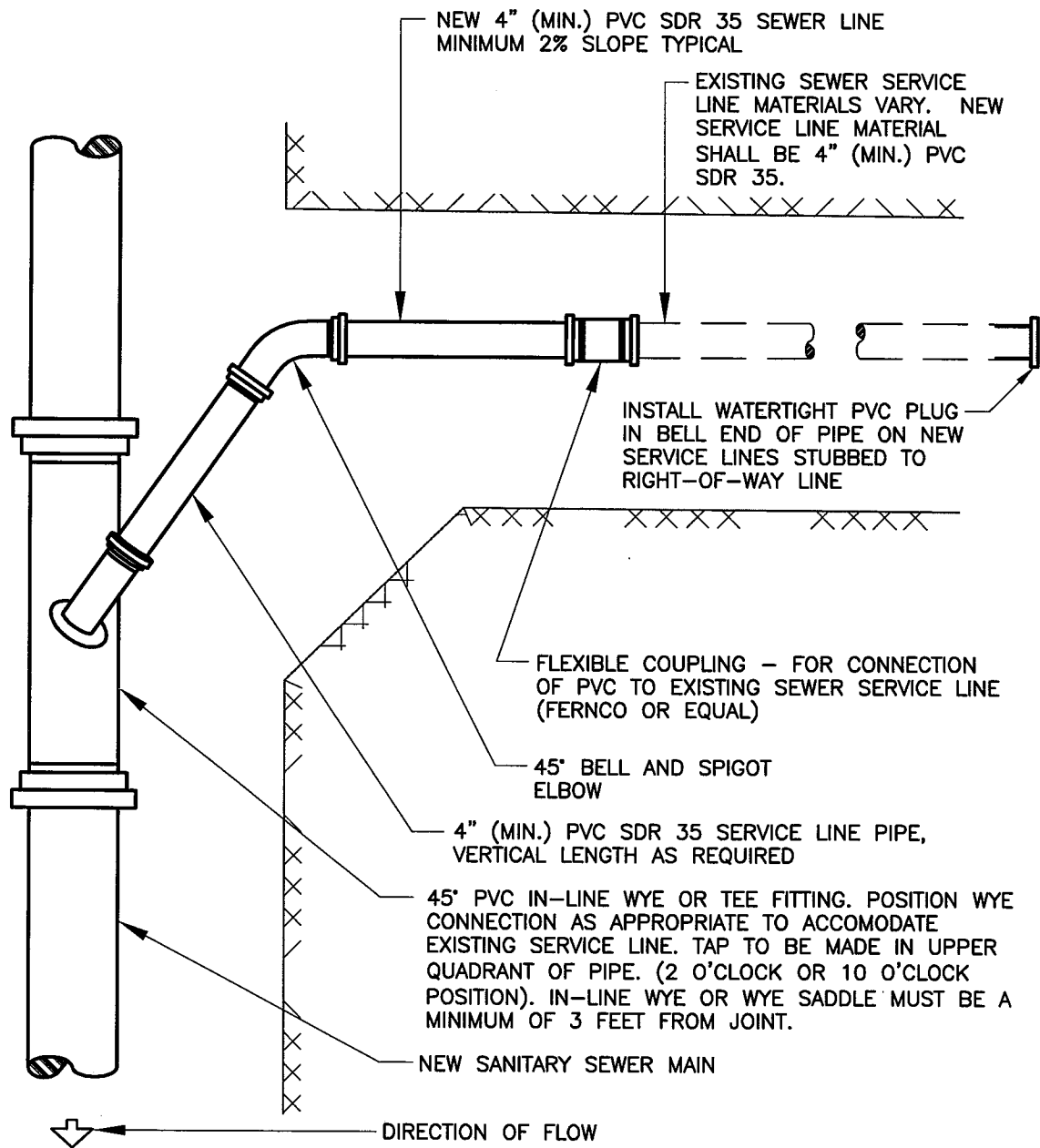
NOTE:
SERVICE LINE CLEANOUTS SHALL BE
PLACED 2" BELOW GRADE WITH A 10"
LONG RISER BOX PLACED AT GRADE
WITH "SEWER" CAST IN THE LID.

**Palmer
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Sanitation
District**

SERVICE LINE CLEAN OUT DETAIL

DRAWN: MWR	REVISED:
DATE: JUNE 2009	REVISED:
SCALE: NONE	REVISED:

DWG-08A



**Palmer
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Sanitation
District**

SEWER SERVICE CONNECTION DETAIL

DRAWN: MWR

REVISED:

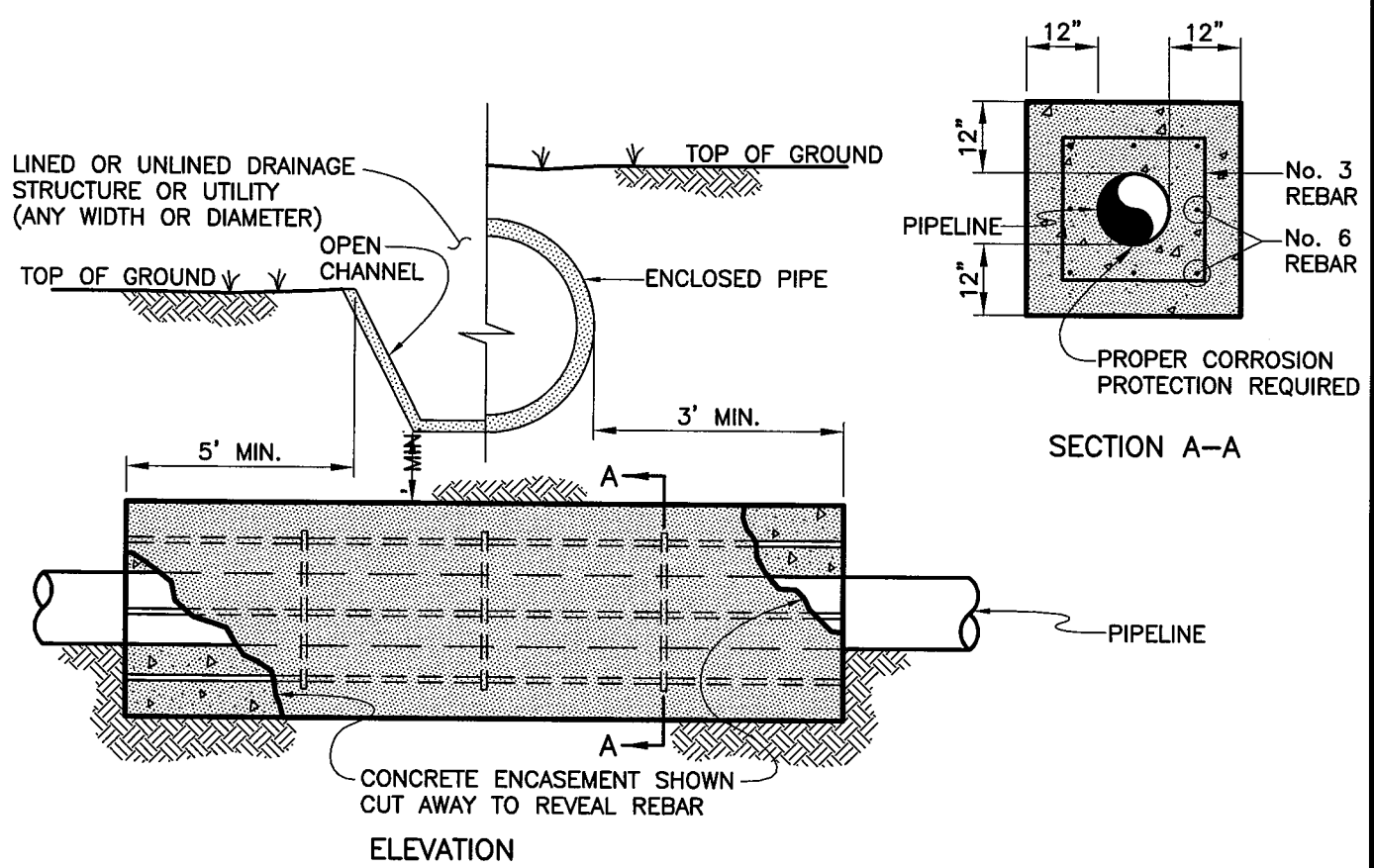
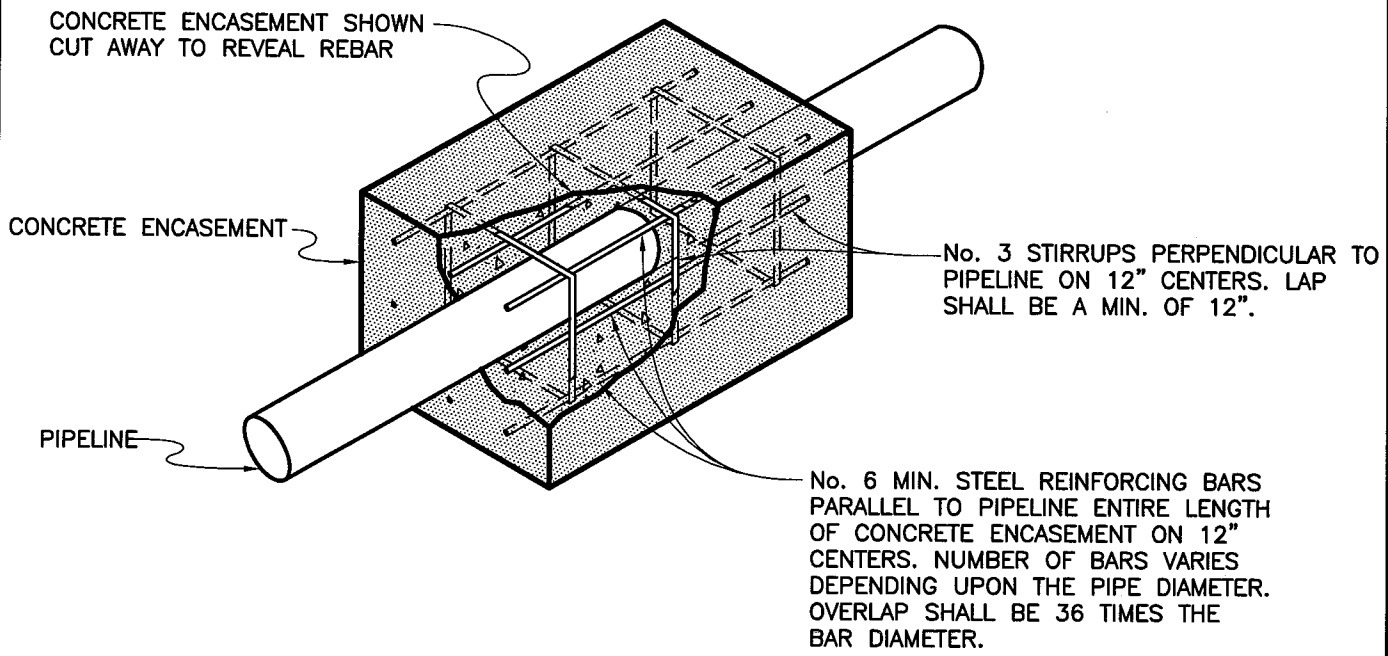
DATE: JUNE 2009

REVISED:

SCALE: NONE

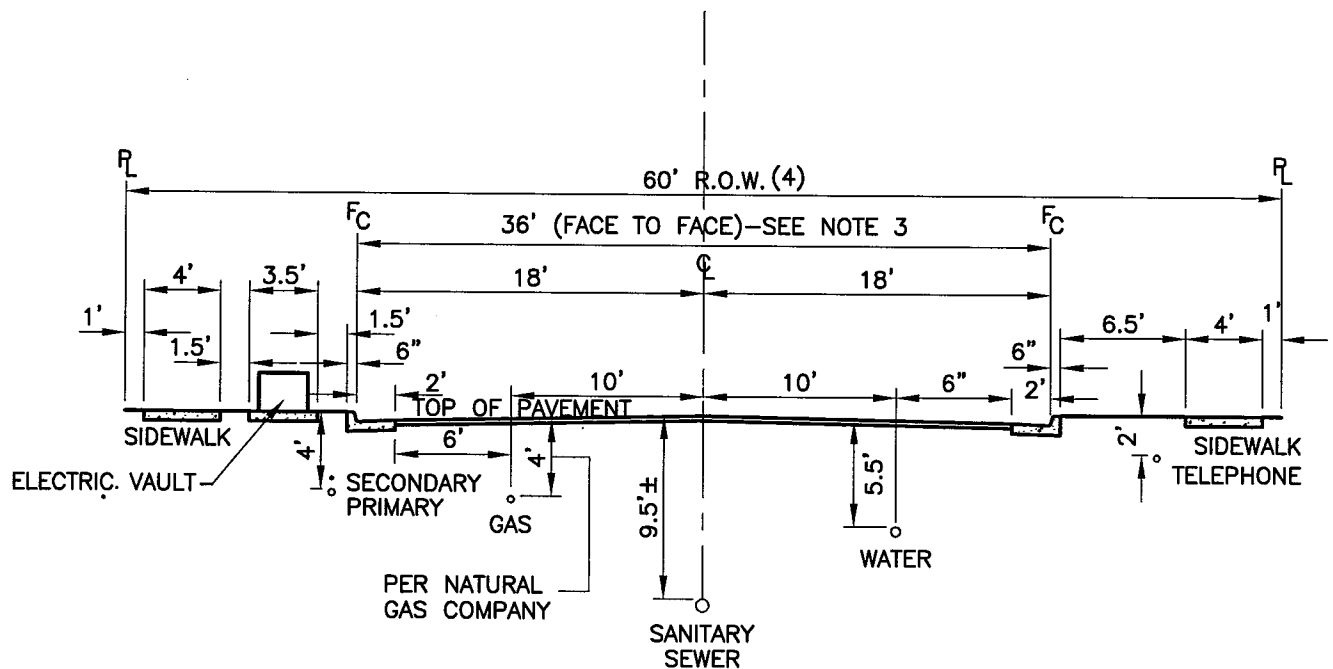
REVISED:

DWG-09



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Palmer Lake Sanitation District	PIPE ENCASEMENT DETAIL		
	DRAWN: MWR	REVISED:	DWG-10
	DATE: JUNE2009	REVISED:	
	SCALE: NONE	REVISED:	



TYPICAL CROSS SECTION
UTILITIES LOCATION

GENERAL NOTES

- 1) STORM SEWERS SHALL MAINTAIN A 10' CLEAR SEPARATION FROM WATER.
- 2) ELECTRIC CONDUITS SHALL BE ON THE OPPOSITE SIDE OF THE STREET FROM WATER.
- 3) FOR 40' WIDE STREET SECTIONS, MAINTAIN WATER 10 FEET FROM SANITARY SEWER AT STREET CENTERLINE.
- 4) FOR 50' WIDE RIGHT-OF-WAY (ROW), A 5-FOOT WIDE SIDEWALK AND UTILITY EASEMENTS ARE REQUIRED ADJACENT TO THE STREET ROW. FIVE (5) FOOT WIDE ATTACHED SIDEWALK IS USED WITH ELECTRIC UTILITIES BEHIND WALK IN EASEMENT.

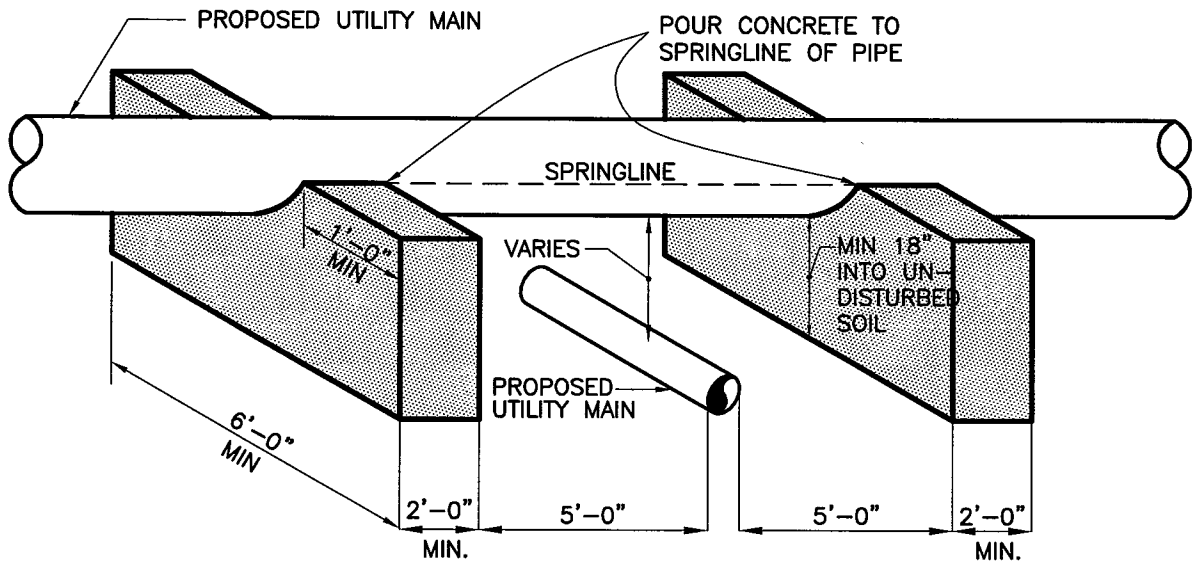
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**Palmer
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Sanitation
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TYPICAL UTILITIES LOCATION

DRAWN: MWR	REVISED:
DATE: JUNE 2009	REVISED:
SCALE: NONE	REVISED:

DWG-11



NOTES :

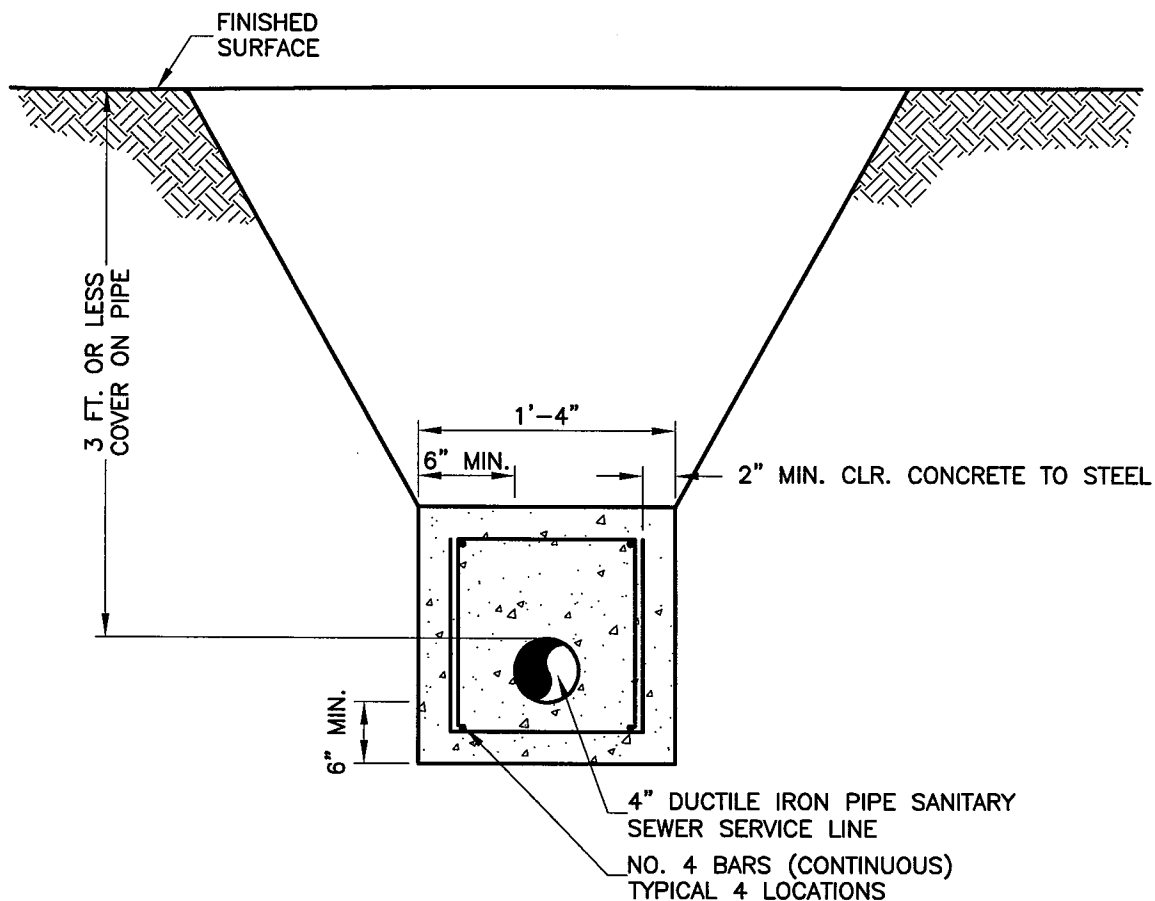
1. CONCRETE BRIDGING BLOCKS TO BE REINFORCED WITH No. 6 REBAR SET ON 12" CENTERS.
2. NO JOINTS OF UTILITY MAIN SHALL BE ALLOWED BETWEEN CONCRETE BRIDGING BLOCKS.

**Palmer
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Sanitation
District**

PIPE BRIDGING DETAIL

DRAWN: MWR	REVISED:
DATE: JUNE 2009	REVISED:
SCALE: NONE	REVISED:

DWG-12



NOTES:

1. DUCTILE IRON PIPE WITHOUT CONCRETE ENCASEMENT MAY BE PERMITTED BY THE DISTRICT IF FINAL PIPE COVER IS MORE THAN 3 FEET.
2. CONCRETE ENCASEMENT PER THIS DRAWING IS REQUIRED WITH DUCTILE IRON PIPE WHERE FINAL PIPE COVER IS 3 FEET OR LESS.
3. IF THE CONCRETE ENCASEMENT IS REQUIRED ON A SANITARY SEWER SERVICE LINE, THE PROPERTY OWNER/CUSTOMER IS COMPLETELY RESPONSIBLE FOR OPERATION, MAINTENANCE AND REPLACEMENT OF ANY SEWER SERVICE LINE FROM THE DISTRICT'S SEWER MAIN TO THE STRUCTURE SERVED.

**Palmer
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Sanitation
District**

SHALLOW SANITARY SEWER LINE ENCASEMENT

DRAWN: MWR

REVISED:

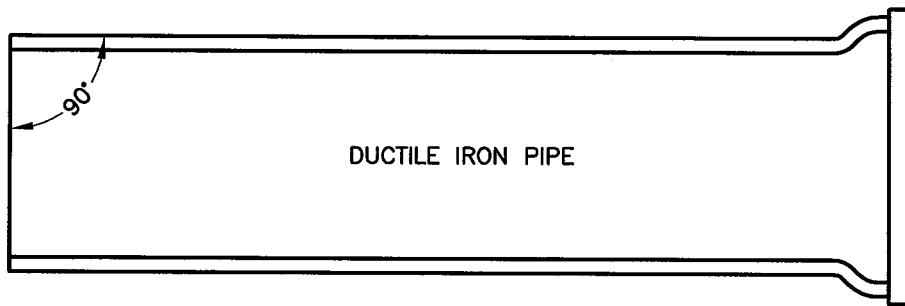
DATE: JUNE 2009

REVISED:

SCALE: NONE

REVISED:

DWG-13



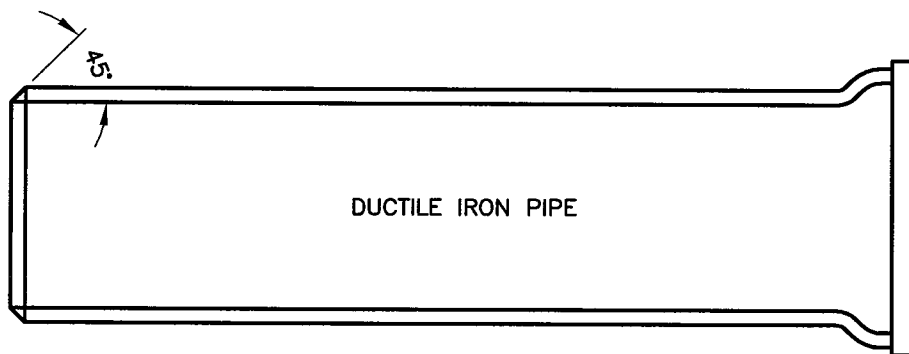
MECHANICAL JOINT CONNECTION

PIPE MUST BE CUT AT RIGHT ANGLES TO LONGITUDINAL CENTERLINE IN ALL CASES.

PIPE ENDS SHALL BE FREE OF BURRS.

MORTAR LINING SHALL BE FLUSH WITH PIPE END.

GOUGES CUT IN PIPE ENDS SHALL NOT BE ALLOWED.



SLIP JOINT CONNECTION

PIPE CUT IN STRAIGHT LINE AND BEVELED AT 45° ANGLE ON END.

GENERAL NOTES:

1. ALL PIPE CUTTING EQUIPMENT AND PIPE CUTS MUST BE APPROVED BY THE PALMER LAKE SANITATION DISTRICT.
2. ALL PIPE ENDS TO BE USED IN INSTALLATION SHALL BE DRESSED SMOOTH TO THE SATISFACTION OF THE INSPECTOR PRIOR TO INSTALLATION.

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**Palmer
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District**

PIPE CUTTING

DRAWN: MWR

REVISED:

DATE: JUNE 2009

REVISED:

SCALE: NONE

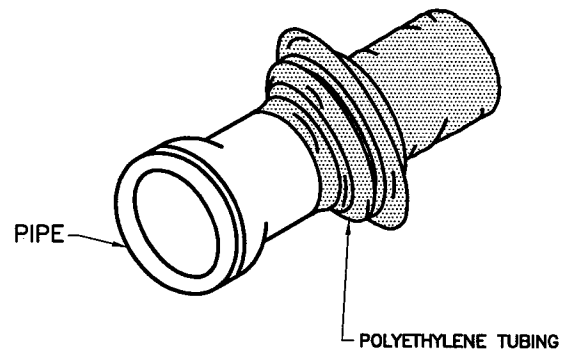
REVISED:

DWG-14

FIELD INSTALLATION OF POLYETHYLENE WRAP

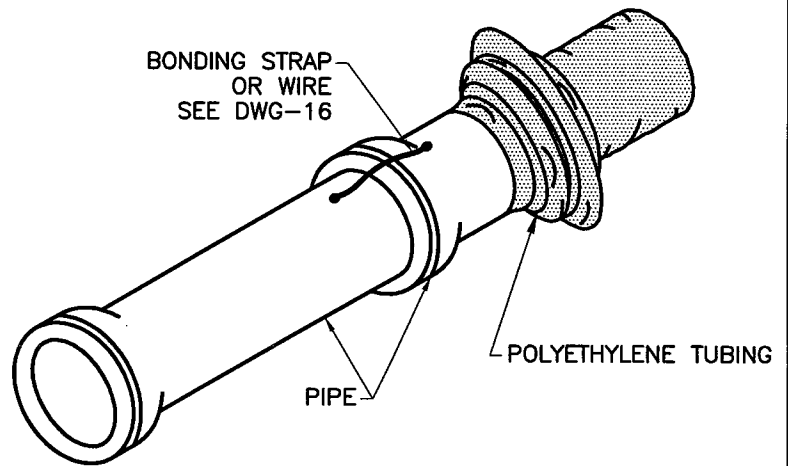
STEP 1:

PLACE TUBE OF POLYETHYLENE MATERIAL ON PIPE PRIOR TO LOWERING IT INTO TRENCH.



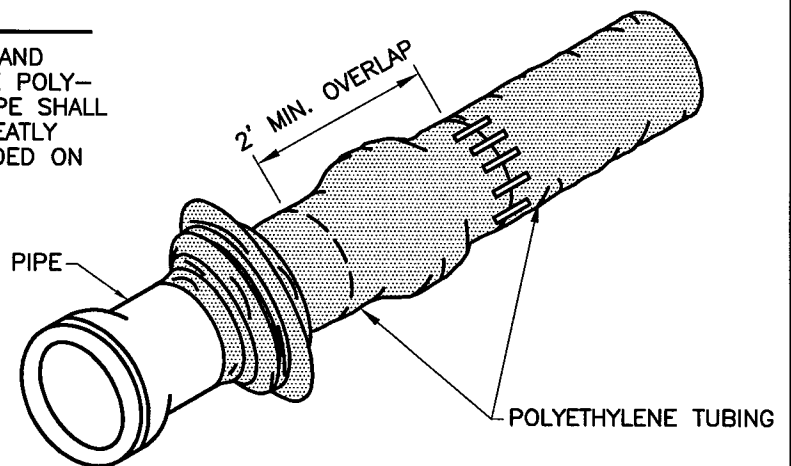
STEP 2:

PULL TUBE OVER THE LENGTH OF THE PIPE. TAPE TUBE TO END AT JOINT. FOLD MATERIAL AROUND THE ADJACENT SPIGOT END AND WRAP WITH TAPE TO HOLD THE PLASTIC TUBE IN PLACE. INSTALL BONDING STRAP OR WIRE AT EVERY JOINT OF PIPE PRIOR TO WRAPPING IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS.



STEP 3:

OVERLAP FIRST TUBE WITH ADJACENT TUBE AND SECURE WITH PLASTIC ADHESIVE TAPE. THE POLYETHYLENE TUBE MATERIAL COVERING THE PIPE SHALL BE LOOSE. EXCESS MATERIAL SHALL BE NEATLY DRAWN UP AROUND THE PIPE BARREL, FOLDED ON TOP OF PIPE AND TAPED IN PLACE.

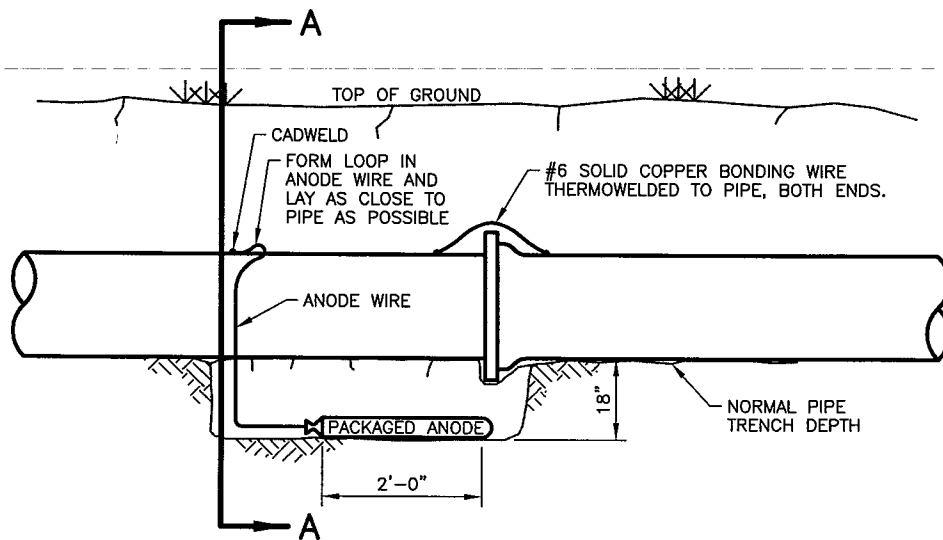


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District**

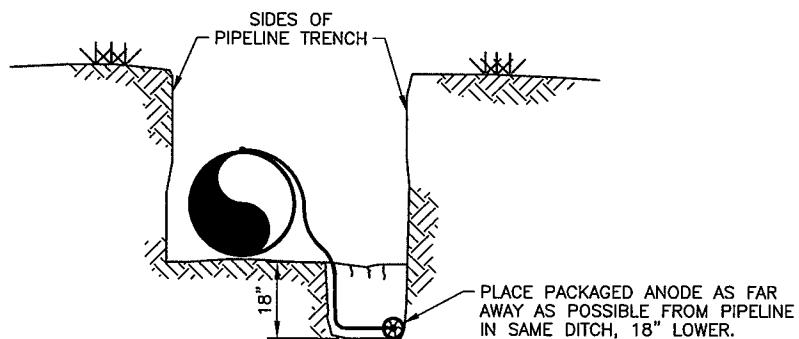
POLYETHYLENE WRAP

DRAWN: MWR	REVISED:
DATE: JUNE 2009	REVISED:
SCALE: NONE	REVISED:

DWG-15



ELEVATION



SECTION A-A

NOTE:

1. CADWELD CONNECTION TO BE PRIMED AND COATED CAREFULLY. PACKAGED ANODE SHOULD BE COVERED WITH FINE SOIL CONTAINING NO ROCKS OR DIRT CLUMPS, TAMPED.
2. WHEN ANODES ARE REQUIRED WITH METAL FITTINGS AND APPURTENANCES TOGETHER WITH PVC PIPE INSTALLATION, THE ANODES SHALL BE PLACED AND ATTACHED TO THE METAL IN SAME MANNER AS SHOWN ON

**Palmer
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Sanitation
District**

CADWELD/ANODES CONNECTION DETAIL

DRAWN: MWR	REVISED:
DATE: JUNE 2009	REVISED:
SCALE: NONE	REVISED:

DWG-16

MAXIMUM DEFLECTION

PER SLIP JOINT OF D.I.P.

PIPE DIAMETER			MFRS. DEFL.	DESIGN DEFLECTION (80% MAX.)			APPROX. RADIUS FOR DEFLECTING CURVES WITHOUT BENDS	
I.D.	O.D.(IN.)	O.D.(FT.)		MAX. DEFL. DIST.		20'L	18'L	
				(1)	(2)			
4"	4.80"	.400'	5'00'00"	4'00'00"	16"	15"	286'	258'
6"	6.90"	.575'	5'00'00"	4'00'00"	16"	15"	286'	258'
8"	9.05"	.754'	5'00'00"	4'00'00"	16"	15"	286'	258'
10"	11.10"	.925'	5'00'00"	4'00'00"	16"	15"	286'	258'
12"	13.20"	1.100'	5'00'00"	4'00'00"	16"	15"	286'	258'
14"	15.30"	1.275'	3'00'00"	2'24'00"	10"	9"	477'	430'
16"	17.40"	1.450'	3'00'00"	2'24'00"	10"	9"	477'	430'
18"	19.50"	1.625'	3'00'00"	2'24'00"	10"	9"	477'	430'
20"	21.60"	1.800'	3'00'00"	2'24'00"	10"	9"	477'	430'
24"	25.80"	2.150'	3'00'00"	2'24'00"	10"	9"	477'	430'
30"	32.00"	2.666'	3'00'00"	2'24'00"	10"	9"	477'	430'
36"	38.30"	3.192'	3'00'00"	2'24'00"	10"	9"	477'	430'
42"	44.50"	3.708'	2'00'00"	1'36'00"	6"	6"	716'	645'

- (1) 20'L = NORMAL 20-FOOT JOINT LAYING LENGTH
(2) 18'L = NORMAL 18-FOOT JOINT LAYING LENGTH

**Palmer
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Sanitation
District**

MAXIMUM PIPELINE DEFLECTION DATA

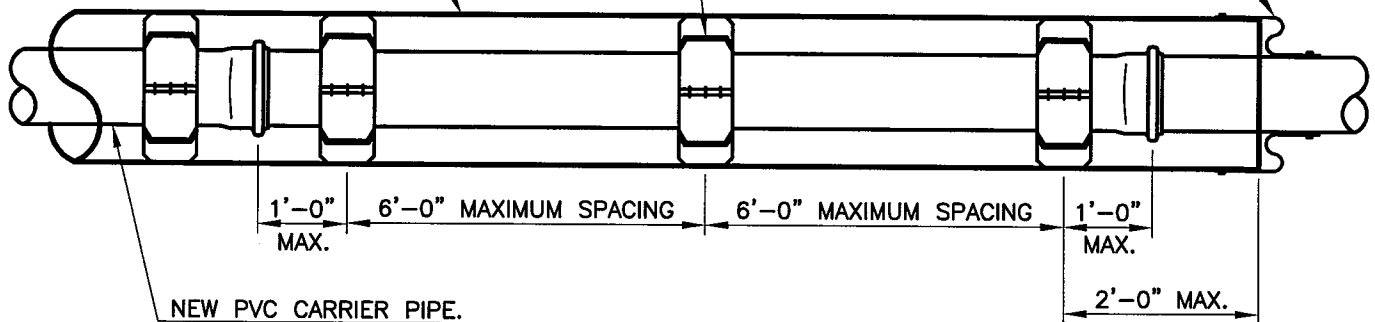
DRAWN: MWR	REVISED:
DATE: JUNE 2009	REVISED:
SCALE: NONE	REVISED:

DWG-17

NEW STEEL CASING PIPE
WITH 0.25" MINIMUM WALL
THICKNESS WITH MINIMUM
YIELD STRENGTH OF
35,000 PSI. REFER TO
PLAN SHEETS FOR SIZE
AND LENGTH

NEW NONMETALLIC
PIPE SKIDS

NEW RUBBER END SEAL
TYP. ON BOTH ENDS



NEW PVC CARRIER PIPE.
REFER TO PLAN SHEETS
FOR PIPE SIZE AND CLASS

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**Palmer
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Sanitation
District**

CASING PIPE DETAIL

DRAWN: MWR

REVISED:

DATE: JUNE 2009

REVISED:

SCALE: NONE

REVISED:

DWG-20

PART III

EARTHWORK STANDARD SPECIFICATIONS

CHAPTER 1 – GENERAL:

1.01 AUTHORITY: These Construction Specifications are promulgated by the Palmer Lake Sanitation District. The interpretation, enforcement, and revision of these Specifications is hereby delegated to the District Manager of the District.

1.02 EFFECTIVE DATE OF SPECIFICATIONS: These Construction Specifications shall be in effect immediately upon adoption by the District Board and shall supersede all former standard Specifications for earthwork within the District.

1.03 REVISIONS, AMENDMENTS OR ADDITIONS: These Construction Specifications may be revised, amended or added to. Such revisions, amendments and additions shall be binding and in full force and effect when adopted in the manner set forth in Section 1.02.

1.04 DISTRICT CONTROL: These Construction Specifications will apply to the installation of wastewater facilities under the control of the Palmer Lake Sanitation District.

1.05 ORGANIZATION AND INTERPRETATION OF SPECIFICATIONS: These Construction Specifications are composed of written Standards of Engineering Practice, Material Specifications and Standard Drawings. The interpretation of any section or of differences between sections, when appropriate, shall be made by the District Manager or District Engineer and his/her interpretation shall be binding and controlling in its application.

1.06 DEFINITIONS: As used in these Construction Specifications or in any of the drawings where these Specifications govern, unless the context shall otherwise require, the following words defined shall have the meanings herein ascribed:

1.06.1 District Manager: The Manager of the Palmer Lake Sanitation District or his/her designated representative.

1.06.2 **Engineer:** The Engineer or consultant of the District, acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties entrusted to them.

1.06.3 **Collection System:** Sanitary sewer mains, together with all appurtenant and necessary manholes, cleanouts, taps, service pipes and associated materials, easements, property and equipment collecting sanitary sewage from individual and commercial customers.

1.06.4 **Wastewater Main or Sanitary Main:** That portion of the wastewater system which collects sewage from the user extending to the wastewater treatment plant, excluding service lines.

1.06.5 **Service Line:** The sanitary sewer pipeline extending from the premises up to and including the connection to the wastewater or sewer main.

1.06.6 **Contractor:** In the context of these Construction Specifications a person or persons, co-partnership or corporation employed by the applicant for the purpose of installing sanitary sewage collection or replacement lines.

1.06.7 **Inspector:** The authorized representative of the District assigned to the project.

1.06.8 **Standard Drawings:** District Standard Drawings are a part of these Construction Specifications.

1.07 **ABBREVIATIONS:** All references to documents or specifications shall be the latest edition or revision thereof:

1.07.1 ASTM American Society for Testing and Materials.

1.07.2 ANSI American National Standards Institute.

1.07.3 AWWA American Water Works Association

<u>1.07.4</u>	NSF	National Sanitation Foundation.
<u>1.07.5</u>	OSHA	Occupational Safety and Health Administration
<u>1.07.6</u>	USGS	United States Geological Survey
<u>1.07.7</u>	CIP	Cast Iron Pipe
<u>1.07.8</u>	DIP	Ductile Iron Pipe
<u>1.07.9</u>	PVC	Polyvinyl Chloride Plastic Pipe
<u>1.07.10</u>	psi	Pounds per Square Inch
<u>1.07.11</u>	PPM	Parts per Million

CHAPTER 2 – TRENCHING, BACKFILLING AND COMPACTING:

2.01 GENERAL PROVISIONS:

2.01.1 Unless otherwise indicated on the drawings, all excavations shall be made by open cut. Provisions for installation of sanitary sewer pipelines and appurtenances in other than open cut conditions shall be specifically detailed in the drawings and contract documents for the project.

2.01.2 The Contractor/Developer shall be responsible for obtaining all permits necessary to accomplish the work. This includes all permits by any local general purpose governing agency relative to excavation and construction within public right-of-way, permits required by state highway agencies, permits required by railroad and other utility agencies and permits required by the State of Colorado, Water Quality Control Division including necessary site approvals, if appropriate.

2.01.3 All work to be accomplished shall be done under the review and inspection of the District Manager or District Engineer. Notification to the District shall be made by the Contractor/Developer indicating proposed schedules and times of work. Work accomplished without notification and review of the District Manager or District Engineer may not be acceptable to the District. It shall be the responsibility of the Contractor/Developer to adequately demonstrate to the District that all facilities have been constructed in accordance with the rules and regulations of the District.

2.01.4 All rules and regulations of the District shall be applicable to all construction and operation of sanitary sewage facilities within the boundaries of the District and those which are proposed for acceptance by annexation to the District. These rules and regulations shall be supplemented by all rules and regulations of the State of Colorado, Water Quality Control Division, in so far as they do not conflict with these rules and regulations. Any conflict shall be governed by an interpretation and ruling by the District Manager or District Engineer, whose decision shall be final.

2.01.5 Earthwork shall include all clearing, grubbing, grading, excavation, fill, backfill, excess excavation, bedding material, borrow material, and surface restoration as may be required to complete the work.

2.02 **JOB CONDITIONS:**

2.02.1 **Protection of Existing Facilities:**

- 1) **Surface Improvements:** The Contractor/Developer shall protect from damage or restore to their original condition all surface improvements encountered during trenching or construction. Said improvements shall include, but not be limited to, the following: surfacing; sidewalks; curbs; valley gutters; trees and shrubs; other surface vegetation; mailboxes; utilities; signs; or other improvements.
- 2) **Underground Utilities and Obstructions:** The Contractor/Developer shall protect from damage any underground pipes, utilities or structures

encountered during construction. Restore any damaged underground obstructions to their original condition at no cost to the District unless evidence of other arrangements satisfactory to all parties is presented to the District.

Before commencing work, obtain information concerning location, type and extent of concealed existing utilities on the site and adjacent properties by calling the Utility Notification Center of Colorado (UNCC) for utility locates.

- 3) Underground obstructions known to exist, except service lines, are to be shown on the drawings or otherwise referred to in the specifications. The locations shown may prove to be inaccurate and other obstructions not shown may be encountered. In any case, it shall be the responsibility of the Contractor/Developer to protect or restore all underground obstructions encountered.

2.02.2 **Sheeting, Shoring and Bracing:** Except where trench banks are cut back on a stable slope, provide and maintain all sheeting necessary to protect adjoining grades and structures from caving, sliding, erosion or other damage and suitable forms of protection against bodily injury all in accordance with applicable codes and governing authorities. Comply with the most recent standards adopted by the Occupational Safety and Health Administration (OSHA). Do not remove any sheeting unless the pipe strength is sufficient to support the trench loads based on trench width measured to the back of sheeting. Remove sheeting and shoring as excavations are backfilled in a manner to protect the construction or other structures, utilities or property. Do not remove any sheeting after backfilling.

2.02.3 **Blasting:** In general, blasting will be allowed in order to expedite the work if a permit by the local authority having jurisdiction is granted and a copy presented to the District. All explosives and appurtenances shall be transported, handled, stored and used in accordance with the laws of the local, state, and federal governments, as applicable.

All blasting shall be controlled so as not to injure any existing structure or facility. The protection of life and property and all liability for blasting shall be placed solely on the person or persons conducting the blasting operation. The hours of blasting shall be fixed by the Inspector in accordance with the permit of the local authority. Owners or occupants of nearby structures or facilities, must be notified by the Contractor/Developer at least 72 hours in advance of blasting, in writing. The notice shall state the date, the time of blasting and who is responsible for the blasting. The District shall be notified a minimum of 48 hours in advance of any blasting.

Blasting shall be controlled to avoid making any excavation unduly large or irregular and so as not to shatter the rock on the bottom or sides of any excavation or surface upon or against which concrete is to be placed. If, in the opinion of the District, blasting is liable to damage rock foundations or supports, concrete, other utilities or structures, all blasting shall be terminated and excavation shall be continued by hammering, boring, wedging or other methods.

2.02.4 Drainage: Maintain the excavations and site free from water throughout the work. Remove any water encountered in the trench to the extent necessary to provide firm subgrade, to permit joints to be made dry at the final grade and to prevent entrance of water into the pipeline. Accomplish the foregoing by the use of sumps and gravel blankets, well points, drain lines or other means approved by the District.

2.02.5 Interruption of Service: Coordinate interruptions of utility services with the District or utility owner as appropriate. Make connections to the existing system requiring the interruption of service during the time designated by the District or utility owner.

Obtain permission to cut and replace existing service lines to facilitate trenching. Notify affected users a minimum of two (2) hours in advance of, and restore service within four (4) hours after any interruption. Repair all lines at no cost to the District unless otherwise provided for.

2.02.6 Detours and Other Traffic Controls: When construction operations are located within streets make provisions at cross streets and walks for free passage of vehicles and

pedestrians by bridging or other approved methods. Do not block streets or walks without prior approval.

Maintenance of access through the construction site by the traveling public shall be maintained by the contractor unless a street closure is approved in writing by the District or other governing authority. Access to all abutting residences and properties shall be maintained to the maximum extent possible. It shall be the responsibility of the Contractor/Developer to coordinate access to all adjacent private properties with the respective owners.

To protect persons from injury and to avoid property damage, adequate barricades, construction signs, safety flasher lights and guards as required shall be placed and maintained during the progress of the construction work and until it is safe for traffic to use the roadway. All material piles, equipment and pipe that may serve as obstructions to traffic shall be enclosed by fences or barricades and shall be protected by proper lights when the visibility is poor. All safety and traffic rules and regulations of local authorities shall be observed. All barricading and detours shall be coordinated as appropriate with the Palmer Lake Sanitation District, the Town of Palmer Lake, Town of Monument, El Paso County and/or the Colorado Department of Transportation and shall be in accordance with their regulations. Controls shall be in accordance with the "American Traffic Safety Services Association Guide" latest edition.

Should the District be contacted regarding a failure to properly barricade a construction area and the responsible Contractor cannot be contacted, the District shall set the necessary barricades at the Contractor's expense.

The Contractor shall carry on the work in a manner that will cause the least interruption in traffic and may close to through travel, not more than two (2) consecutive blocks, including the cross street intersected when so approved by the District. Where traffic must cross open trenches, the Contractor shall provide suitable bridges at street intersections and driveways. The Contractor shall post, where directed by the District, suitable signs indicating that a street or a portion of a street is closed and necessary detour signs for the proper maintenance of traffic.

2.02.7 Sequencing: Pipeline installation shall follow trench excavation within 50 lineal feet. Trench backfill shall follow pipe installation within 50 lineal feet. Approved cleanup shall follow trench excavation within 200 linear feet.

2.03 GUARANTEE:

2.03.1 The Contractor/Developer shall guarantee all materials and workmanship for a period of two (2) years from the date of initial acceptance by the District. Initial acceptance shall be made by the District's official written confirmation of acceptance.

2.03.2 The guarantee shall include the maintenance of acceptable trench backfill for a period of two (2) years from initial acceptance. Acceptable trench backfill shall include maintenance of an acceptable surface configuration matching surrounding grade or conforming to the finished street cross section. Removal and replacement of finished street surfacing due to excessive settlement shall be the responsibility of the Contractor/Developer within the two (2) years warranty period.

2.03.3 The Contractor/Developer shall guarantee to protect and maintain landscaped areas including native grass seeded areas by watering, fertilizing, replanting and weeding or other necessary measures until acceptance by the Owner at the end of the two (2) year warranty period. Acceptance will be based on satisfactory germination of the seed.

2.04 PRODUCTS:

2.04.1 Embedment Materials: All sanitary sewer mains are to receive Class A or imported Class B embedment extending from 6 inches below the bottom of the pipeline to 12 inches over the pipeline.

- 1) Concrete: The pipeline embedment with concrete shall utilize concrete having a 28 day compressive strength of a minimum of 3000 psi and other characteristics as set forth in these Construction Specifications.

- 2) Class B embedment for sanitary sewer main and sanitary sewer service lines: 3/4" imported rock.

- a) Imported, well graded, coarse aggregate in conformance with the requirements of ASTM C33, Gradation 67 with the following gradation:

Sieve Size	Total Percent Passing by Weight
1 inch	100%
¾ inch	90% - 100%
½ inch	----
⅜ inch	20% - 55%
No. 4	0% - 10%
No. 8	0% - 5%

- b) Recycled concrete products meeting the requirements of ASTM C33, Gradation 67.

- 3) Alternative Class B Embedment for sanitary sewer service lines.

- a) Imported, well graded coarse aggregate in conformance with the requirements of ASTM C33, Gradation 8 with the following gradation:

Sieve Size	Total Percent Passing by Weight
½ inch	100%
⅜ inch	85% - 100%
No. 4	10% - 30%
No. 8	0% - 10%
No. 16	0% - 5%

2.04.2 Backfill Materials:

- 1) Suitable Material: Soil obtained from the excavation that is free of frozen material, stumps, roots, brush, other organic matter, debris and other items. In addition, suitable material shall meet the following requirements:

- 2) Upper Portion of Trench: Material placed within one (1) foot of pavement subgrade or finished surface in unimproved areas shall be soil free from rocks greater than 3 inches in nominal diameter.
- 3) Other Portions of Trench: Material within 6 inches below and 12 inches above the pipe shall contain particles of a size to conform to the embedment class required. From a point 12 inches above the pipeline to within one (1) foot of the pavement subgrade or finished surface in unimproved areas, maximum size of any rock in the trench backfill shall be 3 inches nominal diameter.
- 4) Public Highways: Provide and install material in conformance with the Colorado Department of Transportation requirements where they do not conflict with other provisions of these Construction Specifications. Should a conflict exist, submit a request for clarification to the District in writing prior to proceeding with work.

2.05 PREPARATION OF TRENCHING:

2.05.1 Construction Staking: All work shall be constructed in accordance with lines and grades shown on the drawings and as established by the District Manager or District Engineer. These lines and grades may be modified by the District Engineer only after re-approval by the District. Sanitary sewer facilities shall be staked as follows:

Line and grade stakes shall be set for each manhole or other appurtenance and at each 25 foot station along the pipeline. When laser beam equipment is being utilized for alignment of the pipeline, construction stakes shall be set at each manhole and 25 feet, 50 feet and 75 feet and each 100 feet thereafter proceeding upstream from the manhole. The Contractor/Developer shall check the elevation at each grade stake and at intervals between stakes from a string line placed between the grade stakes. Should a variance from the design elevation be found, the pipeline shall be removed to a point where vertical and horizontal alignment is satisfactory and reconstructed in accordance with these Specifications.

All facilities, equipment and assistance shall be furnished by the Contractor/ Developer to facilitate checking alignment and grade of the pipe by the District Manager or District Engineer and workmen involved in the construction.

2.05.2 Pavement Removal: Before trenching begins, remove any pavement, curbs, gutters, sidewalks and other surface improvements necessary to install the pipeline and appurtenances.

Remove bituminous pavement to clean, straight lines at locations necessary to accommodate the work. Width of removal for pipelines shall be kept to a minimum as dictated by trenching operations, but shall extend 6 inches to 12 inches beyond limits of trench excavation. Make pavement cuts with spade-bitted air hammer, saw or other approved method so to provide a straight and square edge. Should a cut edge become damaged during the course of construction, the edge will be recut prior to placement of surfacing material.

Remove concrete surfacing materials to neatly sawed edges with sawcuts made to a minimum depth of 1 ½ inches or as otherwise required to neatly remove surfacing materials.

Make sawcuts in straight lines and at right angles to the alignment of sidewalks or curb and gutter. If the sawcut should fall within 30 inches of an existing construction joint, expansion joint or edge, the concrete shall be removed to the joint or edge.

2.05.3 Clearing: Remove all stumps, roots, brush, other vegetation and debris from areas that will be disturbed by the construction operations.

2.05.4 Sod Removal: In lawn areas, cut and roll back sod before trenching. Store sod for reinstallation after completion of backfilling operations.

2.05.5 Topsoiling: Strip existing topsoil from areas to be disturbed by construction operations. Stockpile in areas designated by the District Engineer. Keep topsoil segregated from non-organic trench excavation materials and debris.

2.06 EXCAVATION – OPEN CUT:

2.06.1 Caution in Excavation: The Contractor/Developer shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground utilities and structures, both known and unknown, may be determined, and he/she shall be held responsible for the repair of such structures when broken or otherwise damaged because of carelessness on his/her part.

2.06.2 Exploratory Excavation: In the opinion of the District, it is necessary to explore and excavate to determine the location of underground utilities and structures that may interfere with construction, the Contractor/Developer shall make the explorations and excavations for such purposes.

2.06.3 Limitation of Disturbed Area: The area disturbed by construction activities shall be confined within the construction limits as shown on the plans. The length of trench to be opened at any one time shall be limited in accordance with the requirements of Part III, Section **2.02.7** of these specifications.

2.06.4 Drainage and Protection: The sides of the trench shall be sloped or braced and the trench drained so that workmen can work safely and efficiently. All work must be done in a dry trench and no water will be permitted to be discharged down the pipe previously laid. The discharge from pumping shall be laid to an approved natural drainage channel or other location to prevent drainage into the sanitary sewer facilities and damage to public or private property.

All pipe trenches or structure excavation shall be kept free from water during pipe laying and other related work. The method of dewatering shall provide for a completely dry foundation at the final lines and grades of the excavation.

Dewatering shall be accomplished by the use of well points, sump pumps, rock or gravel drains placed below subgrade foundations or subsurface pipe drains. All water shall be disposed of in a suitable manner without being a menace to public health or causing public inconvenience. No water shall be drained into other work being completed or under construction.

Discharge from dewatering shall be subject to the regulations and permit requirements of the Colorado Department of Public Health and Environment. The Contractor/Developer shall be solely responsible for full compliance with those requirements.

The dewatering operation shall continue until such time as it is safe to allow the water table to rise in the excavations. Pipe trenches shall contain enough backfill to prevent pipe flotation. When pipe is installed in a casing or tunnel longer than thirty (30) pipe diameters, the pipe inside and casing or tunnel shall be secured so flotation does not occur when the pipe is empty.

Water shall not be allowed to rise until any concrete has set and the forms have been removed. Water shall not be allowed to rise unequally against unsupported structural walls.

Pile material suitable for backfilling in an orderly manner a sufficient distance from banks of the trench to avoid overloading and prevent slides or cave-ins.

Remove waste excavated materials not suitable or not required for backfilling from the site. All surplus excavation shall be removed from the job site and disposed of properly. If the surplus excavation is disposed of on private property, written permission shall be obtained from the owner of the property and a copy given to the District Manager or District Engineer.

2.06.5 **Excavation to Grade:** Accurately grade trench bottoms to provide uniform bearing and support for each section of pipe on undisturbed soil at every point along its entire length. Provide a smooth uniform surface in the pipe subgrade where bedding material will be placed. If the subgrade material is over-excavated more than 2 inches, backfill shall be accomplished with compacted granular material in accordance with the bedding requirements.

2.06.6 **Limiting Trench Widths:** Excavate trenches to provide adequate working space and pipe clearance for proper pipe installation, jointing and embedment. Provide a

minimum clearance of 6 inches on each side of the pipe for a pipe 12 inches in diameter or less and 8 inches for pipe between 14 inches and 30 inches in diameter. The maximum allowable width of trench at one (1) foot above the top of the pipe shall not be greater than the outside diameter of the pipe plus 24 inches for all sizes.

2.06.7 Bell Holes: Dig bell holes and depressions for joints after the trench bottom has been brought to final grade. Bell holes and depressions shall be only of such length, depth and width as required for properly making the particular type of joint. The use of earth mounds for bedding the pipe and adjusting for grade shall not be allowed.

2.06.8 Preparation of Pipe Bearing Areas: Shape the pipe subgrade or bedding material to provide a continuous uniform bearing support at all points along its length except at required bell holes.

2.06.9 Pipe Clearance in Rock: Where rock excavation is necessary, over excavate the trench bottom a minimum of 6 inches below the bottom of the pipe for pipe 24 inches in diameter or less and 9 inches for pipe larger than 24 inches. Backfill over depths with granular material specified.

2.06.10 Excavation for Structures: Except as otherwise dictated by construction conditions, the excavation shall be of such dimensions as to allow for the proper installation and removal of concrete forms, or precast structures, and to permit the construction of the necessary pipe connections. Care shall be taken to insure that the excavation does not extend below established grades. If excavation is made below such grades, the resulting excess excavation shall be filled in with approved material deposited in horizontal layers not more than 6 inches in thickness, after being compacted, as directed by the District.

2.06.11 Unstable Pipe Subgrade: If the bottom of the excavation at subgrade is found to be soft or unstable or to include ashes, cinders, refuse, vegetation or other organic material, or large pieces or fragments of inorganic material that, in the opinion of the inspector, cannot satisfactorily support the pipe or structure, the Contractor shall further excavate and remove such unsuitable material to the width and depth specified by the inspector. Before the pipe or structure is installed, the subgrade shall be made as specified by the District.

Where the bottom of the trench at subgrade is found to consist of material that is unstable to such a degree that, in the opinion of the District, it cannot be removed and replaced with an approved material which will support the pipe or structure properly, the Contractor/Developer shall be required to construct a special foundation or support for the pipe or structure, consisting of pilings, timbers, or other materials, as specified by the District.

2.07 PIPE EMBEDMENT:

2.07.1 Placement of Embedment Material: Embedment material shall be placed in the trench on prepared subgrade in accordance with the requirements of these Construction Specifications. The embedment material shall be brought to a density beneath the proposed pipeline as required herein. The embedment material shall be shaped to conform to a cylindrical surface with a radius equal to the radius of the outside of the pipe with a width sufficient to allow 60% of the width of the pipe barrel to be uniformly supported by the bedding. Bedding material shall then be placed in two lifts, each being compacted to the densities specified herein to a depth of 1 foot above the top of the pipe.

2.07.2 Embedment Classes:

Class A – Concrete Cradle or Arch.

- 1) Concrete Cradle: The pipe shall be bedded in a monolithic cradle of plain or reinforced concrete as specified on drawings, having a minimum thickness of one-fourth the inside pipe diameter or a minimum of 4 inches under the barrel and extending up the sides for a height equal to one-fourth the outside diameter. The cradle shall have width at least equal to the outside diameter of the pipe barrel plus 8 inches. Backfill above the cradle and extending to 12 inches above the crown of the pipe shall be compacted carefully.

- 2) Concrete Arch: The pipe shall be embedded in carefully compacted granular material having a minimum thickness of one-fourth the outside diameter

between barrel and bottom of trench excavation and extending halfway up the sides of the pipe. The top half of the pipe shall be covered with reinforced concrete arch having a minimum thickness of one-fourth the inside diameter of the crown and having a minimum width equal to the outside pipe diameter plus 8 inches.

Class B – Granular Bedding: Imported granular material or fine granular material meeting pipe embedment requirements in Part III, Section **2.04.1**. Place as described in Part III, Section **2.07.1** and compact in accordance with trench backfilling requirements.

Class C – To be used as trench backfill material only, not acceptable for pipe embedment.

Class D – Impermissible Bedding Condition.

2.08 TRENCH BACKFILLING AND COMPACTING:

2.08.1 Backfilled Material: Place backfilled material above embedment materials in a manner to prevent damage or misalignment of the pipeline. Place in lifts of a thickness necessary to acquire the specified backfill density or in conformance with other regulatory requirements. Backfilled material shall conform to the requirements of Part III, Section **2.04.2** of these Construction Specifications.

2.08.2 Backfill Density Requirements: Unless otherwise specified or required by local governing authority, all backfill should be placed in a manner to achieve the density specified below.

- 1) State Highway: 100% of maximum in paved and shoulder areas and 95% of maximum in all other areas.
- 2) Paved roadways, sidewalks and other areas to receive pavement 95% of maximum density for entire trench depth.

- 3) Gravel Roadways: 95% of maximum density for entire trench depth.
- 4) Sodded or lawn areas over a dedicated easement or right-of-way shall receive 90% of maximum density.
- 5) Zone 6 inches below to 12 inches above pipe shall receive 95% of maximum density for all pipelines.

Where another governing agency having jurisdiction over work within a road right-of-way has specifications requiring a greater backfill density, the requirements of the more stringent specification shall apply.

2.08.2 Method of Compaction: In general, backfill shall be mechanically compacted by means of tamping rollers, sheep foot rollers, pneumatic tire rollers, vibrating rollers and other mechanical tampers.

Compaction by jetting shall not be permitted unless material is of suitable granular material as determined by the District. In no case will compaction by jetting be permitted in state highways or paved or gravel roadways.

2.09 BACKFILL FOR STRUCTURES: Backfill and fill within 3 feet adjacent to all structures and for full height of the walls shall be selected non-swelling material. It shall be relatively impervious, well graded, and free from stones larger than 3 inches. Material may be job excavated, but selectivity will be required.

No backfilling will be allowed in freezing weather except by permission of the District. No additional backfill will be allowed over any frozen material already in the trench.

All water required for backfill and compaction operations must be provided by the Contractor/Developer including furnishing all required personnel, valving, hose and other equipment needed to deliver the water to the desired location on the project.

2.10 FIELD QUALITY CONTROL:

2.10.1 Density Testing and Control: Density testing as may be required by the District Manager or District Engineer shall be the responsibility of the Contractor/Developer. Results of such density testing shall be reported directly to the District by the testing agency. All reports shall be submitted with the seal and signature of a registered professional engineer experienced in the testing of soil materials.

2.10.2 Soil Compaction Tests: Conduct in accordance with the requirements of ASTM C698-70 or AASHTO T99, "Standard Method of Test for Moisture Density Relations of Soils Using a 5.5 lb Rammer and a 12 inch Drop". Use method A, B, C or D as appropriate on soil condition and judgment of the testing laboratory. Samples tested shall be representative of materials to be placed (or altered). Obtain optimum moisture density curve for each type of material or combination of materials encountered or utilized. Use test results as a basis for compaction control. Testing includes Atterberg Limits, grain size determination and specific gravity.

Density Control: Conduct tests for density control during compaction operations in accordance with the requirements of:

ASTM D2922 – Tests for Density of Soil and Soil – Aggregate In-Place by Nuclear Methods.

ASTM D1556 – Tests for Density of Soil and Soil – Aggregate In-Place by the Sand Cone Method.

OR

ASTM C2167 – Test for Density of Soil In-Place by the Rubber-Balloon Method.

2.10.3 Test Frequency: The District Manager or District Engineer shall determine the location of all density testing to be accomplished. As a minimum, three tests at three (3) different levels for every 1,000 lineal feet of trench shall be preformed. The tests shall be taken approximately one (1) foot above the pipe, mid-trench depth and within the top one (1) foot of the trench. The Contractor/Developer shall excavate backfilled material to the depths directed by the District Manager or District Engineer to accommodate the testing and backfill

test holes in accordance with these Construction Specifications.

2.11 SURFACE RESTORATION: Fine grade all areas disturbed by the construction operations after completion of backfilling and compacting. Areas which are to receive pavements, surfacing, topsoil or landscaping shall be graded as required to allow installation of the specific surface treatment. Grade all other areas to match the existing ground line.

Replace suitable topsoil to the depth of stripping over all areas disturbed by the construction that do not receive other surface treatment. Do not compact topsoil during stripping, stockpiling or placing.

The Contractor/Developer shall restore all pavement, sidewalks, curbing, gutters, or other surface structures removed or disturbed as part of the work to a condition meeting the standards of the governing agency, and shall furnish all incidental labor and materials. No permanent pavement shall be restored until, in the opinion of the District or agency having control, the condition of backfill is such as to properly support the pavement.

If any pavement, street, landscaping, shrubbery, sod, native grass areas, rock, fences, poles or other property and surface structures have been damaged, removed or disturbed by the Contractor/Developer, whether deliberately or through failure to carry out the requirements of the controlling agency or the specific directions of the District, or through failure to employ usual and reasonable safeguards, such property and surface structures shall be replaced or repaired, to the satisfaction of the owner, at the expense of the Contractor/Developer.

2.12 SURFACE IMPROVEMENT, REPAIR AND RESTORATION: Replace and repair any surface improvements damaged or removed. Meet the requirements specified for the particular type of improvements to be repaired or replaced. All surface improvements shall meet the requirements of the local governing agency and/or the requirements shown on the contract drawings as approved by the District.

2.13 CLEANUP: Upon completion of the work, all rubbish, unused materials, concrete forms, debris from excavation, scrap pipe materials and other like materials shall be removed from the jobsite. All excess excavation shall be disposed of as specified and the areas shall be left in a state of order and cleanliness.

PART IV

GREASE INTERCEPTOR/GREASE TRAP AND SAND/OIL INTERCEPTOR REGULATIONS

CHAPTER 1 – GREASE INTERCEPTOR/GREASE TRAP REGULATION:

1.01 GENERAL:

1.01.1 Grease interceptor or grease trap shall be provided when, in the opinion of the District, they are necessary for the proper handling of liquid wastes containing grease or solids which may be harmful to, or cause obstruction of the publicly owned wastewater collection system, or interfere with the operation of the publicly owned treatment works.

1.01.2 An adequate grease interceptor shall be installed as specified on the wastewater drainage system from any non-residential customer participating in the preparation and/or sale of food to the general public, including , but not limited to, restaurants, cafes, fast food outlets, pizza outlets, delicatessens, sandwich shops, and any and all other kinds and types of food vending establishments in which any food preparation (including heating or defrosting in or by means of any kind of oven or heating device) takes place on the premises, whether or not such facilities are located in a separate building or structure that is occupied by other businesses, as well as schools, churches, boarding houses with communal kitchen facilities, nursing homes, and day care centers which have kitchens and engage in the preparation of food. The adequacy of the grease interceptor or grease trap shall be determined by compliance with the design, sizing, and other requirements of this Construction Specification.

- 1) All drains from the kitchen, food preparation, and dishwashing areas shall be connected to a grease interceptor or grease trap. Fixtures to be connected include, but are not limited to, scullery sinks, pot and pan sinks, dishwashing machines, soup kettles, and floor drains located in areas where grease containing materials may exist.

- 2) When deemed necessary by the District, garbage disposals (garbage grinders) may be required to be connected to an approved grease interceptor. Connection of garbage disposals (garbage grinders) to grease traps will typically not be permitted.
- 3) Toilets, urinals and similar fixtures shall not waste through a grease interceptor or grease trap. Such fixtures shall be plumbed directly into the building sewer and waste system.

1.01.3 A variance as to the requirement for a grease interceptor or grease trap on any non-residential structure may be granted after due consideration by the District for good cause shown including, without limitation, the particular hardship and unique circumstances of the customer which are not brought about as a result of the customers acts or omissions. The granting of any variance shall be at the sole discretion of the District based upon the facts and circumstances of each request.

1.02 **DEFINITIONS:**

1.02.1 For the purpose of this Regulation, the terms “grease interceptor” and “grease trap” shall be defined as follows:

- 1) Grease Interceptor: A unit of at least 1,500 gallons capacity designed to retain grease from one or more fixtures and which shall be located remote from the fixtures being served, typically outside the building being served. This is the minimum capacity allowed by the District.
- 2) Grease Trap: A unit designed to retain grease from one to a maximum of four fixtures and which may be located inside the building being served. Generally these types of units will not be permitted by the District.
- 3) Fixture Unit Equivalent (FUE): A value which permits the comparison of different sized fixtures based on the drainage load produced. One (1) FUE = Discharge flow rate of 7.5 gpm.

1.03 DESIGN AND SIZING:

1.03.1 The design and sizing of grease interceptors shall be in accordance with the International Plumbing Code (IPC) and this Regulation, and shall be designed, sized, installed, maintained and operated so as to accomplish their intended purpose of intercepting the grease and solids from the customer's waste water and preventing the discharge of such grease and solids to the District's Wastewater treatment plant.

- 1) The edition of the UPC currently utilized by the local building permitting authority shall be applicable.

1.03.2 The size, type and location of each grease interceptor shall be approved by the District, in accordance with this Regulation. Except where otherwise specifically permitted, no wastes other than those requiring separation shall be discharged into any grease interceptors. One set of plans, including complete mechanical and plumbing sections shall be submitted to the District for approval prior to construction. Such plans shall include the size, type and location of each interceptor. Such approval shall not exempt the user from compliance with any applicable code, ordinance, rule, regulation or order of any governmental authority. Such approval shall not be construed as or act as a guarantee or assurance that any discharge is or will be in compliance with any applicable code, ordinance, rule, regulation, or order or any governmental authority. Any subsequent alterations or additions to such facilities shall not be made without due notice to and prior approval of the District.

1.03.3 Design:

- 1) All waste shall enter the grease interceptor or grease trap through the inlet pipe only.
- 2) Grease interceptors and grease traps shall be so designed and located as to be readily accessible for cleaning, and shall have a water seal of not less than six (6) inches for grease interceptors and two (2) inches or the diameter of the outlet, whichever is greater, for grease traps.

- 3) Grease interceptors shall be constructed in accordance with the design specifications contained herein, shall be approved by the District and shall have a minimum of two (2) compartments with fittings designed for grease retention. There shall be a minimum of two (2) manholes to provide access for cleaning and inspection of all fixtures and compartments of the interceptor, a minimum of one (1) per ten (10) feet of interceptor length. In the case of smaller or circular interceptors, where it is not practical to install two manholes, a single manhole shall be located so as to permit entrance to the first compartment, and inspection of the second. All areas of the second compartment shall be accessible for cleaning. Manhole covers shall be gastight in construction having a minimum opening dimension of twenty (20) inches. In areas where traffic may exist, the interceptor shall be designed to have adequate reinforcement and cover, meeting HS-20 load specifications.
 - a) A flow control device will not be required preceding a grease interceptor.
- 4) Grease traps shall be equipped with a flow control or restricting device installed in a readily accessible and visible location ahead of the grease trap. Flow control devices shall be designed and rated such that the flow through such a device shall at no time be greater than the rated capacity of the grease trap. No flow control devices having adjustable or removable parts will be permitted.
- 5) If an existing grease trap does not meet the design and sizing criteria as set forth, the grease trap shall be replaced with a grease interceptor.
- 6) A grease trap will only be allowed in those establishments utilizing a grease trap at the time the Grease Interceptor/Grease Trap Regulation was adopted.
- 7) All new restaurant construction or upon change of ownership of an existing restaurant, any applicant for sanitary sewer service shall demonstrate that a minimum of a 1,500 gallon functioning grease trap is installed and in addition, a quarterly report showing all cleaning of the grease trap shall be sent to the District office on a regular basis.

- 8) Grease interceptors and grease traps shall be so designed that they will not become air bound if closed covers are used. The tank and the discharge line shall each be vented, and the vents shall not tie together less than 42 inches above the tank lid elevation.
- 9) An effluent sampling box shall be provided on the discharge of each grease interceptor or grease trap where so required by the District.

1.03.4 Sizing Criteria:

- 1) Grease Interceptors: When determining the minimum size of grease interceptor required, the following shall be considered:
 - a) The minimum acceptable volume shall be not less than one thousand five hundred (1,500) gallons.
 - b) The size of the interceptor shall be based on the maximum number of meals serviced at the maximum periods of the day (either breakfast, lunch or dinner). Volume, in gallons, of the interceptor shall be 2 ½ gallons times the maximum meals served during the busiest period of the day.
 - c) An alternate method of determining the size of the grease interceptor is to multiply seating capacity times a turnover constant of 1.6 times 2 ½ gallons. Seating capacity can be approximated, using ten (10) square feet of dining area per person.
(Volume = Seating Capacity x 1.6 x 2.5 gallons).
 - d) The size of the grease interceptor shall be determined by the following formula:

Interceptor size (liquid capacity in gallons) = number of meals served per peak hour X waste flow rate X retention time X storage factor served per peak hour to be estimated as follows:

Meals served per peak hour to be established as follows:

Seating capacity X occupancy factor (0.80) X meals per hour

per seat (2).

Waste Flow Rate:

With dishwashing machine 6 gallons

Without dishwashing machine 5 gallons

Food waste disposal 1 gallon

Retention Time: 1.0 hours

Storage Factor:

Fully equipped commercial kitchen:

8 hour operation 1

16 hour operation 2

24 hour operation 3

Single service kitchen 1.5

- e) An appropriate volume may be determined by multiplying the total rate of flow in gallons per minute from each fixture required to be connected to the interceptor times a minimum retention time of not less than fifteen (15) minutes, the resulting volume expressed in gallons.

2) Grease Traps: Existing grease traps shall be sized based on one of the following methods:

- a) Fixture Capacity Method: Under this method, the physical size of each fixture compartment to be connected to the grease trap shall be measured and the capacity determined. The drainage load in gallons shall then be computed assuming the drainage load to be equal to 0.75 times the total physical capacity. The sum of the drainage loads for each fixture compartment to be connected to a single grease trap will be the total grease trap drainage load. The total grease trap drainage load is then divided by the drainage period for the fixture compartments connected to determine the flow rate to the grease trap in gpm. Multiply the grease trap flow rate thus determined, or the rated capacity of the flow control device, by the minimum retention time (15 minutes) to determine the required liquid capacity of grease trap to be installed.

- b) **Fixture Unit Method:** Under this method the fixture compartment outlet or trap arm size shall be utilized to determine the fixture compartment drainage load in gpm, assuming one (1) fixture unit equivalent produces a flow rate of 7.5 gpm. The sum of the drainage loads for each fixture compartment to be connected to a single grease trap or the rated capacity of the flow control device will be the total grease trap drainage load in gpm. Multiply this total drainage load in gpm by the minimum retention time (15 minutes) to determine the required liquid capacity of the grease trap to be installed.

The following fixture unit equivalent values shall be utilized when verifying the size of an existing grease trap under the Fixture Unit Method:

Fixture Outlet Trap or Trap Arm Size	Fixture Unit Equivalent Value
1-1/4"	1
1-1/2"	3
2"	4
2-1/2"	5
3"	6
4"	8

- c) The appropriate size for a grease trap is dependent on the drainage period of the fixtures connected to the trap. By adjusting the fixture drainage period through use of a flow control device, (1) a smaller grease trap could be utilized for a given fixture size or capacity; (2) multiple fixtures could be connected to the same grease trap.
- d) Where the existing grease trap size would exceed that which is commercially available or that which is required, a grease interceptor shall be utilized.

1.04 INSTALLATION:

1.04.1 The installation of grease interceptors shall be in accordance with International Plumbing Code (IPC) and this Regulation, and shall be accomplished in a workmanlike manner in compliance with the design and sizing requirements hereunder.

- 1) The edition of the UPC currently utilized by the local building permitting authority shall be applicable.

1.04.2 The installation of grease interceptors shall be accomplished by licensed plumbers with documented experience in the installation of such devices.

1.04.3 Each grease interceptor shall be readily accessible for inspection, servicing, and maintaining in proper working condition. The use of ladders or the removal of bulky equipment in order to inspect or service interceptors shall constitute a violation of accessibility. Where feasible, all interceptors shall be located outside of the facility served. Interceptors may not be installed in any part of a building where food is handled. Location of all interceptors shall be approved by the District, and shall be shown on the approved building plan.

- 1) No dishwasher shall be connected to or discharge into any grease interceptor of less than 1,500 gallons capacity which is utilized by other fixtures. Automatic dishwashing units shall be plumbed through their own properly sized grease interceptor or directly into the building sewer and waste system.
- 2) No food grinder or disposal unit shall be connected to or discharge into any grease trap. Such units shall be plumbed through a properly sized grease interceptor or directly into the building sewer and waste system.
- 3) All fixtures not equipped with a garbage disposal (garbage grinder) which are connected to a grease interceptor shall be equipped with a fixed or

removable mesh or screen which shall catch garbage and food debris and prevent it from entering the grease interceptor.

- 4) Wastes in excess of 140 degrees F shall not be discharged into a grease interceptor or grease trap, and liquid discharge from a grease interceptor or grease trap shall not exceed 70 degrees F.

1.05 MAINTENANCE:

1.05.1 Maintenance of grease interceptors and grease traps shall be done only by a business/ professional normally engaged in the servicing of such plumbing fixtures. An individual property owner will not be permitted to accomplish maintenance specified by this Regulation.

1.05.2 The District shall provide a customer and/or a maintenance business with a form for recording grease interceptor or grease trap maintenance. The maintenance business and customer shall provide one copy of the completed form to the District within 14 calendar days of maintenance of any grease interceptor or grease trap within the District.

1.05.3 As a minimum, any grease interceptor in service in the District shall be serviced at a maximum interval of 90 days.

- 1) A variance from this requirement may be obtained when the owner can confirm that there is no normal use during any given 90 calendar day period. With written authorization from the Board, the maximum time variance between services is 365 calendar days.
- 2) The District may inspect the interceptor and outlet and if it is deemed necessary by the District, more frequent servicing and maintenance will be required.

1.05.4 As a minimum, any grease trap in service in the District shall be serviced at a maximum interval of 30 days.

- 1) A variance from this requirement may be obtained when the owner can confirm that there is no normal use during any given 30 calendar day period.
- 2) The District may inspect the trap and outlet and if it is deemed necessary by the District, more frequent servicing and maintenance will be required.

1.05.5 Biological treatment shall not be a substitute for the pumping of grease interceptors and grease traps at the frequency determined by the District. Emulsification of oil and grease with enzyme treatments only delays physical separation; Therefore, biological treatment shall not be allowed.

1.05.6 The District may inspect grease interceptors and grease traps monthly to determine the load on the fixture and the effectiveness of maintenance activities. The District will inventory all grease interceptors and grease traps in their service area and document the inspections of these interceptors and traps.

- 1) These inspections may determine that more frequent maintenance than previously specified is required.

1.05.7 Existing sources not connected to a grease interceptor or grease trap and contribute oil and grease to the District's waste stream and collection system, will be identified through the District's inspection program. Once these sources are identified, they will be required to install a grease interceptor or grease trap and maintain it according to these guidelines. In the time before a grease interceptor or grease trap can be installed the District will require these businesses to implement Best Management Practices (BMPs) to keep oil and grease out of the sanitary sewer system.

- 1) Scrape food from plates into garbage cans.
- 2) Pre-wash plates by spraying them off with cold water over a small mesh catch basin positioned over a drain. This catch basin should be cleaned into a garbage can as needed.

- 3) Pour all liquid oil and grease from pots into waste grease bucket stored at the pot washing sink. Heavy solid build-up of oil and grease on pots and pans should be scraped off into a waste grease bucket.
- 4) Other kitchen practices identified by the District and/or facility which will decrease the point source discharge of oil and grease.

1.06 RESPONSIBILITY, FINES, AND RETRIBUTION:

1.06.1 Property owners and lessees shall be jointly and severally responsible for cleaning grease interceptors and grease traps for maintaining the grease interceptors and grease traps in efficient operating condition at all times, and for otherwise complying with the provisions of these regulations. Grease interceptors and grease traps shall be maintained by regularly scheduled removal of the accumulated grease and solids so that they will properly operate as intended to intercept the grease and solids from the customer's waste water and prevent the discharge of grease and solids to the District's waste water treatment plant. This maintenance shall be performed in a workmanlike manner before the retention capacity of the interceptor or trap is exceeded. Detailed and accurate records of maintenance shall be maintained on site and shall be provided to and available to the District upon request. Such maintenance records shall be in the form of Exhibit A attached hereto, or such other form as reasonably required from time to time by the manager of the District. The records shall include detailed information relating to the amount of grease removed compared to the size of the grease interceptor/trap.

1.06.2 A copy of the invoice and a manifest of disposal from the business or professional reporting the date the interceptor or trap was cleaned, the amount of grease, oil, and/or sand removed, the time, date and location the grease, oil and/or sand was disposed, and a recommendation of how frequently the interceptor/trap should be cleaned must be sent to the District office within 14 days after each cleaning. A copy of all interceptor/trap cleaning invoices are to be on file at the business being served and available to the District upon request. Failure to comply with the above could result in fines. Penalties, or disconnection of service. The invoice for removal on interceptor and trap contents, together with the waste disposal manifest, shall be

attached to and made a part of the maintenance records required by these regulations.

1.06.3 The District reserves the right to levy any fines to such facilities that do not conform to the District's grease regulations. Retribution shall be paid to any surrounding businesses and/or homeowners for damage resulting from any non-compliance of the District's regulations. Any extraordinary cost incurred by the District due to interference, damage or special processing necessary in the treatment and/or collection system shall be paid by the business. The direct cost of all labor, equipment and materials incurred in rectifying the interference or damage shall be billed directly to the business by the District.

1.07 SEWER USE REGULATIONS:

1.07.1 This regulation forms a part of the Sewer Construction Specifications of the Palmer Lake Sanitation District. Enforcement of this regulation is governed by the express terms hereof and the enforcement provisions of "Article 9, Enforcement and Administration", of the Rules and Regulations of the Palmer Lake Sanitation District, which is incorporated by reference, including, without limitation, those provisions for administrative violations, violation of discharge limitations, enforcement procedures, penalties, field observations, and extra monitoring charges. Any violation of this regulation for grease interceptors and grease traps shall be considered a discharge violation under the enforcement provision of "Article 9, Enforcement and Administration" of the Rules and Regulations of the Palmer Lake Sanitation District. Compliance with this regulation, as well as the other provisions of the Rules and Regulations and the Construction Specifications, shall be the joint and several obligation of the owner of the property served and any party in possession of the property using the wastewater services of the District. Any monies due or penalties to the District under the provisions of the regulation, or other provisions of the Rules and Regulation and/or the Construction Specifications, shall constitute a lien upon the property served.

1.07.2 The Palmer Lake Sanitation District has the right to reject any waste which may be harmful to, or cause obstruction of the publicly owned wastewater collection system, or interfere with the operation of the publicly owned treatment works.

1.08 APPLICATION:

1.08.1 This regulation applies to all existing and future uses within the scope of Section **1.01** above. For those businesses currently conducting operations subject to these regulations, they shall be provided a grace period of one year in which to come into full compliance with these regulations. The District has determined that the enactment of this regulation is in the best interest of the District and its customers and is necessary for this efficient and proper operation and protection of the District's operations and facilities, and that this regulation is necessary and in furtherance of the health, benefit and welfare of the District's customers.

CHAPTER 2 – SAND/OIL INTERCEPTOR REGULATION:

2.01 GENERAL:

2.01.1 A sand/oil interceptor or grease trap shall be provided when, in the judgment of the District, they are necessary for the proper handling of sand and grit and petroleum based liquid waste which may be harmful to, or cause obstruction of the publicly owned wastewater collection system, or interfere with the operation of the publicly owned treatment works. The District will substantiate whether a sand/oil interceptor is suitable for installation. On a general basis, sand/oil interceptors will be recommended.

2.01.2 An adequate sand/oil interceptor shall be installed as specified on the wastewater drainage system from any non-residential customer participating in automotive service and repair, machine shops, and/or mechanics providing service to the general public, including, but not limited to, service stations, truck stops, gasoline stations, automotive/car care centers, auto body shops, automotive dealerships, car washes, motorcycle shops, machine shops, welding shops, tractor/farm implement dealerships, truck/bus dealerships, bus barns, or any other facility that generates sand and grit or petroleum by-product waste that would discharge into the wastewater collection system. The adequacy of the sand/oil interceptor shall be determined by compliance with the design, sizing, and other requirements of this regulation.

- 1) All drains from shop areas, washing areas and/or spill areas shall be connected to a sand/oil interceptor. Fixtures to be connected include, but are not limited to, floor drains, engine/parts cleaning sinks and wash areas located in areas where sand and petroleum based liquid waste containing materials may exist.
- 2) Toilets, urinals and similar fixtures shall not waste through a sand/oil interceptor. Such fixtures shall be plumbed directly into the building sewer and waste system.

2.01.3 A variance as to the requirement for a sand/oil interceptor on any non-residential structure may be granted after due consideration by the District for good cause shown including, without limitation, the particular hardship and unique circumstances of the customer which are not brought about as a result of the customers acts or omissions. The granting of any variance shall be at the sole discretion of the District based upon the facts and circumstances of each request.

2.02 **DEFINITIONS:**

2.02.1 For the purpose of this regulation, the term “sand/oil interceptor” shall be defined as follows:

- 1) Sand/Oil Interceptor: A unit of at least 500 gallons capacity designed to retain sand/oil from one or more fixtures and which shall be located remote from the fixtures being served, typically outside the building being served. This is the preferred unit of choice by the District.
- 2) Fixture Unit Equivalent (FUE): A value which permits the comparison of different sized fixtures based on the drainage load produced.
 - a) One (1) FUE = Discharge flow rate of 7.5 gpm.

2.03 DESIGN AND SIZING:

2.03.1 The design and sizing of sand/oil interceptors shall be in accordance with the International Plumbing Code (IPC) and this Regulation, and shall be designed, sized, installed, maintained and operated so as to accomplish their intended purpose of intercepting the sand/oil from the customer's waste water and preventing the discharge of such sand and oil into the District's wastewater treatment plant.

- 1) The edition of the IPC currently utilized by the local building permitting authority shall be applicable.

2.03.2 The size, type and location of each sand/oil interceptor shall be approved by the District, in accordance with this Regulation. Except where otherwise specifically permitted, no wastes other than those requiring separation shall be discharged into any sand/oil interceptor. One set of plans, including complete mechanical and plumbing sections shall be submitted to the District for approval prior to construction. Such plans shall include the size, type and location of each interceptor. Such approval shall not exempt the user from compliance with any applicable code, ordinance, rule, regulation or order of any governmental authority. Such approval shall not be construed as or act as a guarantee or assurance that any discharge is or will be in compliance with any applicable code, ordinance, rule, regulation, or order or any governmental authority. Any subsequent alterations or additions to such facilities shall not be made without due notice to and prior approval of the District.

2.03.3 Design:

- 1) All waste shall enter the sand/oil interceptor through the inlet pipe only.
- 2) Sand/oil interceptors shall be so designed and located as to be readily accessible for cleaning.
- 3) Sand/oil interceptors shall be constructed in accordance with the design specifications contained herein, shall be approved by the District and shall

have a minimum of two (2) compartments with fittings for sand/oil retention. There shall be a minimum of two (2) manholes to provide access for cleaning and inspection of all fixtures and compartments of the interceptor, a minimum of one (1) per ten (10) feet of interceptor length. In the case of smaller, or circular interceptors, where it is not practical to install two manholes, a single manhole shall be located so as to permit entrance to the first compartment, and inspection of the second. All areas of the second compartment shall be accessible for cleaning. Manhole covers shall be gastight in construction having a minimum opening dimension of twenty four (24) inches. In areas where traffic may exist, the interceptor shall be designed to have adequate reinforcement and cover, meeting HS-20 load specifications.

- 4) Sand/oil interceptors shall be so designed that they will not become air bound if closed covers are used. The tank and the discharge line shall each be vented, and the vents shall not tie together less than 42 inches above the tank lid elevation.
- 5) An effluent sampling box shall be provided on the discharge of each sand/oil interceptor or grease trap where so required by the District.

2.03.4 Sizing Criteria:

- 1) Sand/Oil Interceptors: When determining the minimum size of sand/oil interceptor, the following shall be considered:
 - a) The minimum acceptable volume shall be not less than five hundred (500) gallons.
 - b) An appropriate volume may be determined by multiplying the total rate of flow in gallons per minute from each fixture required to be connected to the interceptor times a minimum retention time of not less than fifteen (15) minutes, the resulting volume expressed in gallons.

2.04 INSTALLATION:

2.04.1 The installation of sand/oil interceptors shall be in accordance with the International Plumbing Code (IPC) and this Regulation, and shall be accomplished in a workmanlike manner in compliance with the design and sizing requirements hereunder.

- 1) The edition of the IPC currently utilized by the local building permitting authority shall be applicable.

2.04.2 The installation of sand/oil interceptors shall be accomplished by licensed plumbers with documented experience in the installation of such devices.

2.04.3 Each sand/oil interceptor shall be readily accessible for inspection, servicing, and maintaining in proper working condition. The use of ladders or the removal of bulky equipment in order to inspect or service interceptors shall constitute a violation of accessibility. Where feasible, all interceptors shall be located outside of the facility served. Location of all interceptors shall be approved by the District, and shall be shown on the approved building plan.

2.05 MAINTENANCE:

2.05.1 Maintenance of sand/oil interceptors shall be done only by a business/professional normally engaged in the servicing of such plumbing fixtures. An individual property owner will not be permitted to accomplish maintenance specified by this Regulation.

2.05.2 The District shall provide a customer and/or a maintenance business with a form for recording sand/oil interceptor maintenance. The maintenance business and customer shall provide one copy of the completed form to the District within 14 calendar days of maintenance of any sand/oil interceptor within the District.

2.05.3 As a minimum, any sand/oil interceptor in service in the District shall be serviced at a maximum interval of 90 days.

- 1) A variance from this requirement may be obtained when the owner can confirm that there is no normal use during any given 90 calendar day period. With written authorization from the Board, the maximum time variance between services is 365 calendar days.
- 2) The District may inspect the interceptor and outlet and if it is deemed necessary by the District, more frequent servicing and maintenance will be required.

2.05.4 Biological treatment shall not be a substitute for the pumping of sand/oil interceptors at the frequency determined by the District.

2.05.5 The District may inspect the sand/oil interceptor monthly to determine the load on the fixture and the effectiveness of maintenance activities. The District will inventory all sand/oil interceptors in their service area and document the inspections of these interceptors.

- 1) These inspections may determine that more frequent maintenance than previously specified is required.

2.05.6 Existing sources not connected to a sand/oil interceptor and contribute sand and oil to the District's waste stream and collection system will be identified through the District's inspection program. Once these sources are identified, they will be required to install a sand/oil interceptor and maintain it according to these guidelines. In the time before a sand/oil interceptor can be installed the District will require these businesses to implement Best Management Practices (BMPs) to keep sand and oil out of the sanitary sewer system.

- 1) Avoid dumping petroleum based waste products into the waste collection system.
- 2) Discontinue the use of wash facilities until such time a suitable system is in place to intercept sand, grit, and petroleum based products.

- 3) Other practices identified by the District and/or facility which will decrease the point source discharge of sand and oil.

2.06 RESPONSIBILITY, FINES, AND RETRIBUTION:

2.06.1 Property owners and lessees shall be jointly and severally responsible for cleaning sand and oil interceptors for maintaining the sand and oil interceptor in an efficient operating condition at all times, and for otherwise complying with the provisions of these rules and regulations. Sand/oil interceptors shall be maintained by regularly scheduled removal of the accumulated sand and/or oil so that they will properly operate as intended to intercept the sand and/or oil from the customer's wastewater and prevent the discharge of sand and/or oil to the District's wastewater treatment plant. This maintenance shall be performed in a workmanlike manner before the retention capacity of the interceptor is exceeded. Detailed and accurate records of maintenance shall be maintained on-site and shall be provided to and available to the District upon request. Such maintenance records shall be in the form of Exhibit A attached hereto, or such other form as reasonably required from time to time by the District Manager of the District. The records shall include detailed information relating to the amount of sand and/or oil removed compared to the size of the sand/oil interceptor.

2.06.2 A copy of the invoice from the business/professional reporting the date the interceptor was cleaned, the amount of sand and/or oil removed and a recommendation of how frequently the interceptor should be cleaned must be sent to the District office after each cleaning. A copy of all interceptor cleaning invoices are to be on file at the business being served and available to the District upon request. Failure to comply with the above could result in fines, penalties, or disconnection of service.

2.06.3 The District reserves the right to levy any fines to such facilities that do not conform to the District's sand/oil Regulations. Retribution shall be paid to any surrounding businesses and/or homeowners for damage resulting from any non-compliance of the District's regulations. Any extraordinary cost incurred by the District due to interference, damage or special processing necessary in the treatment and/or

collection system shall be paid by the business. The direct cost of all labor, equipment and materials incurred in rectifying the interference or damage shall be billed directly to the business by the District.

2.07 SEWER USE REGULATIONS:

2.07.1 This Regulation forms a part of the Sewer Use Regulations of the Palmer Lake Sanitation District. Enforcement of this Regulation is governed by the express terms hereof and the enforcement provisions of “Part I, Chapter 3 - Enforcement” of these Construction Specifications and Regulations of the Palmer Lake Sanitation District, which is incorporated by reference, including, without limitation, those provisions for administrative violations, violation of discharge limitations, enforcement procedures, penalties, field observations, and extra monitoring charges. Any violation of this Regulation for grease interceptors and grease traps shall be considered a discharge violation under the enforcement provisions of “Part I, Chapter 3 - Enforcement” of the Construction Specifications of the Palmer Lake Sanitation District. Compliance with this Regulation, as well as the other provisions of the Construction Specifications, shall be the joint and several obligation of the owner of the property served and any party in possession of the property using the wastewater services of the District. Any monies due or penalties to the District under the provisions of the regulation, or other provisions of the Construction Specifications, shall constitute a lien upon the property served.

2.07.2 The Palmer Lake Sanitation District has the right to reject any waste which may be harmful to, or cause obstruction of the publicly owned wastewater collection system, or interfere with the operation of the publicly owned treatment works.

2.08 APPLICATION:

2.08.1 This Regulation applies to all existing and future uses within the scope of Section **2.01** above. For those businesses currently conducting operations subject to these Regulations, they shall be provided a grace period of one year in which to come into full compliance with these Regulations. The District has determined that the enactment of this Regulation is in the best interest of the District and its customers

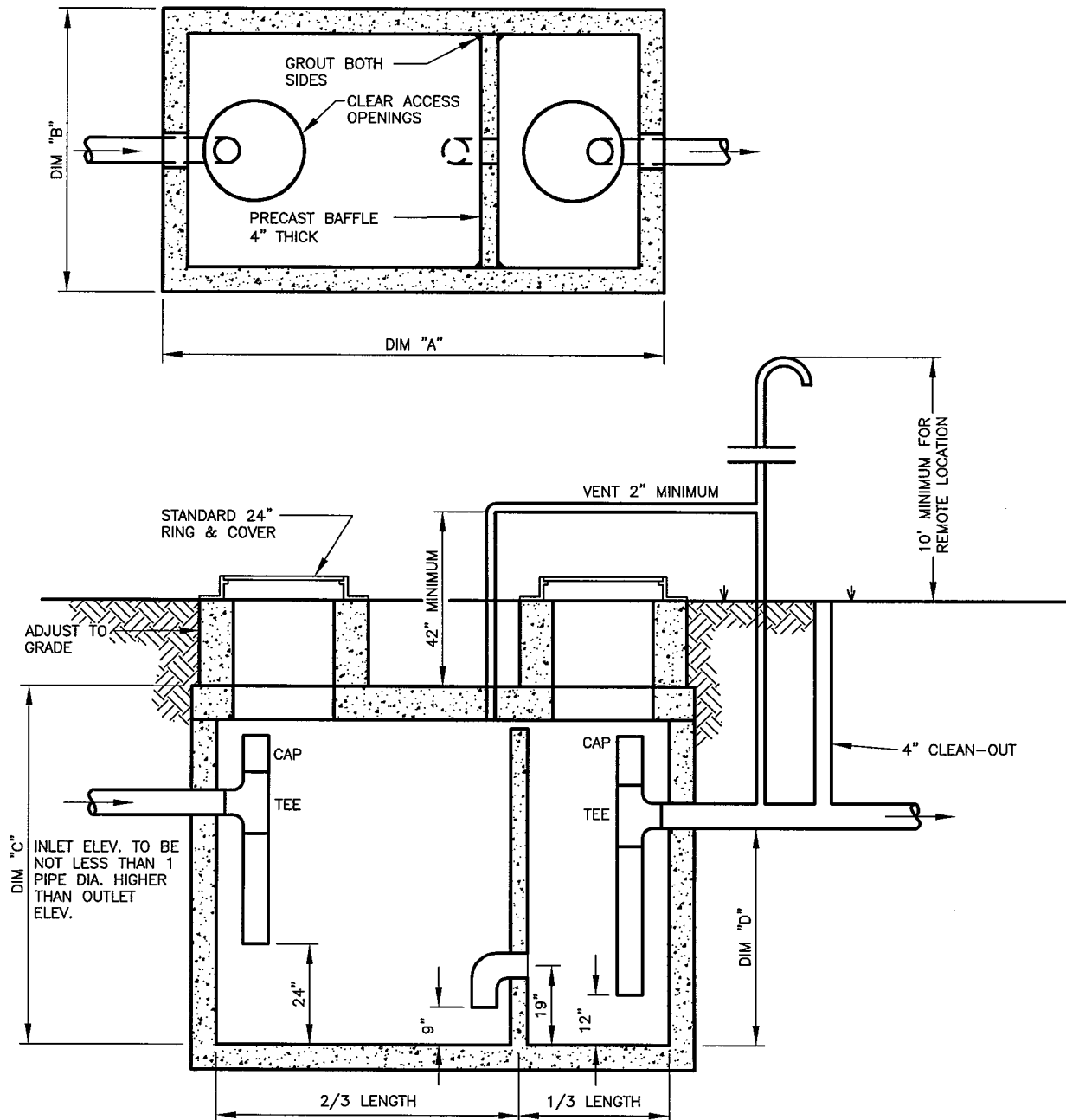
and is necessary for this efficient and proper operation and protection of the District's operations and facilities, and that this Regulation is necessary and in furtherance of the health, benefit, and welfare of the District's customers.

NOTES :

1. MINIMUM SIZE = 1500 GALLON
2. CONCRETE = 28 DAY COMPRESSIVE STRENGTH = 4500 psi
3. DESIGN: ASTM C857-87 & C858-83 MINIMUM
4. LOADING: AASHTO HS-20
5. FILL w/ CLEAN WATER PRIOR TO START-UP OF SYSTEM

SIZING CHART

GALLON CAPACITY	DIM "A"	DIM "B"	DIM "C"	DIM "D"
1500	9'-0"	5'-8"	7'-2"	4'-4"
1750	11'-2"	5'-8"	7'-2"	4'-11"
2000	11'-2"	6'-8"	8'-0"	4'-7"
2500	12'-8"	6'-8"	8'-0"	5'-6"
2750	12'-8"	6'-8"	8'-0"	6'-0"
3000	15'-7"	9'-7"	8'-6.5"	6'-3"
4000	15'-7"	9'-7"	8'-6.5"	6'-3"
5000	19'-11"	9'-11"	8'-11"	6'-2"
6000	19'-11"	9'-11"	10'-5"	7'-2"



**Palmer
Lake
Sanitation
District**

GREASE INTERCEPTOR

DRAWN: MWR

DATE: JUNE 2009

SCALE: NONE

REVISED:

REVISED:

REVISED:

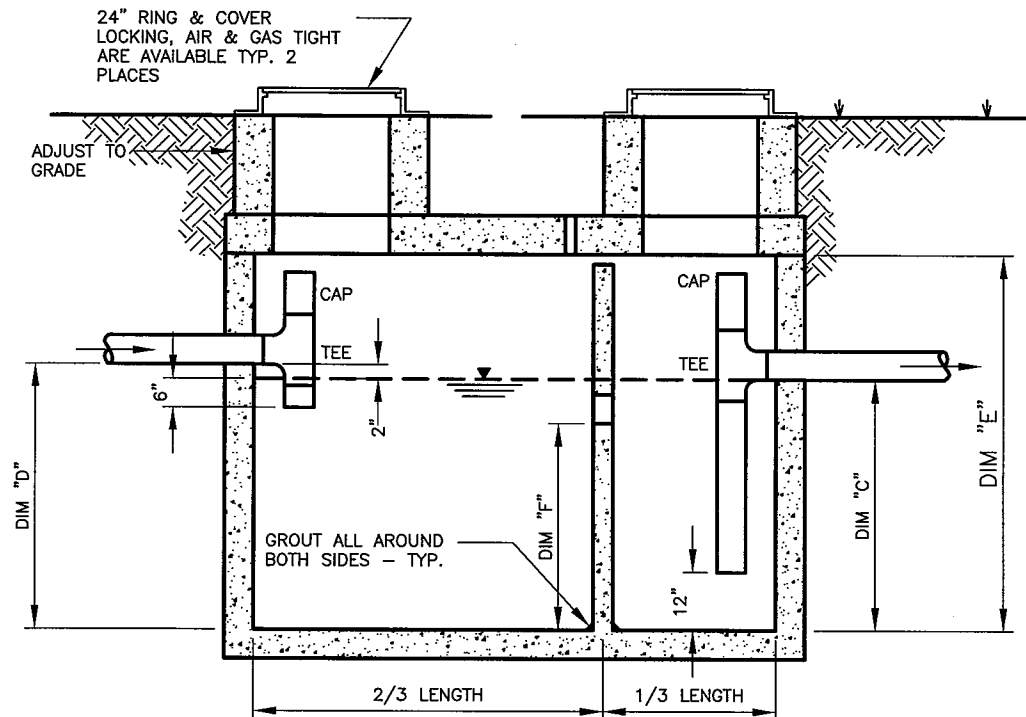
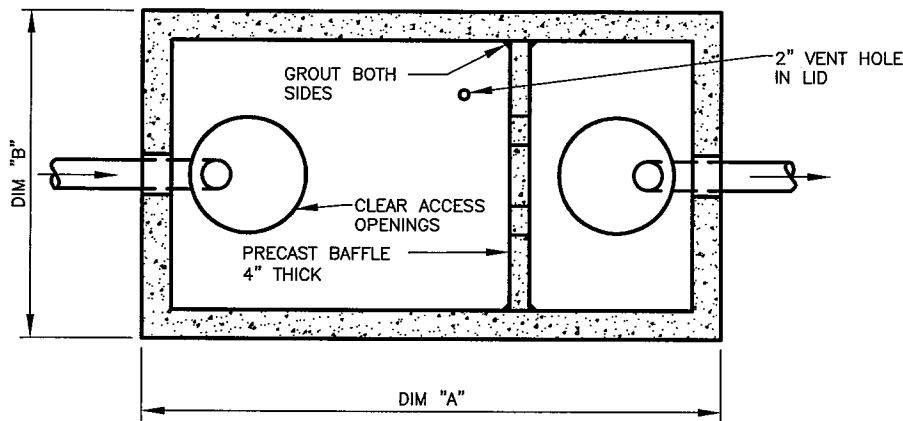
DWG-18

NOTES :

1. MINIMUM SIZE = 500 GALLON
2. CONCRETE = 28 DAY COMPRESSIVE STRENGTH = 4500 psi
3. DESIGN: ASTM C857-87 & C858-83 MINIMUM
4. LOADING: AASHTO HS-20
5. FILL w/ CLEAN WATER PRIOR TO START-UP OF SYSTEM

SIZING CHART

GALLON CAPACITY	DIM "A"	DIM "B"	DIM "C"	DIM "D"	DIM "E"	DIM "F"
500	6'-0"	4'-0"	3'-0"	3'-2"	4'-0"	2'-6"
750	6'-0"	4'-0"	5'-0"	5'-2"	6'-0"	4'-0"
1000	6'-0"	4'-0"	6'-0"	6'-2"	7'-0"	5'-0"
1250	8'-0"	4'-0"	5'-3"	5'-5"	6'-6"	4'-3"
1500	8'-0"	4'-0"	6'-2"	6'-4"	7'-0"	5'-2"
1800	11'-0"	4'-0"	5'-6"	5'-8"	7'-0"	4'-6"
2000	12'-6"	6'-0"	4'-0"	4'-2"	5'-0"	3'-0"
2500	12'-6"	6'-0"	5'-0"	5'-2"	6'-0"	4'-0"
3000	12'-6"	6'-0"	6'-0"	6'-2"	7'-0"	5'-0"
3500	16'-0"	8'-0"	4'-0"	4'-2"	6'-0"	3'-0"
5000	16'-0"	8'-0"	5'-6"	5'-8"	7'-0"	4'-6"
5500	16'-0"	8'-0"	6'-0"	6'-2"	7'-0"	5'-0"



**Palmer
Lake
Sanitation
District**

SAND/OIL INTERCEPTOR

DRAWN: MWR

DATE: JUNE 2009

SCALE: NONE

REVISED:

REVISED:

REVISED:

DWG-19

**Palmer Lake Sanitation District
Grease Interceptor/Trap Inspection Form**

Date of Inspection: _____

Business: _____

Address: _____

Contact Person
and Title: _____ Phone: _____

Grease Interceptor Location: _____

Interceptor Capacity (gallons) _____ Number of Pits _____

Is the capacity sufficient: ☐ YES ☐ NO

Use of enzymes? ☐ YES ☐ NO

Number of Customers/Day: _____

General Condition of
Interceptor/Trap: ☐ **Excellent** ☐ **Good** ☐ **Poor** ☐ **Replace**

Pumping Company: _____

Address: _____

Contact Person
and Title: _____ Phone: _____

Interceptor Pump Schedule: _____

Date of Last Pumping: _____

Comments: _____

Recommended Cleaning &
Inspection Schedule: ☐ 3-month ☐ 6-month ☐ Yearly