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SECTION 1 GENERAL CONDITIONS

1.1 PURPOSE

The Board of Directors of the South Durango Sanitation District (SDSD or the District) has adopted these Codes & Standards for the following purposes:

- To supplement the Rules and Regulations of the District. (A copy of the District's Rules & Regulations is provided in Appendix A).
- To govern the design and construction of all sanitary sewers and appurtenances within the District's service area.
- To standardize the District's plan submittal and review procedures, construction inspection, and final acceptance procedures.

The term Codes & Standards shall include Sections 1, 2 and 3; Appendices A, B, C and D; and all resolutions of the Board of Directors which relate thereto.

Developers, engineers, and contractors designing and constructing facilities that will become part of or connect to the District's infrastructure shall be familiar with and must comply with these Codes & Standards.

It shall be unlawful for any person, firm, or corporation to construct, enlarge, alter, repair, move, improve, remove, excavate, convert, or demolish any public improvements or common facilities owned and operated by the South Durango Sanitation District without abiding by the requirements of these Codes & Standards.

Any variation from these Codes & Standards will require prior written approval from the District.

1.2 EFFECTIVE DATE OF CODES & STANDARDS

These Codes & Standards shall be in effect immediately upon formal adoption by the District Board of Directors and shall supersede all former standard specifications.

1.3 REVISIONS, AMENDMENTS, OR ADDITIONS

These Codes & Standards may be revised, amended, or added to from time to time. Such revisions, amendments, and additions shall be binding and in full force immediately upon formal adoption by the District Board of Directors. All parties in possession of the SDSD Codes & Standards shall be responsible for ensuring they have the most current edition.

1.4 ALTERNATE MATERIALS AND METHODS OF CONSTRUCTION

The provisions of these Codes & Standards are not intended to prevent the use of any material or method of construction not specifically prescribed by these procedures, provided any alternate has been approved and its use authorized by the District.

1.5 MODIFICATIONS

Whenever there are practical difficulties involved in carrying out the provisions of these Codes and Standards, the District may grant modifications for individual cases, provided that the District shall first find that special unique circumstances makes these Codes & Standards impractical, that the modification is in conformity with the intent and purpose of these Codes & Standards, and that such modification does not affect the functionality of the improvements or increase the District's maintenance burden.

1.6 TESTS

Whenever there is insufficient evidence of compliance with any of the provisions of these Codes & Standards or evidence that any material or construction does not conform to the requirements herein, the District shall require that the Contractor have tests performed to demonstrate compliance. Test methods will be as specified by these Codes & Standards or by other recognized test standards. If there are no recognized test methods for the proposed alternate, the District will determine test procedures. All tests will be made by an approved agency and all costs shall be the responsibility of the Contractor. Reports of such tests shall be submitted to and retained by the District.

1.7 ENFORCEMENT AND INTERPRETATION

The District Manager is authorized and directed to enforce all provisions of these Codes & Standards, and may appoint an engineer, construction inspector, or other authorized representative to act in his/her behalf. Wherever the term District Manager is used it shall include any authorized representative of the District Manager. Whenever any work is being done contrary to the provisions of these Codes & Standards, the District Manager may order the work stopped by verbal notice, followed by a written notice which will be served on any persons engaged in the doing or causing of such work to be done, and any such persons shall forthwith stop such work until authorized by the District Manager to proceed.

The District Manager shall have the authority to interpret any Section, or any difference between Sections, when appropriate, and his/her interpretation shall be binding and controlling in its application.

1.8 LIABILITY

The District Manager, acting in good faith in the discharge of his/her duties, will not be personally liable for any damage that may occur to persons or property as a result of any act or by reason of any act or omission in the discharge of his/her duties.

1.9 FEES & FINES

As part of the implementation of these Codes & Standards, certain fees will be required and certain fines may be imposed. A current fee schedule is available at the District office. Fees may be established and changed by the Board of Directors at any time. Following is a brief description of the various fees and fines:

Codes & Standards Reproduction Fee. Fees for copies of the Codes & Standards are set to cover the cost of reproduction. The fee includes one hard copy of the Codes & Standards.

Plan Review Fee. This fee covers the costs of Plan Review by the District's Engineer for projects requiring Reimbursement Agreements (RA). Plan Review Fees will be determined on a case-by-case basis.

Construction Service Fee. This fee covers the costs of construction inspection and testing by the District for projects requiring Reimbursement Agreements. Construction Service Fees will be determined on a case-by-case basis.

Plant Investment Fee (PIF or Tap Fee). A PIF is assessed to recover a proportionate share of the capital cost of the District facilities. The PIF includes an amount for the capital cost of the existing District facilities and an amount for the capital cost of expansion of District facilities. The combination of these two components supports the District's policy that growth pays for growth. The PIF rate may be changed at any time by the Board of Directors of the District.

Tap Inspection Fee. A tap inspection fee is charged for inspecting each tap connection. The fee is paid at the time the PIF is paid.

User Fee. User fees for sewer service are collected to pay for the operation and maintenance expenses of the District. The User Fee shall be assessed the month after the PIF is paid. Fines for late payment of user fees are set forth in the Rules & Regulations.

Unauthorized Use of Infrastructure Fine. Fines for unauthorized use of District Infrastructure (e.g. making connections without a District Inspector present) will be determined on a case-by-case basis.

Infrastructure Disturbance Fine. Fines for disturbing District infrastructure will be determined on a case-by-case basis.

SECTION 2 PROJECT PROTOCOLS

2.1 GENERAL

Required project protocols are described in this Section. These protocols must be followed for all projects that plan to connect to the District's facilities. These protocols standardize:

- Submittal and review procedures for project plans and specifications
- Construction inspection requirements
- Final acceptance requirements
- Warranty requirements

The protocols are broken into the following project phases:

- Project Initiation
- Design Phase
- Construction Phase
- Final Acceptance
- Warranty Period

An overview of the entire project process is presented in the Project Flow Chart illustrated in Figure 2-1 on the following page. Checklists to track the progress of each project phase are presented in Appendix B.

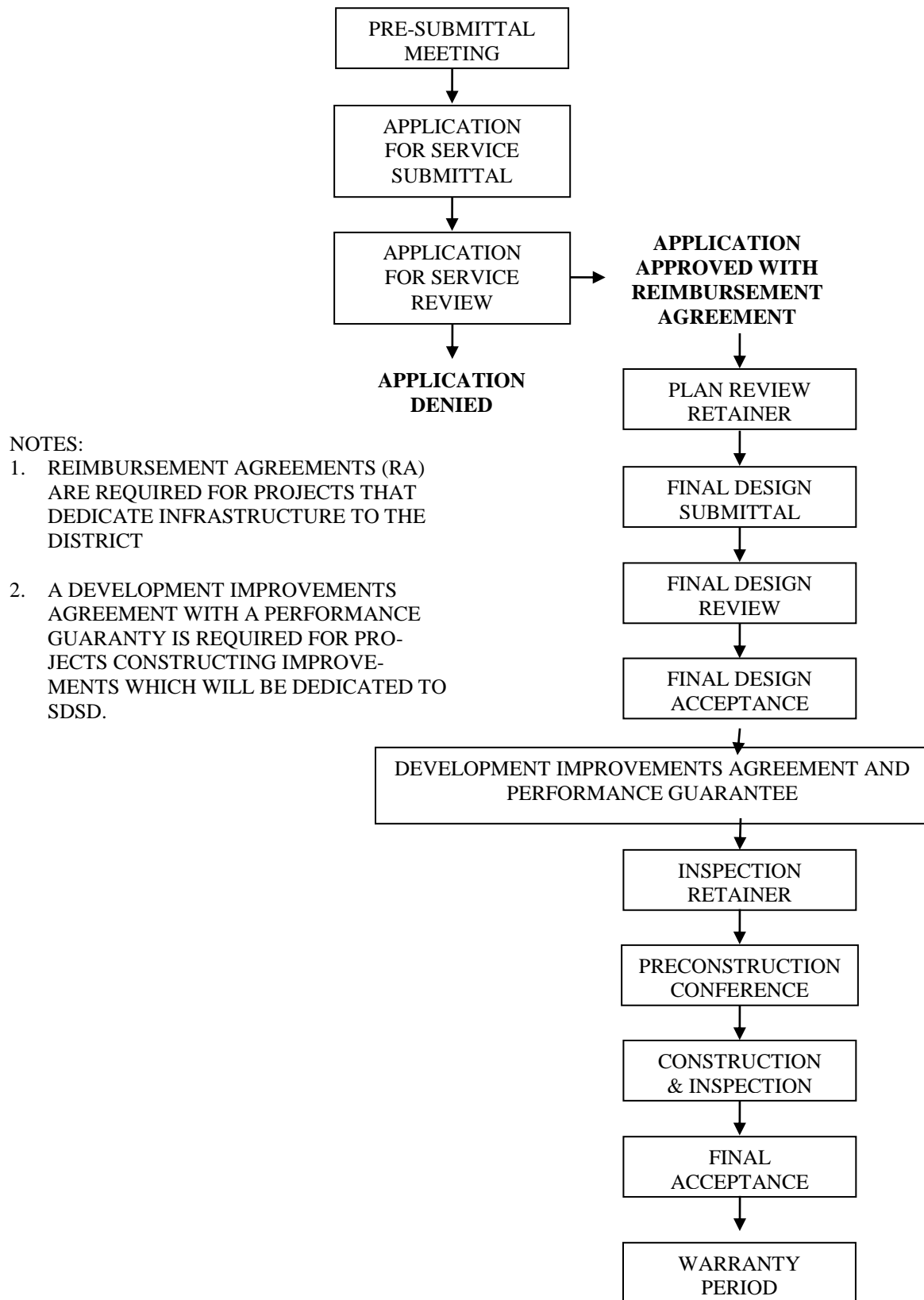
2.1.1. Projects not requiring a Reimbursement Agreement.

For projects that do not require Reimbursement Agreements, such as new taps in an approved subdivision, the Owner is required to take the following steps:

- A. Prior to making the connection, complete a standard sewer tap application and pay the required PIF to the District.
- B. Notify the District via fax with time and date stamp 48-hours before making the connections to the District's sewer lines so that a District representative can be present to inspect the connection as it is being made.
- C. Make the connection to the system in the presence of the District's inspector.

The remaining portions of Section 2 shall not apply to such projects. For projects that do not require Reimbursement Agreements, plans and specifications are not required, however, the work must conform to the District's Codes & Standards. If plans are available for these types of projects, one copy of the plans shall be submitted to the District to be kept in the project file for future reference.

FIGURE 2-1: PROJECT FLOW CHART



2.2 PROJECT INITIATION

2.2.1 Pre-Submittal Meeting

To commence a project, a Pre-Submittal Meeting will be held between the District, the Applicant, and, for larger projects, the Applicant's Engineer. The purpose of the meeting is to introduce the District to the project, and to introduce the Applicant to the District's Codes & Standards requirements. The Applicant should bring any preliminary project plans and location maps to the meeting. Following this meeting, the District will create a file for the project.

2.2.2 Application For Service Submittal

The next step in the process is for the Applicant to complete and submit an Application for Service. Completed applications shall be submitted to the District Manager. The purpose of this application is to provide detailed project and contact information. Preliminary plans and specifications shall be submitted with the application, along with a copy of the deed for the project property.

2.2.3 Application for Service Review

The District will review the Application for Service and will determine whether the project meets the requirements for service as set forth in the District's Codes & Standards, and whether or not a Reimbursement Agreement (RA) will be required for the project.

If the application is incomplete, the missing information shall be requested from the Applicant and the review process suspended until the additional information is submitted.

The District Manager has the authority to approve Applications for Service unless the project requires a new commitment to serve, any variation from the Codes & Standards or any other issue which the District Manager believes requires review by and approval of the Board. In such cases the application will be referred to the District Board at the next scheduled monthly board meeting. The District will inform the Owner in writing as to whether or not the Application for Service has been approved or denied.

2.2.4 Reimbursement Agreement (RA)

Reimbursement Agreements will be required for all projects that involve the construction of improvements which will be dedicated to the District or for projects that result in significant disturbance or relocation of existing District facilities. The purpose of the RA is to ensure that the District's costs for administrative, engineering, legal, and any specialized services associated with the project, such as plan review and construction inspection, are paid for by the Owner and not by the District's existing customers.

For projects in which the Owner proposes dedicating sewer improvements to a Home Owner's Association (HOA), or other similar entity, the District will make the final

determination of whether the proposed improvements should be dedicated to the HOA or the District. The District policy is to avoid situations where the Owner dedicates improvements to a HOA and later the HOA requests the District to accept improvements that may not have been constructed or maintained in accordance with the Codes & Standards.

2.3 DESIGN PHASE

Design of all improvements which will be dedicated to the District shall be performed under the direct supervision of a Professional Engineer registered in the State of Colorado.

All design information and submittals required by these Codes & Standards shall be provided to the District, even if the Owner is utilizing alternative methods of design and construction, such as design-build.

The District may request that certain improvements be oversized to provide future service to areas adjacent to the proposed project. In these instances, an agreement between the Owner and District will be developed dictating the terms of reimbursement to the Owner for the additional incremental cost of constructing the oversized improvements.

2.3.1 Plan Review Retainer

The District's costs for plan review will be estimated based on the preliminary project plans submitted with the Application for Service.

A plan review retainer will be required from the Owner that covers the estimated review costs. This retainer must be submitted prior to the start of the review. If the actual cost of plan review ends up exceeding the plan review cost estimate, the Owner shall pay for the additional review costs. Once final plans and specifications are approved, any remaining plan review retainer will be refunded to the Owner.

2.3.2 Final Design Submittal

All improvements which will be dedicated to the District shall be designed in accordance with the design criteria provided in Section 3 of these Codes & Standards. Additionally, the design shall incorporate the Standard Details provided in Appendix C and the Technical Specifications provided in Appendix D.

Any deviations from these Codes & Standards shall be clearly noted and shall require written approval from the District prior to construction.

Plans shall be drawn to scale and shall have sufficient clarity to indicate the location, nature, and extent of the work proposed and show in detail that it conforms to the provisions of these Codes & Standards and all relevant laws, ordinances, rules and regulations. The term plans shall include all drawings and technical specifications.

Plans shall be submitted on full size or half size sheets. A Plan Submittal Checklist is included in Appendix B that lists minimum requirements for drawing content. To reduce the likelihood of having to resubmit the plans, the Owner's engineer shall abide by this list when preparing the project drawings.

If requested, copies of all supporting data such as calculations, geotechnical reports, and surveys shall be submitted with the plans to assist with the review process.

Copies of all review comments from any other regulatory agencies reviewing the project shall be provided if such comments will assist with the review process.

If requested, copies of any proposed Contract Documents between the Owner and the Contractor shall be provided with the Final Design Submittal.

Four (4) complete copies of the Final Design Submittal, including all supporting data, shall be submitted to the District, one for the Project File, one for the District's Engineer, and one copy for the District's inspector.

For projects that will have several phases of construction, detailed master plan drawings of the entire project shall be submitted prior to, or with, the first phase plan set. The master plan drawings shall contain sufficient infrastructure detail to determine if the proposed design concepts for the entire site are feasible.

2.3.3 Final Design Review

The District's Engineer will review the Owner's Final Design Submittal to ensure compliance with the District's Codes & Standards. Approval by the District is not intended and shall not be interpreted as guaranteeing the design of the facilities. The District will not be responsible for any damages arising out of the design of the facilities.

A review period of 15 working days will be required on all submittals. Unusually large submittals may require additional time. At the end of the review period, or sooner if possible, written comments will be returned to the Owner. The response may be an unconditional approval, a request for additional data, or a request for revision and resubmittal. For resubmittals, an additional 15 day review period will be required from the date of the resubmittal. Plans and specifications that do not conform to the District Codes & Standards may require repeated resubmittals before the District's Engineer approves them.

2.3.4 Final Design Acceptance

Once the final design is in conformance with the requirements of these Codes & Standards, the final design will be approved in writing by the District. One copy of the Final Design Submittal with the District Engineer's signature of approval shall be returned to the Owner. The accepted plans and specifications may not be changed without authorization from the District.

No improvements to be dedicated to the District shall be constructed prior to Final Design Acceptance. Fines may be imposed for unauthorized connections.

Any project not under construction within one-year from the date that the District Engineer approves the final set of design drawings shall be subject to re-approval at the District's discretion.

2.4 CONSTRUCTION PHASE

Upon approval of the final design for RA projects, the Construction Phase of the project may commence.

2.4.1 Construction Financial Guarantee

An itemized cost estimate of the cost of constructing the improvements to be dedicated to the District shall be provided to the District. The District's Engineer shall review the cost estimate and either approve the estimate or require changes. The Owner shall submit a financial guarantee with the DIA prior to construction, in a form acceptable to the District, for 110 percent of the total approved estimated construction cost of the improvements. After the improvements have been constructed and accepted, the District may release a portion of the guarantee equal to not more than 50 percent of the estimated costs of the improvements. The remaining portion shall be kept until the end of the warranty period. The guarantee shall be available to reimburse any expenses incurred by the District to maintain or repair the facilities. The Owner will still be liable for all expenses incurred by the District that are not reimbursed through the guarantee.

2.4.2 Construction Services Retainer

The Owner shall reimburse the District for the District's construction inspection and testing services. The District shall prepare a cost estimate for construction services. A retainer shall be required from the Owner that covers the estimated costs. This retainer must be submitted prior to the start of construction. Once notification of final acceptance is issued, any remaining retainage shall be refunded to the Owner. If the actual cost of construction services ends up exceeding the cost estimate, the Owner shall be responsible for the additional costs.

2.4.3 Pre-Construction Conference

A pre-construction conference shall be required at least two weeks prior to the start of construction. The District shall be notified of this meeting at least one week prior to the date scheduled. Attendees shall include District staff, the District's Engineer, the Owner, the Owner's Engineer, the General Contractor, and any key Subcontractors. A Checklist is included in Appendix B that lists topics that should be discussed at this meeting.

2.4.4 Construction & Inspection

- A. Installation Guidelines.** Installation guidelines for sewer system work are provided in Section 3.
- B. Schedule.** The Contractor shall submit an initial project schedule at the Pre-Construction Conference. Periodic schedule updates shall be provided thereafter at intervals determined at the Pre-Construction Conference. The schedule shall identify when District infrastructure will be impacted by construction or staging operations.
- C. Submittals.** The Contractor shall provide a list of materials that will be used on the project at the Pre-Construction Conference. At that time, it will be determined which of the materials shall require shop drawing submittals. Six copies of all required shop drawings shall be submitted to the District for review. Three copies with review comments shall be returned to the Contractor. The District's Engineer shall review the drawings within 10-working days of receipt and provide comments back to the Contractor. The Contractor shall submit shop drawings in a timely manner so that the full review timeframe is available to the Engineer without affecting the construction schedule. Any submittals that are not in accordance with these Codes & Standards, and which are therefore subject to rejection, shall be submitted even earlier in case they need to be submitted a second time.
- D. Safety.** All construction work performed within the District shall conform to all applicable Federal, State, County and City rules and regulations concerning safety. The safety of the crew and public shall be considered at all times. When working within public right-of-ways, the Contractor shall conform to all applicable traffic control regulations. Contractors are expected to know the necessary safety measures and the District assumes no responsibility for the safety procedures or lack of such procedures used by the Contractor.
- E. Locating and Protecting Utilities.** The Contractor shall be responsible for locating and protecting all utilities at the project site. The Utility Locate Service phone number is 1-800-922-1987 for the District's service area. Three days advance notice is typically required before any excavation.

In the event of a break in any utility, the Contractor shall immediately notify the responsible official of the organization operating the interrupted utility and shall lend all possible assistance in restoring services.

- F. Insurance.** The Contractor shall list the District as an additional insured on all insurance coverage and shall provide the District with a Certificate of Insurance at the Pre-Construction Conference.
- G. Indemnification.** The Contractor hereby agrees to save and hold harmless the District, and any of its officers, employees, subcontractors or agents from all

costs, loss, damage and liability incurred by any of the above as a result of any third party claims, demands, costs or judgments which is caused by an activity, condition or event arising out of the performance or nonperformance of any provision of the construction of the project by Contractor, its agents or independent subcontractors. When any cost, damage or liability occurs as aforesaid, Contractor assumes the burden of proof that the activity, condition or event did not cause such cost, damage or liability.

H. Materials Testing. Material testing requirements and frequencies shall be as required in these Codes & Standards and shall be reviewed at the Pre-Construction Conference. The Contractor shall pay for all materials testing and shall furnish the District with copies of all test reports. The failure of any portion of the work to meet any of the testing requirements of the Codes & Standards shall be reasonable cause for the District to require the removal or correction and reconstruction of any such work. All retesting shall be at the expense of the Contractor.

I. Inspection. All work and materials that are to be dedicated to the District must be inspected by the District's inspector in accordance with the Reimbursement Agreement and the following requirements:

1. Notification: The Contractor shall notify the District a minimum of 48-hours in advance of any work that will affect the District's infrastructure. At the time of notification, the Contractor shall advise the District of the nature and the anticipated duration of the construction activities.
2. Material Inspection: All pipes, fittings, appurtenances and any other materials that will be dedicated to the District shall be carefully examined for defects before installation. Bell and spigot ends of pipes shall be examined with particular care, as these areas are most vulnerable to damage from handling. Defective materials shall be marked and removed from the work site as soon as possible.
3. Construction Inspection: The District's Inspector will check all new infrastructure for conformance to these Codes & Standards. No work may be buried until inspected. The District will not be responsible for the quality of the work performed by the Contractor nor for any defects subsequently found in the work or materials. The District's Inspector shall have the authority to halt construction, if in his opinion, these Codes & Standards and/or standard construction practices are not being followed, or the work is otherwise defective.

J. Mitigating Construction Impacts. The Contractor shall control and minimize all impacts related to the performance of the work. All possible efforts shall be made to avoid disruption and disturbance of any neighbors. If the Contractor fails to provide adequate mitigation in a timely fashion, the District reserves the right to perform the necessary mitigation work itself or through subcontractors, and to

then back charge the Contractor for all costs associated with this work. At a minimum, the following shall be provided for the duration of the project:

1. Daily Cleanup. Daily construction cleanup shall be required.
2. Mud and Earth Tracking on Public Streets. The Contractor shall conduct his operations so that equipment tracking of mud and earth onto adjacent public streets is minimized. If requested by the District's inspector, the Contractor shall be required to clean all streets affected by mud and/or earth tracked by his equipment or that of his subcontractors or suppliers.
3. Road Re-grading. Regular re-grading of gravel roads negatively impacted by construction traffic shall be required.
4. Pothole Fixing. Regular fixing of potholes along construction access roads shall be required.
5. Temporary Paving. For multiyear projects, temporary paving of impacted streets will be required prior to the onset of winter, if, in the Inspector's opinion, road damage is extensive.
6. Dust Control. Gravel roads shall be sprinkled with a water solution containing calcium or magnesium chloride as often as is necessary to control dust arising from the operations connected with the work.
7. Sanitary Facilities. Outhouses shall be provided and shall be located as far away as possible from any existing residences or businesses. Regular servicing of outhouses shall be required.
8. Working Hours. Working hours shall be restricted to 7:00 AM to 7:00 PM, Monday through Friday. Overtime work outside of regular working hours or the performance of work on Saturday, Sunday, or any legal holiday will not be allowed without prior written consent from the District.
9. Interruption of Service. District customers impacted by new connections to the existing District infrastructure shall be provided with a minimum of 48-hours notice prior to any shutdowns. No shutdowns will be allowed on weekends. Prior to all shutdowns, the Contractor shall present the proposed shutdown plan to the District's Inspector for approval.
10. Protection of Public and Private Property. The Contractor shall use every reasonable precaution to prevent the damage or destruction of public or private property such as poles, trees, shrubbery, crops, fences, and survey monuments adjacent to or interfering with the work, and all overhead structures such as wires or cables, within or outside of the right-of-way.

Where trees, hedges, shrubs or other ornamental plantings within the construction limits are not designated to be protected or saved, the Contractor shall notify the owner of the property fronting the plantings in question not less than ten days prior to removing the plantings. This notification shall include allowing the property owner the option to transplant the plantings fronting his property onto his property instead of having the Contractor remove them.

11. Traffic Disruption. The Contractor shall carry on the work in a manner that will cause the least interruption in traffic. Access rights of the public shall be considered at all times. All barricading, signage, flagmen, lights, and detours shall be the Contractor's responsibility and shall be coordinated with the appropriate entities including the City of Durango, La Plata County and the Colorado Department of Transportation and shall be in accordance with their regulations and all applicable OSHA standards. A Traffic Control Plan shall be submitted prior to beginning construction where any construction activity will involve the use of public right-of-ways. The plan shall provide project specific details for guiding and handling traffic safely through the construction work zone. The Contractor shall coordinate intersection and driveway closures with property owners and the District. If backfill has been completed to such an extent that safe access may be provided, and the street open to local traffic, the Contractor shall immediately clear the street and driveways and provide and maintain access. The Contractor shall cooperate with the various parties involved in the delivery of mail, snow removal, and the collection and removal of trash and garbage to maintain existing schedules for these services.
12. Staging and Parking Areas. Contractor Staging and Parking Areas shall be established that avoid disruption to any neighbors.
13. Explosives. The use of explosives will not be permitted without written permission from the District.

K. Emergency Work. When, in the opinion of the District, or its assigned representatives, the Contractor has not taken sufficient precautions to ensure the safety of the public or the protection of the work to be constructed, or of adjacent structures or property which may be injured by processes of construction on account of such neglect, and an emergency may arise and immediate action is considered necessary in order to protect public or private, personal or public interest, the District, WITH OR WITHOUT NOTICE, to the Contractor or the Developer, may provide suitable protection by causing such work to be done and material to be furnished and placed as the District may consider necessary and adequate. The cost and expense of such work and material so furnished will be born by the Contractor or Developer and will be paid upon presentation of the bills. The performance of such emergency work under the direction of the District will in no way relieve the Contractor of responsibility for damages which may occur during or after such precaution has been taken.

In an emergency threatening loss of life or extensive damage to the work or to adjoining property, and where the Contractor is unable to obtain special instructions or authorization from the District after diligent attempts to obtain such special instruction or authorization in sufficient time to take the necessary action, the Contractor is hereby permitted to act at his own discretion to prevent such threatening loss or damage.

- L. Startup.** Startup of all facilities that will be dedicated to the District shall be closely coordinated with the District's Engineer and Inspector. All equipment that will be dedicated to the District shall first have the installation checked and certified by a manufacturer's representative. The manufacturer's representative shall also be present when the equipment is first started up.

2.5 FINAL ACCEPTANCE

2.5.1 General

At the completion of construction, the Final Acceptance requirements, as outlined in these Codes & Standards, must be met before the District will assume ownership of the project and release all or a portion of the financial guarantee.

2.5.2 Acceptance Testing

Acceptance Testing in accordance with the Technical Specifications shall be provided for all infrastructure that will be dedicated to the District. The District's Inspector shall be notified 48-hours before any testing and shall be present to witness the tests.

2.5.3 Punchlist

The Contractor shall notify the District when the work is complete to perform a walkthrough of the project for the purpose of developing a Punchlist. The Punchlist shall identify all unfinished work and completed work requiring modifications. Upon completing the Punchlist Items, the Contractor shall again setup a walkthrough with the District to inspect the work and check-off the items on the Punchlist. Until the Project is accepted, the District reserves the right to add to the Punchlist at anytime. A schedule for completing the Punchlist work shall be established. If the Contractor fails to complete the Punchlist work in a timely fashion, the District reserves the right to perform the necessary Punchlist work itself or through subcontractors and to back charge the Owner for all costs associated with this work.

2.5.4 Restoration of Prior Conditions

Upon completion of the work, the Contractor shall restore all disturbed areas and facilities to their pre-project condition or better. Restoration activities shall include, but not be limited to, streets, curbs, gutters, drainages, grading, and landscaping. Additionally, the

Contractor shall perform a final cleanup of all areas impacted by the construction to the satisfaction of the District's Inspector.

2.5.5 Record Drawings

The Contractor is responsible for maintaining record drawings during construction to show any changes from the original plans. Upon completion of the work, the Contractor shall provide the record drawings to both the Owner's Engineer and the District for comments. The Owner's Engineer shall incorporate all comments and provide final drawings in both reproducible hard copy form (Mylars) and in electronic form (Auto-CAD). The hard copy drawings shall be signed and sealed by the Owner's Engineer and shall be stamped "Record Drawings".

2.5.6 Copies of Testing Reports

The Contractor shall provide copies of all testing reports produced as part of the project.

2.5.7 O&M Manuals

The Contractor shall provide Operations & Maintenance Manuals for all equipment dedicated to the District as part of the project.

2.5.8 Training

The Contractor shall provide training by a manufacturer's representative for all equipment that will be dedicated to the District.

2.5.9 Easements & Dedications

All easements and dedications shall be officially recorded prior to final acceptance of the project by the District.

2.5.10 Ownership

The Owner shall dedicate all infrastructure to the District and shall execute such documents evidencing that dedication as may reasonably be required by the District.

2.5.11 Lien Waiver Releases

All infrastructure to be dedicated to the District shall be conveyed free and clear of all liens and encumbrances prior to final acceptance of the project by the District.

2.5.12 Initial Release of Financial Guarantee

Up to 50 percent of the Financial Guarantee may be released at the time of Final Acceptance. The remainder of the Guarantee will not be released until the end of the warranty period.

2.5.13 Notification of Final Acceptance

Upon completion of all final acceptance requirements to the satisfaction of the District, the District shall issue a Notification of Final Acceptance Letter to the Owner. Any remaining construction inspection retainage shall be returned to the Owner at this time.

2.6 WARRANTY PERIOD**2.6.1 Warranty**

The Owner will be responsible for all work performed, including proper function of the work, repair of settled areas, adjustment of manholes, meter pits, valve vaults, and similar items to grade, for a period of two (2) years from the date of Notification of Final Acceptance. Any malfunction during the warranty period shall be remedied by the Owner to the satisfaction of the District at no expense to the District. If the District is required to make repairs to the improvements, the Owner shall be responsible for the costs of such repairs including engineering, legal, and administrative costs.

2.6.2 Warranty Inspection

Not more than thirty days prior to expiration of the warranty, the Owner shall contact the District to schedule a final inspection of the work. Following inspection, a list of deficiencies will be prepared. The deficiencies must be corrected within thirty days after receipt of the list. After repairs have been made, a follow-up inspection must be requested. The warranty period shall continue until the Owner requests a final inspection and all warranty repairs have been made. The warranty period for repairs shall be two (2) years.

2.6.3 Final Release of Financial Guarantee

At the end of the warranty period, after all warranty issues have been addressed, the District shall release the remainder of the financial guarantee not previously released at the time of Final Acceptance minus any expenses incurred by the District to maintain or repair the facilities during the warranty period. If significant repairs are required, at the District's discretion, a portion of the financial guarantee may be held back until the warranty period for the repairs has expired.

SECTION 3 WASTEWATER SYSTEM

3.1 GENERAL

3.1.1 Easements

Wherever feasible, the wastewater infrastructure shall be constructed in the rights-of-way of streets that the City of Durango, La Plata County, Colorado Department of Highways or some other entity has accepted or will accept for maintenance. Facilities to be constructed outside street rights-of-way shall be located in easements dedicated for the use of the District by the owner. No structures shall be placed within sewer easements. Such easements shall be dedicated and shown either on the plat or on a form of easement deed approved by the District. Copies of all recorded plats, easement deeds or descriptions and maps must be provided for District records. All sewer lines shall have minimum 20-foot easements centered on the centerline of the pipe. Lift stations shall have sufficient easements to allow for access to and maintenance of all equipment.

3.1.2 Surveys

All surveys shall be conducted by a professional land surveyor licensed in Colorado and, where practical, shall use the most recent NAD 83 City of Durango aerial datum, with scaling factors provided by the District. Control points must be tied down sufficiently to enable the District to find and use them at the time the surveys are submitted and to enable points that may be destroyed prior to construction to be reestablished. Benchmarks should be established in locations where they will not be disturbed by construction and shall be completely described in the original survey notes.

3.1.3 Geotechnical Investigations

If soil investigations are performed as part of the project, a copy of the soil investigation report shall be provided to the District. The report shall provide sufficient subsurface exploratory and sample analysis to permit an adequate assessment of any soil problems that may be encountered. The following information should be included in the report:

- The in-place relative density
- Type and extent of material to be encountered
- Moisture content in lbs per cubic foot, % by weight, and % of optimum
- Potential excavation problems
- Location and extent of excavation
- The suitability of excavated materials for use as backfill
- The compaction characteristics of the soils
- The ground water conditions

3.1.4 Access

All sewer infrastructure structures (manholes, vaults, lift station, etc.) shall be accessible by a minimum 10-foot wide all-weather access road. The access drive shall have an all-weather surface such as asphalt or concrete paving, or at a minimum, be composed of four inches of 3/4" minus ABC overlaying six inches of 3" minus ABC, which overlays suitable compacted subgrade material. The access road shall be capable of supporting HS-20 vehicle loading and shall be designed to provide adequate drainage. Refer to Standard Sewer Detail No. 21.

3.2 DESIGN CRITERIA

3.2.1 General

All sewer systems shall be designed in accordance with these Codes & Standards and applicable sections of Colorado Department of Public Health and Environment (CDPHE) Policy 96-1. Besides requiring approval from the District, all designs for sewer lines 24-inch in diameter or larger, and all designs for wastewater lift stations must be approved by CDPHE and must be submitted to CDPHE by the Owner's Engineer with the appropriate Site Application form.

3.2.2 Design Flows

The wastewater collection system shall be designed to transport average and peak flows at ultimate build-out of the project. Average day flows shall be calculated using the Equivalent Residential Tap (ERT) Schedule provided in Exhibit A of the District's Rules & Regulations and an Average Day Flow rate of 250 gallons per day per ERT. This flow rate is based on historical data and includes an infiltration component.

The table below indicates peaking factors to be used for sizing pipes:

Sewer Pipe Diameter	Peaking Factor
10-inch and smaller	4.0
12-inch to 15-inch inclusive	3.5
18-inch to 27-inch inclusive	3.0
30-inch and larger	2.5

3.2.3 Sewer Lines

Sanitary sewer lines shall be designed for gravity flow conditions and in accordance with the following criteria.

- A. **Pipe Sizing.** Hydraulic characteristics shall be calculated for each reach of the sanitary sewer system using the following design criteria:

1. Sewer lines shall be designed to carry the peak flow with a flow depth of one-half of the full pipe.
2. Minimum and maximum acceptable slopes shall be as shown in the following table:

Nominal Pipe Diameter	Minimum Slope (%)	Maximum Slope (%)
4	1.0	12.0
6	1.0	12.0
8	0.5	12.0
10	0.5	12.0
12	0.4	10.0
15	0.4	8.0
18	0.4	6.0
21	0.4	5.0
24	0.4	4.0

3. No public sewer shall be smaller than eight inches in diameter.
4. Sanitary sewer system layout shall provide a system of lines that generally increase in diameter from higher to lower areas within a basin. Once a sewer line size is increased at any point in the system, it shall not be reduced in size at any downstream location, regardless of available slope.

B. Location. The following criteria shall apply:

1. Where possible, sewer lines shall be located under streets in the center of a driving lane.
2. Sewers should be laid deep enough to drain basements and to prevent freezing. All sewer lines shall have a minimum depth of cover of 3-feet, and a maximum depth of cover of 18-feet, measured from the top of pipe to the final surface grade.
3. Where sewer line depths are less than 4-feet and the main is located under a right-of-way, street, driveway, parking lot, or other areas where live loading is a concern, special pipe materials (such as ductile iron pipe) or other structural measures (such as concrete encasement) shall be provided.
4. All sewer lines shall be laid at a constant slope between manholes.
5. All sewer lines shall be laid in a straight alignment between manholes.
6. Sewer lines shall be designed to provide a minimum clear separation of 10 horizontal feet from any water line or appurtenance. Horizontal edge-to-edge separation with utilities other than water lines shall be 5 horizontal feet mini-

mum, and shall in all cases allow for future excavation of the sewer line without causing damage to the adjacent utility.

7. Where sewer lines are proposed to cross water lines or other utility lines, they shall be designed to cross at an angle close to 90-degrees. Minimum vertical clearance between the edge of the sewer line and the edge of the other utility line shall be 18-inches.
8. Where a minimum horizontal separation of 10-feet or a vertical separation of 18-inches cannot be maintained between sewer and water lines, the crossing must be constructed to protect the water line. Minimum protection horizontally shall consist of concrete encasement. Minimum protection vertically shall consist of concrete encased SDR-35 pipe extending 10-feet either side of the crossing. See Standard Sewer Detail No. 9 for further requirements.
9. Where sewer lines are placed in carrier pipes, the casing shall conform to the requirements of Standard Sewer Detail No.10.

C. Materials. The following criteria shall apply:

1. Gravity sewer pipe shall be new and shall be SDR-35 PVC pipe in accordance with Technical Specification 02595: 8"-15" PVC Pipe or Technical Specification 02596: 18"-27" PVC Pipe. All sewer pipes shall be of adequate strength to support trench and AASHTO HS-20 highway loadings.
2. Sanitary sewers under pressure shall be ductile iron pipe in accordance with Technical Specification 02565: Ductile Iron Pipe (AWWA C151), or PVC pipe in accordance with Technical Specification 02597: 4"-12" PVC Pressure Pipe, (AWWA C-900).
3. Sewer pipe shall be installed per Technical Specification 02200: Earthwork and the Standard Sewer Detail No. 8.

D. Summary Table. A table shall be prepared that summarizes the sewer line design. The table may be included on the drawings or submitted separately, and shall contain the following information for the downstream end of every pipe:

1. ERTs = Number of ERTs tributary to the pipe
2. D = Pipe diameter
3. M = Pipe Material
4. PF = Peaking factor
5. n = Manning's 'n'

6. S = Slope (ft/100 ft)
7. Q -peak = Peak flow (gpd)
8. V -peak = Peak flow velocity (fps)
9. d -peak = Peak flow depth (inches)
10. d/D peak = Ratio of peak flow depth to inside pipe diameter
11. Q -avg = Average flow (gpd)
12. V -avg = Average flow velocity (fps)
13. d -avg = Average flow depth (inches)
14. d/D avg = Ratio of average flow depth to inside pipe diameter

3.2.4 Manholes

Manholes shall be designed to promote smooth, continuous flow between adjacent reaches of sanitary sewer lines. Standard Sewer Details No. 1 through 7 and the following design criteria shall apply to manholes:

A. Location. The following criteria shall apply:

1. Manholes shall be required at all pipe junctions, at the upper end of each sewer line, and at all changes in slope, pipe diameter, and pipe alignment.
2. Manholes shall be required at all service connections eight inches in diameter or larger.
3. Manholes shall be required along sewer lines at distances not greater than 400-feet for all sized pipes.
4. Where possible, manholes will be located in streets in the center of a driving lane.
5. Manholes shall not be located in curbs, pans, drainage ditches, or any locations where water can collect and pool.
6. Manholes shall not be located in areas subject to flooding from floodplains, surface runoff, or ponding.

7. Direct access by maintenance vehicles shall be provided to each manhole in accordance with the provisions of Section 3.1.4.

B. Size and Configuration. The following criteria shall apply:

1. Manholes shall have a minimum inside diameter of 4-feet for pipes 18-inch in diameter or smaller. Manholes shall have a minimum inside diameter of 5-feet for pipes 21-inch in diameter or larger.
2. Sanitary sewer lines shall be designed so that the minimum angle between any upstream line and the downstream line is 90-degrees.
3. Manholes less than or equal to 5-feet from invert to top of cone shall have a flat-top section in lieu of a cone section.
4. Grade adjustments shall be made using precast concrete adjusting collars ranging in size from a minimum of 4-inches to a maximum of 10-inches. Total grade adjustment allowed by use of collars shall be 18-inches.
5. In open space areas, manhole rims shall be set 6-inches above grade to prevent infiltration from surface runoff.
6. U-shaped flow channels shall be required in all manholes, connecting the inverts of the upstream and downstream pipe sections. For pipes less than 15-inches in diameter, the height of the channel shall be one-half of the pipe diameter. For pipes 15-inches in diameter or larger, the height of the channel shall be three-fourths of the pipe diameter.
7. Manholes shall have a minimum drop of 0.2-feet across the manhole.
8. Where manholes are designed to collect flows from two or more incoming lines, the design "in" inverts shall be set to keep the largest incoming line lower in the manhole than the other incoming lines. The other, smaller incoming line(s) shall enter the manhole a minimum of 0.1-feet higher than the invert of the largest line. Maximum inside drop from upstream invert to downstream invert shall be 18-inches.
9. Drop manholes shall be avoided wherever possible. Where there are no available alternatives, outside drop manholes shall be required where the invert of the upstream pipe section entering the manhole is greater than 18-inches above the invert of the downstream pipe exiting the manhole. Drop manholes shall be constructed per Standard Sewer Detail No. 2 and 3.
10. Service connections directly to manholes are not permitted.

C. Materials. The following criteria shall apply:

1. All manholes shall be constructed of pre-cast concrete barrels and bases unless otherwise approved by the District. If approved, cast-in-place manhole bases shall extend a minimum of 8-inches below the pipe invert and the overall outside base dimensions shall be 16-inches greater than the inside diameter of the manhole barrel section. The base shall be constructed of pre-mixed concrete having a minimum 28-day compressive strength of 3,000 psi.
2. All manhole structures shall be of adequate strength to support AASHTO HS-20 highway loadings.
3. Manholes that must be located within the 100-year floodplain, or in a location where runoff may accumulate and pond, shall be installed with a watertight, bolting-type cover to prevent infiltration. The manhole ring shall be bolted to the manhole cone to prevent possible damage due to run off.
4. Manholes shall be in accordance with Technical Specification 02540: Precast Concrete Manholes and Vaults.

3.2.5 Service Lines

Service lines shall be a minimum of 4-inches in diameter and shall be placed in accordance with the minimum and maximum slope information provided previously in this section. The service line shall be joined to the sewer main with a wye fitting or an approved saddle permanently connected above the spring line of the sewer main. See Standard Sewer Detail No. 11 for further requirements on service line connections.

Service lines shall not enter at manholes.

Separate service lines shall serve each building capable of future individual ownership. Condominium or townhome service line configurations will be approved on an individual basis. Sewer service lines shall be installed per the latest version of the Uniform Plumbing Code.

Service lines are to be installed only in cases where served lots are known and likely building locations designated. Services to future locations that cannot be identified closely enough to guarantee their use by the property owner will not be installed.

Cleanouts, in accordance with Standard Sewer Detail No. 12, shall be installed on all service lines at the property line.

3.2.6 Lift Stations & Force Mains

The District will only accept lift stations and force mains after all gravity alternatives have been exhausted. If a lift station is necessary, it shall be designed in accordance with the most recent version of CDPHE regulations for Wastewater Pumping Stations (Policy

96-1) and these Codes & Standards. Concurrent with District review of the design, the Developer's Engineer shall submit the design to CDPHE for approval and shall be responsible for completing the required Site Application process. In addition to the requirements of CDPHE Policy 96-1, all lift stations shall meet the requirements of Standard Sewer Detail No. 20 and shall include the following:

- A. Control panel which provides for:
 - 1. Automatic alternator for lead-lag operation
 - 2. Automatic reset
 - 3. Hour meter for each pump motor
 - 4. Low voltage protection relays
 - 5. Running overload and high level lights
 - 6. HOA switch for each pump
- B. Basket strainers that are easily accessible.
- C. Mercury bulb float switches
- D. Auxiliary heaters and insulation in the dry well
- E. Separate check and gate valves for each pump
- F. Dry well sump pump or drain outlet
- G. Epoxy paint coatings inside and outside for all metal surfaces
- H. Remote-switched blower ventilation system

Minimum size of force mains shall be four (4) inches. Pipe shall be sized to maintain velocities between 2 and 6 feet per second. Force mains should be installed at a positive grade to a manhole where a gravity sewer line begins. Where positive grades cannot be maintained, air and vacuum release valves must be installed at all relative high points in the line. Minimum depth for force mains shall be four feet.

Valves on force mains shall be installed per Standard Sewer Detail Nos. 14 and 15 and shall meet the requirements of the following specification sections:

- Technical Specification 15200 – Valves, General
- Technical Specification 15203 – Check Valves
- Technical Specification 15206 – Gate Valves
- Technical Specification 15207 – Plug Valves
- Technical Specification 15230 – Miscellaneous Valves

Pressure cleanouts on force mains shall be installed per Standard Sewer Detail No. 13.

Thrust blocks on force mains shall be installed per Standard Sewer Detail Nos. 16 and 17.

3.2.7 Grease Interceptors

To prevent grease buildup in the wastewater collection system, grease interceptors shall be installed as required by the District's Rules and Regulations. The grease interceptor design shall be shown on the sewer plans, along with design calculations, and shall be certified by a Professional Engineer licensed by the State of Colorado. Grease interceptors shall be designed per the applicable Plumbing Code used by the City of Durango or La Plata County, and the criteria listed below. If any conflicts arise between the various criteria, the more stringent criteria shall apply.

- A. Grease interceptors shall be installed and connected so that they shall be easily accessible for inspection, cleaning, and removal of the intercepted grease. The interceptor shall be located as close to the source as practical; however, it must be outside the facility served.
- B. The interceptor shall only collect waste from kitchen areas, i.e. no sanitary wastes.
- C. For eating establishments and restaurants of any size, the size of the interceptor shall be determined by the following formula:

$$TS = D \times GL \times HR/2 \times LF$$

where:

TS = total size of interceptor, in gallons

D = number of seats in dining room

GL = gallons of waste per meal (use 5 gallons/meal)

HR = number of hours restaurant is open

LF = loading factor

0.8 for active facility, or if open more than 8 hours/day

0.5 for light activity, or if open less than 8 hours/day

The minimum interceptor size shall be 750 gallons.

- D. For establishments other than restaurants, the size of the interceptor shall be determined by the following method:
 - 1. Determine the type of fixtures and the size of a dishwasher, if any, discharging into the interceptor.
 - 2. Determine the dishwasher flow rate and the flow rate of the single largest of all the sinks based on trap size. Using the following table, pick the highest gpm found for either the largest trap size or the dishwasher. This is the maximum probable flow rate into the interceptor.

<u>Drain Outlet or Fixture Trap size, inches</u>	<u>Max Flow, gallons per minute equivalent</u>
1-1/2	22.5
2	30
2-1/2	35
3	45
4	60
30 gallon or less dishwasher	15
50-gallon or less dishwasher	25
100-gallon or less dishwasher	40

3. Multiply the maximum probable flow rate by 30 to calculate the minimum interceptor size in gallons. Pick the standard size with a capacity equal to or larger than the calculated size.
4. A minimum size should be chosen based on the size of the establishment as follows:
 - For small shops, such as pizza parlors, meat markets, or other similar establishments: 750-gallon capacity.
 - For larger size establishments, such as regular supermarkets: 1,000-gallon capacity.
 - For very large supermarkets and other similar establishments: 1,500-gallon capacity.
- E. See Standard Sewer Detail No. 18 for additional grease interceptor design requirements.
- F. Grease interceptors shall be cleaned when 50% of the wetted height contains grease or every 6 months whichever comes first.

3.2.8 Sand & Oil Interceptors

To prevent petroleum-based waste, sand, and gravel from entering the treatment system, sand and oil interceptors shall be installed as required by the District's Rules and Regulations. The sand and oil interceptor design shall be shown on the sewer plans, along with design calculations, and shall be certified by a Professional Engineer licensed by the State of Colorado. Sand and oil interceptors shall be designed per the applicable Plumbing Code used by the City of Durango or La Plata County, and the criteria listed below. If any conflicts arise between the various criteria, the more stringent criteria shall apply.

- A. Sand and oil interceptors shall be installed and connected so that they shall be easily accessible for inspection, cleaning, and removal of the intercepted oil. The interceptor shall be located as close to the source as practical; however, it must be outside the facility served.
- B. The interceptor shall only collect waste from washdown areas, i.e. no sanitary wastes.
- C. Vehicle Servicing. When a sand and oil separator is installed in an automobile, truck, bus, or tractor garage, in a service station, or in a repair shop with facilities for motor or transmission overhauling, it must have a minimum static water depth of 24-inches below the invert of the separator outlet and a minimum static water capacity of 6 cubic feet. This applies to facilities where not more than three vehicles are serviced. For each additional vehicle up to and including 10, one cubic foot of static capacity shall be added. For each vehicle over ten, an additional 0.25 cubic foot shall be added.
- D. Vehicle Storage. In motor vehicle storage facilities, a combination separator-drain shall be installed with a static water level of 1 gallon for every 100 square feet of area to be drained.
- E. Vehicle Storage and Servicing. Where motor vehicles are serviced and stored, a sand and oil separator shall be installed with a static water capacity of 1 cubic foot for every 100 square feet of area to be drained. The interceptor shall have a minimum capacity of 6 cubic feet.
- F. Mechanical Car Washing. In facilities designed especially for mechanical washing of motor vehicles, a sand and oil interceptor shall be installed to receive the water from all washing facilities. A minimum static water level of 2.5 feet and a minimum static water capacity of 50 cubic feet shall be maintained.

Where motor cleaning services are rendered at mechanical car washing facilities, a sand and oil separator shall be installed in that section of the drainage system which receives water from this operation.
- G. Manual Car Washing. In a one-car washing facility, a combination separator-drain shall be installed with a minimum static water capacity of 30-gallons.
- H. See Standard Sewer Detail No. 19 for additional sand and oil interceptor design criteria.

3.2.9 Interceptor Maintenance Agreement

An Interceptor Maintenance Agreement is required for all grease, sand, and oil interceptors before they are brought on-line. This agreement establishes recommended cleaning frequencies and requires the Owner of the facility to send the District copies of receipts

from the interceptor cleaning company in order to provide evidence of regular interceptor maintenance.

3.3 INSTALLATION

3.3.1 General

The Contractor shall verify measurements and dimensions of the work, as an integral step of starting each installation. Where installations include manufactured products, the Contractor shall comply with the manufacturer's applicable instructions and recommendations for installation, to whatever extent the manufacturer recommendations are more explicit or stringent than applicable requirements in these Codes & Standards.

If required, dewatering shall be in accordance with Technical Specification 02140: Dewatering.

All excavation, trenching, and backfilling shall be in accordance with Technical Specification 02200: Earthwork.

3.3.2 Storage & Handling

The Contractor will be responsible for the safe storage and protection of all materials delivered to the work site. Any damaged materials shall be repaired or replaced at the Contractor's expense. All materials shall be handled with equipment and methods adequate to prevent shock or damage and in accordance with any applicable industry standards.

3.3.3 Acceptance Testing

Testing for sewer system installations shall be in accordance with Technical Specification 02622: Pipeline and Manhole Testing.

3.3.4 Materials

A. Sewer Pipe

1. Check for proper pipe. Should be factory-stamped "SDR-35 ASTM 3034"
2. Check for cracks at both ends – reject if necessary.
3. Check for dents or blemishes - discoloration indicates problems.
4. Check for sun exposure damage - discoloration indicates problems.
5. Check that rubber gaskets in bell ends are not weathered or cracked and are still black and pliable.

6. Should be new and cleaned out.

B. Manholes

1. Concrete Condition
 - Check for cracked or chipped concrete – patch if necessary
2. Poured inverts:
 - Must have long radius bends running continuously from inlet to outlet resulting from the use of a special invert form.
 - No short radius bends especially for deflections of more than 45°
 - Check for cracked concrete – patch if necessary
3. Steps
 - Check that steps are well installed and line up with the orientation of the manhole so that when assembled the steps align with the eccentric edge of the cone and/or opening for the rim and cover, and not over the channel but the shelf to allow one to step off onto the shelf at the bottom easily
4. Grade Rings
 - Check to make sure that when assembled the manhole will not require more than 18" of grade rings above the top of the cone or reducing slab (for shallow flat top manholes) to reach finished grade
5. Rim and Cover
 - Make sure they are labeled with "SEWER" and are durable cast iron with adequate lifting or opening slots or eyes
6. PSX Boots or A-Lock
 - Both acceptable
 - If A-Lock, don't grout outside because don't want to lose flexibility

C. Pipe Zone Bedding Material

1. Ideal material is 3/4" minus A.B.C. (aggregate base course) or CDOT Class 6 material (same thing).
2. Contractor may try to substitute some cheaper material, which may be O.K but must be approved on a case by case basis. In general the material must have:
 - No rocks bigger than 3/4-inch in diameter
 - If using a gravelly material such as screened or washed rock or pea gravel (something without finer graded material mixed in), then we need filter fabric on top of pipe zone to prevent fines from the trench zone material above from filtering down into the gravel resulting in a settling trench.

- Sand, Crusher Fines, or other fine grained material shall be carefully evaluated to insure that it has a low clay content and is well graded (several different sizes of particles) and is high in sand content.
3. Proctor Test on Material - All material used shall have a proctor taken by a geotechnical testing lab (a proctor tells how dense a particular material can get i.e. in general terms a 100-percent proctor density is the most dense or compact a material can get). Without a proctor no relative compaction testing can be done. The important thing about a proctor and compaction testing is that the materials are homogeneous and consistent in characteristics. If the material changes, i.e. it looks different, or it performs different, a new proctor should be taken for the different material.

D. Trench Zone Bedding Material

1. Depends if there is a road above or open land
2. If road, then should be backfilled with 3" minus A.B.C. or smaller gradation A.B.C. (aggregate base course - road base material).
3. If open land, then can be back filled with "suitable" native material - "suitable" meaning not top soil or organic material or thick wet clay but material that is well graded and has some structural stability.
 - No rocks bigger than 12-inch in diameter if compaction equipment can accommodate 18" lifts. Basically largest rock size shall be 6" less than the back fill lift thickness the contractor's equipment can accommodate (check with engineer to confirm equipment's capabilities)
4. Proctor Test on Material - same as described above in 3.3.4, C-3.

3.3.5 Excavation

- A. Cut trench starting from the downstream end and proceeding upstream, (opposite the direction of flow).
- B. Excavate trench to the flow line grade plus 5" minimum, and to the bottom of manhole grade plus 12" minimum.
- C. Get all large rocks out to create smooth even trench bottom.
- D. Over-excavate soft spots or non-suitable material and replace with 3/4" minus A.B.C. compacted to 95% modified proctor density according to ASTM D 1557.
- E. If groundwater is encountered, the work should stop and the contractor must submit a dewatering plan for approval by the District Engineer.

3.3.6 Bedding Below Pipe

- A. Minimum of 4-inches of pipe zone bedding below pipe.
- B. Compact to 95% modified proctor density according to ASTM D 1557
- C. Compaction testing may be required at the inspector's discretion, if it is suspected that the compaction effort is not achieving the desired density.

3.3.7 Pipe Laying

- A. Lay pipe from downstream to upstream with pipe bells pointed upstream.
- B. Slope per drawings (ideally use laser device to set pipe grade and to monitor grade as the pipe is being installed, bedded, and compaction is completed).
- C. Smooth, continuous bedding under pipes (no air gaps). This requires the contractor to hand dig small depressions to accommodate the bells at each joint as the pipe is being laid.
- D. Full pipe lengths should be used wherever possible to minimize the number of joints and the potential for leaks.
- E. A No. 12 copper wire shall be attached to all PVC force main pipe for the purpose of future location in accordance with the Standard Details and specifications. Warning tape shall be installed above all PVC gravity pipe at a depth of 18-inches below finished grade to provide adequate warning of a buried utility to persons performing excavation activities.
- F. Make sure joints are not driven home completely....but close! – joints should be assembled so that as the spigot end of the pipe is being inserted into the bell, the black line on the plain end should just disappear from view. This gives a narrow gap on the inside of the pipe, while still allowing for a flexible joint. If the joint is "driven home" so that the end of the spigot makes direct contact with the taper of the bell, the joint will have limited flexibility and no thermal expansion room.
- G. Check for minimum cover requirements. From top of pipe to finish grade must be a minimum of 3-feet.
- H. Photos should be taken at this stage to show pipe and bedding.

3.3.8 Service Connections

- A. Both service saddles and full pipe "wye" fittings are acceptable. Contractor shall submit method and product information at the pre-construction conference.

- B. The service connections shall be assembled so that the opening into the main is located above spring line at approximately 2 or 10 o'clock.
- C. All sewer service lines shall be a minimum 4" in diameter, and laid at a minimum slope of 1%.
- D. All fittings used shall be long radius bends not exceeding 45-degrees in deflection angle, and not all glue fittings (gasketed fittings shall be installed at regular intervals to allow for flexibility).
- E. The District takes no responsibility for service lines beyond the main line including any service saddle or pipe or fittings beyond the full pipe "wye" fitting.

3.3.9 Bedding on Sides of Pipe

- A. Bring pipe zone bedding up to a couple of inches above centerline (springline) of pipe.
- B. Prevent dirt from entering end of pipe or at service line wyes.
- C. Watch carefully, as this procedure will tend to lift the pipe and bring it off of the desired design grade. Ballast material or other methods may be used to hold the pipe down, e.g. put piles of pipe zone bedding material on the nearby joints.
- D. Hand haunch the back fill material with a bar or shovel handle to fill all air voids around and under the pipe.
- E. Hand compact both sides of the pipe with "jumping jack" type compaction equipment to ensure pipe is well-bedded at "springline" on both sides.
- F. Compact to 93% modified proctor density according to ASTM D 1557
- G. Compaction testing may be required as quality assurance dictates (inspectors discretion, as you suspect the compaction effort is not getting the desired density).
- H. Re-check grade after pipe is bedded

3.3.10 Bedding to 12-inches Above Pipe

- A. Bring pipe zone bedding up to 12-inches above pipe
- B. Compact to 95% modified proctor density according to ASTM D 1557
- C. Compaction testing may be required as quality assurance dictates (inspectors discretion, as you suspect the compaction effort is not getting the desired density).

- D. Lay filter fabric material as may be required.

3.3.11 Trench Zone Backfilling

- A. A six inch (6") wide warning tape shall be installed above all gravity pipe at approximately 18-inches below finished grade to indicate the location of the buried pipeline.
- B. Bring to within 12" of the top of the trench (or as directed by the development plan requirements) using trench zone material.
- C. Compact in 18-inch or less lifts
- D. Compact to 93% modified proctor density according to ASTM D 1557
- E. Test compaction every 400 feet of trench, and at each branch or section of trench less than 400 feet. Testing shall be performed at the top of the trench zone and at the mid depth of the trench zone when the trench zone thickness exceeds four feet. Additional testing may be required as quality assurance dictates (inspectors discretion)

3.3.12 Surface Zone Backfilling

- A. Trench shall be surfaced according to development plans and specifications.
- B. In open areas or areas that will be left undeveloped, the surface zone of the trench (top 12" of the trench depth) shall backfilled with the trench zone material and all large rocks above 6" diameter shall be removed.
- C. Compact to 93% modified proctor density according to ASTM D 1557.

3.3.13 Manhole Installation

- A. Compact native material below manhole to 95% modified proctor density according to ASTM D 1557
- B. Place a minimum 12" thick layer of 3/4" A.B.C. material as a leveling course compacted to 95% modified proctor density according to ASTM D 1557.
- C. Test compaction only as quality assurance dictates (inspectors discretion)
- D. Set base section level, oriented or rotated according to plan, and to the design grades using laser device and other methods as required.
- E. Assemble manhole sections as per manufactures recommendations and to meet District Standard Sewer Details. Watch step placement as described above.

- F. Pipes shall be inserted into manhole and grouted in place so as to match the invert of the pipe with the invert of the concrete trough of the manhole within a tolerance of 1/8" (no humps or jumps). Shimming the pipe inside the manhole to accomplish this grade is not allowed, as shims are often left in the grout and affect the grout integrity. The pipe shall be blocked from the outside of the manhole only, until the pipe is securely grouted on the inside as per District standards and specs.

3.3.14 Acceptance Testing

- A. Acceptance Testing shall be in accordance with Specification 02622.
- B. Test after trench is backfilled but before permanent resurfacing is placed.
- C. Plug service lines or don't connect them until after testing
- D. Air Pressure Test to test sewer lines for leaks
- E. Check for rock points, leaks, alignment, deflections, etc.
- F. Lamp Test and Mandrel Test to test sewer lines for deflection (pipes shall be cleaned immediately before Lamp and Mandrel tests)
- G. CCTV inspection at the end of construction and the end of the warranty period (pipes shall be cleaned immediately before CCTV inspection)
- H. Optional water-testing of manholes at Inspector's discretion – see Specification 02622.

**APPENDIX A
RULES & REGULATIONS**

- 2000-4: A Resolution to Sewer Use Resolution 95-4 Concerning Payment of Monthly User Fees
- 2000-3: A Resolution to Sewer Use Resolution 95-4 Pertaining to Late Payment Penalties and Interest on Fees and Charges
- 1998-3: A Resolution to Sewer Use Resolution 95-4 Concerning Service Lines
- 1996-3: A Resolution to Sewer Use Resolution 95-4 Amending ERT Schedule for Automobile Dealerships
- 1995-4: South Durango Sanitation District Sewer Use Resolution
- Section 1 - Definitions
 - Section 2 – Ownership and Operation of District Facilities
 - Section 3 – Unlawful Acts: Connection Required
 - Section 4 – Private Sewage Disposal Systems
 - Section 5 – Sewer Connection Permits and Requirements
 - Section 6 – Discharge Regulations and Limitations
 - Section 7 – Inspection Required: Enforcement
 - Section 8 – Sewer Main Extensions
 - Section 9 – Plant Investment Fee Schedule
 - Section 10 – User Fees
 - Exhibit “A” – ERT Schedule
- 1986-1: South Durango Sanitation District Sewer Use Resolution

SOUTH DURANGO SANITATION DISTRICT SEWER USE RESOLUTION NO. 95- 4

THIS RESOLUTION is adopted pursuant to the statutes of the State of Colorado for the purpose of establishing rules, regulations and fees pertaining to the South Durango Sanitation District sewage collection and treatment system.

WHEREAS, the South Durango Sanitation District is a political subdivision of the State of Colorado authorized pursuant to the Special District Act, Section 32-1-101 C.R.S., *et seq.* and is authorized to provide sanitation services in the South Durango area; and

WHEREAS, the Board of Directors of the South Durango Sanitation District has determined that a comprehensive sewer use resolution governing the operations and functions of the District is desirable; and

WHEREAS, the Board of Directors of the District has further determined that an equitable rate structure for plant investment fees (tap fees) and monthly user charges, based on the actual costs for treating commercial and residential sewage, is desirable; and

WHEREAS, the nature of the District's sewage treatment facility indicates that the system will function best if the system is not used to treat industrial type wastes and, it is the intent of the District to exclude the burden of industrial type wastes from sewage to be treated by the District facilities.

WHEREAS, this Resolution shall supersede any previous resolution, rules and regulations of the District which are in conflict with the provisions hereof.

NOW, THEREFORE, BE IT RESOLVED THAT THE FOLLOWING SOUTH DURANGO SANITATION DISTRICT SEWER USE RESOLUTION BE ADOPTED:

Section 1. DEFINITIONS

Unless the context specifically indicates otherwise, the meaning of terms used in this Resolution shall be as follows:

- 1.1 BOARD and
BOARD OF
DIRECTORS: The governing body of the South Durango Sanitation District.
- 1.2 BOD (Biochemical
Oxygen Demand): The quantity of oxygen utilized in the chemical oxidation of organic matter under standard laboratory procedure in five (5) days at twenty degrees centigrade (20°C), expressed in milligrams per liter (mg/l).

- 1.3 **BUILDING DRAIN:** That part of the lowest horizontal piping of a drainage system which receives the discharge from waste and other drainage inside the walls of the building and conveys it from the building five feet outside the outer face of the building wall.
- 1.4 **COMBINED SEWER:** A sewer receiving both surface or storm water and sewage. (Prohibited in the South Durango Sanitation District.)
- 1.5 **DISTRICT:** The South Durango Sanitation District, acting through the authority of its Board of Directors and its authorized representatives.
- 1.6 **EQUIVALENT RESIDENTIAL TAP or ERT:** That sewage flow originating from any single family home, mobile home, condominium, townhouse, dwelling unit, or other unit based on 250 ~~g~~ ²²⁵ gallons per day flow, a five day average BOD of 200 ppm and 250 ppm total suspend solids. ₂₅₀
- 1.7 **FLOATABLE OIL:** Oil, fat or grease in a physical state such that it will separate by gravity from wastewater by treatment in an approved pretreatment facility. A wastewater shall be considered free of floatable fat if it is properly pretreated and does not interfere with the collection system.
- 1.8 **GARBAGE:** Solid wastes from the domestic and commercial preparation, cooking and dispensing of food, and from the handling, storage and sale of produce.
- 1.9 **INFILTRATION:** Any material such as surface waters, ground waters or storm waters entering service lines or public sewers which is not sewage.
- 1.10 **INDUSTRIAL WASTE:** The liquid wastes from industrial manufacturing processes, trade or business as distinct from sanitary sewage.
- 1.11 **NATURAL OUTLET:** Any outlet into a watercourse, pond, ditch, lake or other body of surface or ground water.
- 1.12 **OFFICIAL NOTICE:** Notice which shall be in writing issued by authority of the Board of Directors, directed to the owner (or owner's agent) of the property as shown on the records of the County Assessor, mailed to the address shown on the records of the County Assessor by certified mail, return receipt requested, and such notice shall be deemed to have been given as of the date of mailing.

- 1.13 PERSON:** Any individual, firm, company, association, society, corporation, group or trust or other entity.
- 1.14 pH:** The logarithm of the reciprocal of the weight of hydrogen ions in grams per liter of solution.
- 1.15 PLANT INVESTMENT FEE or PIF:** The fee required to be paid to the District as a proportionate share of the capital cost of the District's facilities sometimes called a tap fee.
- 1.16 PROPERLY SHREDDED GARBAGE:** The wastes from the preparation, cooking, garbage, and dispensing of food that have been shredded to such a degree that all particles will be carried freely under the flow conditions normally prevailing in public sewers, with no particle greater than one-half inch (1.12 centimeters) in any dimension.
- 1.17 PUBLIC SEWER or SEWER MAIN:** Any sewer which is owned and maintained by the District.
- 1.18 SANITARY SEWER:** A sewer which carries sewage and to which storm, surface and ground waters are not admitted intentionally.
- 1.19 SERVICE LINE:** The extension from the building drain to the public sewer or other place of disposal and shall include lines serving more than one unit which have not been accepted by the District such as collection lines in mobile home parks, townhouse or condominium projects or similar multi-unit situations.
- 1.20 SEWAGE (WASTEWATER):** A combination of the liquid and water carried wastes from residences, business buildings, institutions and industrial establishments.
- 1.21 SEWAGE TREATMENT PLANT:** Any arrangement of devices and structures used for treating sewage also called the "Wastewater Treatment Plant or "WWTP".
- 1.22 SEWAGE WORKS:** All facilities for collecting, pumping, treating and disposing of sewage.
- 1.23 SEWER:** A pipe or conduit for carrying sewage.
- 1.24 SHALL, MAY:** Shall is mandatory; May is permissive.

- 1.25 STORM DRAIN: A pipe or conduit which carries storm and surface waters and drainage, but excludes sewage and industrial wastes, other than unpolluted cooling water.
- 1.26 SUSPENDED SOLIDS: Solids that either float on the surface of, or are in suspension in water, sewage, or other liquid and which are removable by laboratory filtering.
- 1.27 USER FEES: A monthly service fee paid to the District for a proportionate share of the operation and maintenance expenses of the District's facilities including depreciation.
- 1.28 WATERCOURSE: A channel in which a flow of water occurs, either continuously or intermittently.

Section 2. OWNERSHIP AND OPERATION DISTRICT FACILITIES

2.1 General Statement of Policy. The District was created for the purpose of providing sanitation service to property in the South Durango and Grandview areas. In order to achieve that goal, the District assumes responsibility for the operation and maintenance of the sewage works in accordance with this Resolution however, the District assumes no liability or responsibility for inadequate treatment or interruption of service due to circumstances beyond the Districts control.

2.2 Liability. The District shall not be liable for any claims or damages arising from clogging in the system causing backup of ~~effluent~~ ^{effluent}, breakage of lines from injuries to persons or property growing out of the maintenance or operation of the sewage works or from interruption of service, unless such damages are the results from negligent or willful acts of the District, its employees and agents. Although the District will inspect service lines, it assumes no responsibility for the negligent design, installation or operation of service lines. The District does not waive the defenses or immunity from claims arising under the Governmental Immunity Act of the State of Colorado. *

2.3 Ownership. All public sewers (sewer mains) shall become and are the property of the District. District ownership shall be valid without any conveyance required. The connection of a public sewer to the District's system shall automatically transfer ownership to the District regardless of the party who constructed or paid for installation. All service lines, whether presently existing or connected in the future, shall become and are the property of the owner who receives service from such line.

2.4 Agents of the District. Any duly authorized representative of the District, including it's manager, engineer, attorney or other employee or subcontractor, is authorized to ~~to~~ ^{en}force the provisions of this Resolution and to the extent necessary to enter upon public and private property for the purpose of inspection, observation, sampling and testing. *

Section 3. UNLAWFUL ACTS; CONNECTION REQUIRED

3.1 Deposits of Wastes. It shall be unlawful for any persons to place, deposit, or permit to be deposited in any unsanitary manner on public or private property within the jurisdiction of the District any human excrement, garbage or other objectionable waste.

3.2 Unlawful Discharge. It shall be unlawful to discharge to any natural outlet within the jurisdiction of the District any sewage or other polluted water except where suitable treatment has been provided in accordance with the provisions of this Resolution.

3.3 Private systems prohibited. Except as provided in Section 4, it shall be unlawful to construct or maintain within the District any privy, privy vault, septic tank, cesspool, or other facility intended or used for the disposal of sewage.

3.4 Connection required. The owner(s) of all houses, buildings or properties used for human occupancy, employment, recreation or other purposes, situated within the District and abutting on any street, alley or right-of-way in which there is now located or may in the future be located a public sanitary sewer of the District, is hereby required at the owner(s) expense to install suitable toilet facilities therein, and whenever necessary for the protection of public health, to connect such facilities directly with the proper public sewer in accordance with the provisions of this Resolution within thirty (30) days after the date of official notice to do so, provided that said public sewer is within four hundred feet (400') of the premises. Failure to comply with this paragraph is an unlawful act and, in addition to any other remedies the District may have, the District may connect the premises to the public sewer and assess the cost to the owner in accordance with C.R.S. 32-1-1006(l)(a).

Section 4. PRIVATE SEWAGE DISPOSAL SYSTEMS

4.1 Connection to approved private system. Where a public sewer or sewer main is not available under the provisions of subsection 3.4 of this Resolution the building sewer shall be connected to a private sewage disposal system complying with the provisions of this Resolution and in accordance with the rules and regulations of and approved by the San Juan Basin Health Unit.

4.2 Abandonment of private systems. At such time as a public sewer becomes available requiring connection pursuant to subsection 3.4 of this Resolution, all septic tanks, cesspools, and similar private sewage disposal facilities shall be abandoned and filled with suitable material, in accordance with all state and local ordinances, rules and regulations.

Section 5. SEWER CONNECTION PERMITS AND REQUIREMENTS

5.1 Unauthorized connection. No unauthorized person shall uncover, make any connection with or opening into, use, alter or disturb any public sewer or appurtenance thereof without first obtaining a written permit from the District.

 Sewer Tap Application ?

5.2 Inclusion of property required. Except as provided in Subsection 5.3, sewer service shall be provided only to property which is legally included within the District. Persons desiring sewer service whose property is not located within the boundaries of the District shall make application for inclusion and pay all legal fees and publication costs for the proceedings.

5.3 Service by contract. The District may agree, by written contract, to provide sewer service to property not within the boundaries of the District, but only in cases where inclusion of the property is not legally possible. In such cases, the agreement shall contain at a minimum provisions for collecting fees, rates, tolls and charges which are at least equal to those paid by users in the District and an agreement to comply with all the rules and regulations contained in this and any other resolutions of the District.

5.4 Application for service. Any person desiring sewer service shall make application on a permit application furnished by the District. The permit application shall be supplemented by any plans, specifications, or other information considered pertinent in the judgment of the District. The PIF as determined hereunder and a permit and inspection fee established by the District shall be paid to the District at the time of application.

5.5 Owner's responsibilities for service line. All costs and expenses incident to the installation and connection of the service line shall be borne by the owner. The owner shall indemnify the District from any loss or damage that may directly or indirectly be occasioned by the installation, operation or maintenance of the service line.


5.6 Shared service lines. A separate and independent service line shall be provided for each lot or parcel. The District shall have no maintenance responsibility for any service line, including shared service lines. More than one building or unit may be connected to the service line provided it is of adequate size to serve all connections. The portion of the line which serves more than one building or unit shall be known as a "shared service line". In the event the lot or parcel is later subdivided, each new lot or parcel shall have a separate service line. * See Resolution 98-3

5.7 Existing service lines. Old service lines may be used in connection with new buildings only when they are found, on examination and/or testing by the District, to meet all requirements of this Section.

5.8 Service line specifications. The size, slope, alignment, materials of construction of a service line, and the methods to be used in excavating, placing of the pipe, jointing, testing and backfilling the trench, shall all conform to the requirements of the District's specifications and the state plumbing code.

5.9 Private lift stations. Whenever possible, the service line shall be brought to the building at an elevation below the basement floor. In all buildings in which any building drain is too low to permit gravity flow to the public sewer, sanitary sewage carried by such building drain shall be lifted by an approved means and discharged to the service line, at no expense to the District.

5.10 Connections prohibited. No person shall make connections of roof down spouts, interior or exterior foundation drains, areaway drains, floor drains or other sources of surface runoff or groundwater to a service line which in turn is connected directly or indirectly to a public sanitary sewer. All clean water drain connections are specifically prohibited.

5.11 Inspection of service lines. The applicant for sewer service shall notify the District when the building sewer is ready for inspection and connection to the public sewer. The connection shall be made under the supervision of the District, at the expense of the applicant.  ?

5.12 Safety and restoration required. All excavations for service line installation shall be adequately guarded with barricades and lights so as to protect the public from hazard. Streets, sidewalks, parkways, paving cuts and other public property disturbed in the course of the work shall be restored in a manner satisfactory to the District and other governmental entities.

5.13 Extension of sewer mains. Any person who (1) does not have access to sewer main service of the District within 400' of his premises during initial construction or petitions for inclusion to the District; and (2) requires sewer main extension for service, shall be required to extend the sewer main of the District to his property in accordance with Section 8.

Section 6. DISCHARGE REGULATIONS AND LIMITATIONS

6.1 Clean water and industrial process water prohibited. No person shall discharge or cause to be discharged any storm water, surface water, groundwater, roof runoff, subsurface drainage including interior and exterior foundation drains or industrial process waters to any sanitary sewer of the District.

6.2 Prohibited sewage. No person shall discharge or cause to be discharged any of the following described waters or wastes to any public sewers, which is hereinafter called "prohibited sewage":

6.2.1. Any gasoline, oil, benzene, naphtha, fuel or other flammable or explosive liquid, solid or gas.

6.2.2. Any waters or wastes containing radioactive, toxic or poisonous solids, liquids or gases in sufficient quantity, either singly or by interaction with other wastes, to injure or interfere with any sewage treatment process, to constitute a hazard to humans or animals, to create a public nuisance, or to create any hazard in the collection system of the sewage treatment plant.

6.2.3. Any waters or wastes having a pH lower than 5.5 or higher than 9.5, or having any other corrosive property capable of causing damage or hazard to structures, equipment and personnel of the sewage works.

6.2.4. Solid or viscous substances in quantities or of such size capable of causing obstruction to the flow in sewers or other interference with the proper operation of the sewage works such as, but not limited to, ashes, cinders, sand, mud, straw, shavings, metal, glass, rags,

feathers, tar, plastics, wood, whey, buttermilk, carcasses or hides of dead animals or fowl, whole blood, paunch manure, hair, entrails, paper dishes or cups, milk containers and similar items either whole or ground.

6.3 District right to prohibit discharge of special sewage. No person shall discharge or cause to be discharged the following described substances, materials, water, or wastes (hereinafter called "special sewage") if it appears likely in the opinion of the District that such special sewage can harm either the sewers, sewage treatment process, or equipment, have an adverse effect on the receiving stream, or can otherwise endanger life, limb, public property or constitute a nuisance. In forming its opinion as to the acceptability of special sewage, the District will give consideration to such factors as the quantities of subject wastes in relation to flows and velocities in the sewers, materials of construction of the sewers, nature of the sewage treatment process, capacity of the sewage treatment plant, degree of treatability of wastes in the sewage treatment plant, and other pertinent factors. The substances prohibited are:

6.3.1. Any liquid or vapor having a temperature higher than one hundred fifty degrees Fahrenheit (150°F or 65°C).

6.3.2. Any water or wastes containing fats, wax, grease or oils whether mulsified or not, in excess of one hundred (100) mg/l.

6.3.3. Any garbage that has not been properly shredded.

*- Require kitchens to
dump scraps in
trash not sinks?*

6.3.4. Any radioactive wastes or isotopes of such half-life or concentration as may exceed limits established by the District in compliance with applicable State or Federal regulations.

6.3.5. Waters or wastes containing substances which are not amenable to treatment or reduction by the sewage treatment processes employed, or are amenable to treatment only to such degree that the sewage treatment plant effluent cannot meet the requirements of other agencies having jurisdiction over discharge to the receiving waters.

6.3.6. Any waters or wastes having:

(a) A five (5) day BOD greater than three hundred (300) parts per million by weight, or

(b) Containing more than three hundred (300) parts per million by weight of suspended solids, or

(c) An average daily flow greater than two percent (2%) of the average sewage flow of the District, shall be subject to the review of and approval for discharge by the District.

6.4 Procedures for special sewage. If any special sewage is discharged, or is proposed to be discharged to the public sewers, which in the judgment of the District may have a deleterious effect upon the sewage works, processes, equipment, or receiving waters, or which otherwise create a hazard to life to constitute a public nuisance, the District may:

- (a) Reject the wastes;
- (b) Require preliminary treatment to an acceptable condition before discharge to the public sewers (see subsection 6.5);
- (c) Require control over the quantities and rates of discharge; and/or;
- (d) Require payment to cover the added cost of handling and treating the wastes not covered by existing taxes or sewer charges.

If the District permits the pretreatment or equalization of waste flows, the design and installation of the plants and equipment shall be subject to the review and approval of the District, and subject to the requirements of all applicable codes, ordinances and laws. Where preliminary treatment or flow-equalizing facilities are provided for any special sewage, they shall be maintained continuously in satisfactory and effective operation by the owner at the owner's expense.

6.5 Preliminary treatment. Where necessary in the opinion of the District, the owner shall provide at his expense, such preliminary treatment as may be necessary to:

- (a) Reduce the biochemical oxygen demand to three hundred (300) parts per million by weight, or
- (b) Reduce the suspended solids to three hundred (300) parts per million by weight, or
- (c) Control the quantities and rates of discharge of such waters or wastes.

Plans, specifications and any other pertinent information relating to proposed preliminary treatment facilities shall be submitted for the approval of the District and no construction of such facilities shall be commenced until said approvals are obtained in writing.

6.6 Interceptors required. Grease, oil, and/or sand interceptors shall be provided by the owner at the owner's expense when, in the opinion of the District, they are necessary for the proper handling of liquid wastes containing grease in excessive amounts, or any flammable wastes, sand, or other harmful ingredients; except that such interceptors shall not be required for private living quarters or dwelling units. All establishments where food is prepared for sale, including restaurants, carry-out facilities, butcher shops and similar establishments, shall install and maintain a grease interceptor. All interceptors shall be of a type and capacity approved by the District, and shall be located as to be readily and easily accessible for cleaning and inspection.

6.7 Observation manholes. When required by the District, the owner of any property serviced by a service line carrying special sewage requiring pretreatment shall install a suitable control manhole together with such necessary meters and other appurtenances in the service line to facilitate observation,

sampling, and measurement of the wastes. Such manhole, when required, shall be accessible and safely located, and shall be constructed in accordance with plans approved by the District. The manhole shall be installed by the owner at the owner's expense, and shall be maintained by the owner so as to be safe and accessible at all times.

Section 7. INSPECTION REQUIRED; ENFORCEMENT

7.1 Inspection permitted. The District or its representatives shall have the authority at any time to inspect any portion of the facilities of the District and of the building drains and sewers connected to those facilities.

7.2 Inspection of service lines. At such time as a service line has been prepared for connection to the District's sewer mains, a representative of the District shall be empowered to make a visual inspection of said connection. The inspection will consist of a visual assurance that excessive infiltration and inflow are not present in the service line and that the connection has been made in accordance with District's specifications. No service line shall be backfilled without said inspection and approval.

7.3 Excess infiltration. At any time that reasonable evidence exists that infiltration or type of flow from a building sewer has changed to the detriment of the District or exceeds permitted levels, the District's representative may cause to be uncovered or inspected said service line in order to determine the magnitude of such changes. Repairs ordered by the District to a service line will be at the cost of the person or individual owning that building sewer.

7.4 Interference with sewage works. The District shall have the power to enforce all provisions of this Resolution. In addition, the District shall have the power to prevent any interference or obstruction of the District's sewage works. This shall include, but not limited to, malicious mischief, illegal connections, improper discharge to system, unauthorized lifting of manhole lids, trespass on the sewage treatment site and other similar acts.

7.5 Abandonment of service lines. Whenever a service line is abandoned or temporarily disconnected, the owner of the property served by such line shall properly excavate and cap the service line so as to prevent any infiltration to the public sewer. No capped service line shall be backfilled without the inspection and approval by the District.

7.6 Enforcement. The District shall have the power to enforce all provisions of this Resolution by action for damages, or injunction, or by criminal prosecution in any court of competent jurisdiction. The District shall also have the right, after reasonable notice, to enter the property of any person to make necessary repairs, connections or disconnections of service lines and related facilities, at the expense of the owner. Unpaid monies due to the District are a perpetual lien on the property served or subject to the charge and are the personal liability of the owners of such property until paid. Such monies may be collected by an action to foreclose the lien, for money, damages or in any other method provided by law. In all enforcement and collection matters, the owner or person responsible shall pay all costs incurred by the District including reasonable attorneys fees.

Section 8. SEWER MAIN EXTENSIONS

8.1 Approval required. No sewer main shall be constructed within the boundaries of the District, or connected to the existing facilities of the District without written approval from the Board. All

sewer mains shall be constructed in accordance with District specifications then in effect.

8.2 Costs of extensions. Except when the District determines that an extension would be in the best interest of the District, all public sewer extensions shall be constructed at the sole expense of the developer, owner or person requesting such extension. In addition to the actual construction costs, the owner, developer or person requesting the extension shall pay all expenses incurred by the District in connection with the extension including all District engineering fees for the design, review and testing of the extension, all legal expenses incurred by the District in preparing, reviewing, approving and enforcing the extension agreement and all testing expenses.

8.3 Required submittal. For approval of any extension the following documents and information must be submitted for review:

- (a) A copy of the proposed or final plat for any subdivision;
- (b) Drawings and specifications for all sewer lines, manholes, lift stations and related equipment prepared and certified by a registered engineer;
- (c) Construction and performance bond equal to 100% of the construction cost of the proposed extension; and
- (d) Easements, deeds, title reports and other evidence to demonstrate that sufficient easements for the extension exist.
- (e) Any other information deemed necessary for complete review by the District.

*Match
wording
or
revise
here*

After approval of the proposed extension, the District will enter into an agreement authorizing the extension in accordance with this resolution.

8.4 Acceptance of extensions. After construction and prior to acceptance for maintenance of any extension and prior to permitting any connection of service lines to the extension, the following must be submitted and approved by the Board:

- (a) As-built drawings and profile maps of the sewer extension stamped or certified by a registered engineer.
- (b) Drawings and specifications for lift stations, if any.
- (c) Deeds for all new easements and bill of sale or other documents of conveyance for all lines and other facilities.

8.5 Compensation for oversized facilities. No person extending the public sewer shall be entitled to any reimbursement or other compensation from adjoining land owners who connect to the extension, except when the District requires over sizing of the facilities in order to serve future development. In those cases where over sizing is required, the District will enter into a recovery agreement allowing the person financing the extension to recover a portion of the additional costs resulting from the over sizing of the facility.

Section 9. PLANT INVESTMENT FEE SCHEDULE

9.1 Equivalent Residential Taps. It shall be required of all persons using (or desiring to use as explained below) the facilities of the South Durango Sanitation District sewage works that a proportionate share of the capital investment in the cost of the District facilities be paid known as the Plant Investment Fee (PIF) or tap fee. For the purposes of determining the proportion of total flow any user contributes to the system an Equivalent Residential Tap(ERT) unit is established. An ERT shall be the average sewage flow in terms of both quantity and strength originating from any single family home, mobile home, condominium, townhouse or dwelling unit. From that ERT definition, the schedule for calculating the ERTs for various uses is adopted and attached as Exhibit "A". This schedule is based upon Colorado Department of Health Guidelines for per capita flow and the District engineer's recommendations concerning loading for the types of uses shown, derived generally, but not exclusively, from a 250 gallons per ERT sewage flow, a five (5) day average BOD of 200 ppm and 250 ppm total suspended solids. ²²⁵ ₂₅₀

9.2 Plant Investment Fees. Prior to connection of any service line to the District's facilities a plant investment fee shall be paid in full. The amount of the plant investment fee shall be determined by multiplying the total ERT's from the owner's application (see Subsection 9.1) by the current rate established for each ERT. The District reserves the right to periodically adjust the rate for the purpose of providing sufficient funds for repair, expansion and replacement of the District's facilities.

9.3 Transferability. PIF's shall be purchased for a specific property and specific land use and will be non-transferable to another property. PIF's shall be automatically transferred to successive owners of the same property.

9.4 Expanded use. If any owner at any time expands the ERT use on his property beyond that stated in the PIF Application and Permit for which the owner paid the District, such owner shall apply, pay for and obtain a further Permit for such additional ERTs and pay an additional PIF. Such further PIF payment shall be at the rate in effect as of the date of application or date of actual use, whichever is higher, and shall be due as of the date of first use and shall bear interest from date of first use until paid at 12% per annum.

9.5 Relinquishment of PIFs. Whenever any person desires to permanently abandoned PIFs (or any portion thereof) this person shall execute and submit to the District a relinquishment form. The form will specify the address and description of the property, the number of ERTs being abandoned and shall contain an acknowledgment by the owner that relinquishment constitutes a full and complete surrender of all rights and privileges for the ERTs. Any future sewer use on the property shall require new application and payment of all PIFs, permit fees and related expenses. Upon acceptance of the relinquishment by the District, the PIFs shall be relinquished and no further user charges for the relinquished PIFs shall be assessed.

Section 10. USER FEES

10.1 Service charge. ^{* See Resolution 2000-4} Any person connected to the District System shall pay a monthly service fee regardless of whether the building sewer in question is being utilized, unless a seasonal rate has been permitted. Payment will be required for unoccupied dwellings, businesses shut down or temporarily idle, vacant mobile home spaces and all other unused connections. Failure to pay said service charge within 90 days will be grounds for revocation of the privilege to utilize the sewer system of the District

and all PIF's paid will be subject to forfeiture.

10.2 Rates. The District shall establish a monthly service charge per ERT. The amount of such charge may be changed periodically by resolution of the Board. The District further reserves the right to require installation of a water meter and a metered rate for any user.

10.3 Billing.* The District shall bill all users on a monthly basis. All bills shall be payable by the 10th of the month. All charges shall bear interest at 12% per annum from date due until paid. Any charge not paid within 30 days of billing date shall also have a 10% penalty added automatically.

* See Resolution 2000-3

10.4 Expanded use. From and after the date any owner expands the ERT use on property already served by sewer connection (see subsection 9.4), the owner shall to pay the District the service charge for the total ERT available to be served through the sewer connection with interest at 12% per annum from the date of first use.

10.5 Surcharge. The District will assess a surcharge rate for all non-residential users reasonably suspected of discharging wastes having a flow or BOD or TSS concentration greater than that represented by the number of ERT's purchased by that user. The District may compel any sewer user to install sealed water meters on all user's water sources at user's expense to meter flows for the purpose of enacting a surcharge. The surcharge rates shall be as follows:

(a) For a flow in excess of 250 gallons per day per ERT a surcharge of \$1.50 per 1,000 gallons of excess per month shall be charged.

(b) For BOD or TSS, a surcharge of \$1.00 per 1,000 gallons per month shall be charged for each 50 ppm in excess of 250 ppm.

10.6 Collection.* Any payment due to the District shall be a perpetual lien on the property to which the charge applies and shall be the personal responsibility of all owners of the property until paid. Delinquent amounts may be collected by civil suit and/or foreclosure of the lien against the property and against the owners. * See Resolution 2000-3

DONE AND ADOPTED at Durango, Colorado, this 3rd day of August, 1995.

SOUTH DURANGO
SANITATION DISTRICT

(S E A L)

By
President

ATTEST:

Secretary

**SOUTH DURANGO SANITATION DISTRICT
ERT SCHEDULE**

	DESCRIPTION	ERTS
(1)	Single family residential including townhomes, condominiums, mobile homes & ADUs	1 ERT/unit
	Single family residential including townhomes, condominiums, mobile homes & ADUs less than 700 sf	.75 ERT/unit
	Single family residential including townhomes, condominiums, mobile homes & ADUs less than 400 sf	.5 ERT/unit
	Multi-family residential (apartments)	1 ERT/unit
	Multi-family units of less than 700 sf	.75 ERT/unit
(2)	Hotels and motels	
	No restaurants or kitchens (.4 X number of rooms)	.4 ERT/room
	With kitchenettes not rented for a period in excess of two weeks	.55 ERT/room
	With restaurants	See below
	With non-public laundry	add .2 ERT/room
(3)	Restaurants and bar	
	Food service	
	Open 12 hours or less/day	.1 ERT/seat
	Open more than 12 hours/day	.2 ERT/seat
	Bar only	.05 ERT/seat
(4)	Schools and day care centers	To be determined
(5)	Service stations	
	No wash rack or maintenance bay	1 ERT
	With wash rack or maintenance bay (add 1.0/rack)	1 ERT/rack or bay
	Public sanitary dump station; automated car wash	to be negotiated

(6)	Shopping centers and stores	.35 ERT/1,000 sq. ft.
(7)	Travel trailer/camper park/transient	
	Full hookups	.4 ERT/space
	No sewer hookups, central showers	.1 ERT/space
	Non-public sanitary dump station	2 ERT/station
(8)	Laundry - coin operated or public including common facilities in apts	.5 ERT/wash mach.
(9)	Car wash	1ERT/bay
	Automated car wash	To be determined
(10)	Warehouses and offices	.35ERT/1,000 sq. ft.
(11)	Theaters (Drive In)	.02 ERT/space
(12)	Beauty and barber shops	.25ERT/wash station
(13)	Carry-out restaurant	To be determined
(14)	Butcher shops and locker plants	established by District
(15)	Churches	1 ERT
	with eating/banquet facilities	add .5 ERT
(16)	Automobile Dealership	.3 ERT/1,000 sq. ft.
	Includes wash bays for use by dealership. Public car washes will require additional ERTs	

The foregoing table shall serve as a **general guide** for establishing an ERT for a commercial use. When other data is available to determine actual flows, the District will analyze such information and establish an ERT which accurately represents the anticipated flows for a particular use. Any type of use not specifically listed shall not be permitted unless authorized by the District following a review of all pertinent information.

When determining the ERT number for any use, the following general guidelines will apply:

1. All persons desiring to obtain or required to obtain sewage treatment from the District shall make application for service on forms provided by the District. Failure to accurately describe the proposed use or furnish any requested information shall be cause for denial or suspension of service.
2. All users shall be charged a minimum of 1 ERT.
3. Seasonal use rates, for commercial establishments only, may be permitted by the District when non-use exceeds three months.
4. Whenever interpretation of the above table or data provided by an applicant for service could result in different ERTs, the higher ERT shall be charged.

From Sewer Use Resolution 95-4 with amendments approved by Board of Directors

RESOLUTION NO. 98- 3

A RESOLUTION AMENDING RESOLUTION NO. 95-4 CONCERNING SERVICE LINES

WHEREAS, the District has previously adopted a comprehensive Sewer Use Resolution, Resolution No. 95-4; and

WHEREAS, the Board of Directors has reviewed the requirements for shared service lines and determined that an amendment of the requirements for shared service lines would be in the best interest of the District and its customers.

NOW THEREFORE, BE IT RESOLVED AS FOLLOWS:

1. That Section 5.6 of Resolution No. 95-4 is hereby amended to read as follows:

5.6 Shared service lines. A separate and independent service line shall be provided for each lot or parcel. The District shall have no maintenance responsibility for any service line, including shared service lines. More than one building or unit may be connected to the service line provided it is of adequate size to serve all connections. The portion of the line which serves more than one building or unit shall be known as a "shared service line". In the event the lot or parcel is later subdivided, each new lot or parcel shall have a separate service line.

2. That this amendment shall not in any way affect or alter the responsibility of the Owner to install and maintain service lines. Shared service lines shall not be considered a public sewer or sewer main.

ADOPTED this 15th day of January, 1998

SOUTH DURANGO SANITATION
DISTRICT

By_____

RESOLUTION NO. 96- 3

A RESOLUTION AMENDING THE SOUTH DURANGO SANITATION DISTRICT'S SEWER USE RESOLUTION.

WHEREAS, the South Durango Sanitation District has adopted a comprehensive Sewer Use Resolution, Resolution No. 95-____; and

WHEREAS, the Sewer Use Resolution establishes an ERT schedule for various property uses within the District; and

WHEREAS, an application has been made for a sewer tap for a large automobile dealership for which the District has no specific ERT schedule; and

WHEREAS, the District's engineer and the Board of Directors have reviewed water use information on automobile dealerships to determine an appropriate ERT for such facilities.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE SOUTH DURANGO SANITATION DISTRICT, LA PLATA COUNTY, COLORADO:

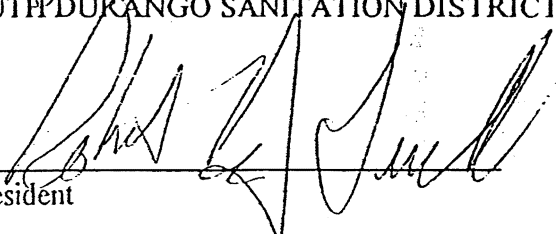
1. That the ERT schedule attached to the Sewer Use Resolution as Exhibit "A" is hereby amended with the addition of the following:

(16) Automobile Dealerships

.3 ERT per 1,000 square feet of covered floor space (Includes wash bays for use by the dealership. Public car washes will require additional ERTs)

ADOPTED this 11 day of July, 1996.

SOUTH DURANGO SANITATION DISTRICT

By 
President

ATTEST:

Cheryl Bellino
Secretary

RESOLUTION NO. 2000-3

A RESOLUTION AMENDING THE SOUTH DURANGO SANITATION DISTRICT SEWER USE RESOLUTION PERTAINING TO LATE PAYMENT PENALTIES AND INTEREST ON FEES AND CHARGES

WHEREAS, the Board of Directors of the South Durango Sanitation District (District) has previously adopted Resolution No. 95-4 establishing rules, regulations and fees for the District; and

WHEREAS, the State of Colorado has enacted new statutory provisions regulating delinquency charges by local governments at C.R.S. 29-1-1101 and 1102; and

WHEREAS, the Board of Directors of the District has determined that certain changes are necessary in its billing regulations in order to conform with statutory requirements.

NOW THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE SOUTH DURANGO SANITATION DISTRICT:

1. That Section 10.3 of the District's Sewer Use Resolution, Resolution No. 95-4, shall be amended to read as follows:

10.3 Billing. The District shall bill all users on a monthly basis. All bills shall be payable by the 20th of the month. Any charge not paid within 30 days of the billing date shall be charged a delinquency fee equal to 10% of the amount of the monthly charge or \$15.00, whichever is less. The District reserves the right to require installation of a water meter and establish a metered rate for sewer use.

2. Section 10.6 of Sewer Use Resolution No. 95-4 shall be amended to read as follows:

10.6 Collection. Any payment due to the District shall be a perpetual lien on the property to which the charge applies and shall be the personal responsibility of all owners of the property until paid. All delinquent amounts except monthly user fees shall bear interest at the rate of 1% per month until paid. Delinquent amounts may be collected by civil suit and/or foreclosure of the lien against the property and the owners. District shall be

entitled to collect all reasonable costs of collection, including court costs and reasonable attorney fees.

3. These changes shall be effective January 1, 2000.

ADOPTED this ____ day of January, 2000.

SOUTH DURANGO SANITATION DISTRICT

ATTEST:

Marshall A. Moreland
Secretary

By H. Charles Blake
Chairman

2000-4
RESOLUTION NO. 99-2000-4

A RESOLUTION OF THE SOUTH DURANGO SANITATION DISTRICT AMENDING SEWER USE RESOLUTION NO. 95-4 CONCERNING PAYMENT OF MONTHLY USER FEES

WHEREAS, the South Durango Sanitation District (District) has adopted Sewer Use Resolution No. 95-4 establishing rules, regulations and fees pertaining to the South Durango Sanitation District sewage collection and treatment system; and

WHEREAS, the District has historically commenced charges for sewer service in the month following payment of a Plant Investment Fee; and

WHEREAS, the existing Sewer Use Resolution requires clarification concerning when such fee shall be charged.

NOW THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE SOUTH DURANGO SANITATION DISTRICT:

1. Paragraph 10.1 Service Charge of the District's Sewer Use Resolution No. 95-4 is amended to read as follows:

10.1 Service Charge. Commencing on the billing date for the month following payment of a Plant Investment Fee, a monthly user fee shall be paid for each ERT. The monthly user fee shall be charged regardless of whether the connection has been made or whether the building sewer is being utilized, unless a seasonal rate has been permitted. Payment will be required for unoccupied dwellings, businesses shut down or temporarily idle, vacant mobile home spaces, and all other permitted ERTs. Failure to pay said user fee within 90 days will be grounds for revocation of the privilege to utilize the sewer system of the District and all PIFs paid will be subject to forfeiture.

2. The foregoing amendment shall be effective immediately.

ADOPTED this 20 day of January, 1999 2000
(MM)

SOUTH DURANGO SANITATION DISTRICT

ATTEST:

Marshall Mordand
Secretary

By H. Christy Blake
Chairman

**APPENDIX B
CHECKLISTS**

1. Project Initiation Checklist
2. Plan Submittal Checklist
3. Design Phase Checklist
4. Pre-Construction Conference Checklist
5. Construction Phase Checklist
6. Final Acceptance Checklist
7. Warranty Period Checklist

PROJECT INITIATION CHECKLIST**(Y = Yes N = No NA = Not Applicable)****PROJECT NAME:** _____

_____ Pre-Submittal Meeting Held

_____ Codes & Standards provided

_____ Project File Opened

_____ Application for Service Form Completed Properly and Submitted along with Preliminary Project Plans and Specifications and Property Deed

_____ Project Concept Approved by the District Board and Owner notified in writing

_____ Project Concept Denied by the District Board and Owner notified in writing

_____ Reimbursement Agreement Required

_____ Reimbursement Agreement Signed

_____ If RA required, Plan Review Retainer Submitted

PLAN SUBMITTAL CHECKLIST

(Y = Yes N = No NA = Not Applicable)

PROJECT NAME: _____**General** (Show the following items on every sheet)

- _____ Title Block (lower right-hand corner preferred)
- _____ Scale (both horizontal and vertical for plans and profiles)
- _____ Date and Revision
- _____ Name of Professional Engineer or Firm
- _____ Professional Engineer's seal and signature
- _____ Drawing Number

Cover Sheet

- _____ Project Name
- _____ Vicinity Map
- _____ Drawing Index
- _____ General Notes
- _____ Statement:

"All work shall be constructed to South Durango Sanitation District Codes & Standards. This plan set has been reviewed and found to be in general compliance with these Codes and Standards and other District requirements. The Engineering Design and Concept remains the responsibility of the Professional Engineer whose stamp and signature appear hereon.

Accepted by: _____ " "
District Engineer Date

- _____ Variance Statement (if necessary):

"The applicant is requesting a variance from the South Durango Sanitation District Codes & Standards for the following:

1. (list all applicable items)

Accepted by: _____ “
District Engineer Date

Plan Sheets

- _____ North arrow (oriented to top or right of the drawing)
- _____ Property lines
- _____ Ownership or subdivision information
- _____ Street names and easements with width dimensions
- _____ Location and depth of existing buried utility lines
- _____ Location and elevation of benchmarks. Where feasible, use the most recent City of Durango NAD 83 aerial datum with scaling factors provided by the District.
- _____ Site topography at 2-foot interval contours.
- _____ Significant physical features such as creeks, drainage facilities, railroads, and irrigation ditches that might influence the location of underground utilities.
- _____ 100-Year Flood Plain Limits
- _____ Supporting Data including calculations, Design Summaries, surveys, and geotechnical information.
- _____ Show all easements, right-of-ways, and property lines in the construction zone.
- _____ Location and legal descriptions of easements to be provided.
- _____ Locations of right-of-way lines
- _____ Indicate the type, size, and ownership of all existing utilities in easements or rights-of-way in which the proposed infrastructure is to be constructed. Tie utilities and house connections to street or right-of-way line or property line.

Profile Sheets

- _____ Vertical and horizontal grids with scales
- _____ Ground surface, existing and proposed

- _____ Existing and proposed utility lines where crossed
- _____ Bench marks
- _____ Existing and proposed manholes with horizontal coordinates, inverts and rim elevations

Detail Sheets

- _____ Reference the Districts Standard Details, contained in this document by general note.

Sanitary Sewer

In addition to the general plan, profile, and details, all sanitary sewer construction plans shall include the following:

- _____ All sewer lines shall be shown in both plan and profile. The plan view shall be directly above the profile when feasible.
- _____ The plan view will show centerline of sewer mains and service lines with ties, stationing matching profile, bearing and distance of proposed alignment, manhole coordinates, angles of deflection, distance from property lines and/or right-of-way lines, and other pertinent data to depict the horizontal location of the line(s).
- _____ The profile view will show distance between manholes, stationing, proposed line grade, pipe type, pipe size, existing ground surface, other buried utilities to be crossed and other pertinent data to depict the vertical location of the line(s).
- _____ Sewer lines and manholes shall be located in the center of a driving lane.
- _____ Show manhole elevations (rim, surface, invert in, invert out)
- _____ Manhole numbers shall conform to the District's numbering system.
- _____ Proposed future extensions
- _____ Proposed service connections or stub-ins
- _____ Proposed concrete encasements
- _____ Methods of construction for tie-ins to the existing system
- _____ Horizontal and vertical utility separation criteria met or mitigation provided
- _____ Detailed drawings of lift stations, if any

DESIGN PHASE CHECKLIST**(Y = Yes N = No NA = Not Applicable)****PROJECT NAME:** _____

- _____ Plans meet Plan Submittal Requirements
- _____ Plans in accordance with District Design Criteria
- _____ Plans in accordance with District Technical Specifications
- _____ Plans in accordance with District Technical Details
- _____ Supporting data submitted
- _____ Other agency comments submitted
- _____ Plats and rights-of-way to be dedicated fully signed and recorded by the County and copies of these documents submitted to the District
- _____ Final Design accepted by the District
- _____ One complete master set of final drawings, stamped and signed by the Owner's Engineer, and stamped "Approved for Construction", presented to the District's Engineer for his signature in the District Signature Block.
- _____ 3 Copies of signed and stamped plan sets, and 3 copies of all bid/construction contract documentation and technical specifications, provided to the District.
- _____ Excess Plan Review Retainage refunded after final plans approved
- _____ 3 Copies of an itemized cost estimate for improvements to be dedicated to the District prepared by a registered professional engineer in the state of Colorado, provided to the District.
- _____ A Development Improvement Agreement executed and accepted by the District.

PRE-CONSTRUCTION CONFERENCE CHECKLIST**(Y = Yes N = No NA = Not Applicable)****PROJECT NAME:** _____

- _____ Names of all Conference Attendees recorded
- _____ Contact names and numbers exchanged
- _____ Review Project Schedule and determine frequency of schedule updates
- _____ Determine schedule for Progress Meetings
- _____ Identify any Submittals that may be required and submittal schedule and protocols
- _____ Identify any Traffic Control Plans that may be needed
- _____ Review Inspection Notification requirements and activities requiring inspection.
- _____ Review Construction Impact Mitigation Requirements
- _____ Discuss coordination with other contractors and regulatory agencies
- _____ Determine if construction easement agreements are properly executed
- _____ Review Contractor's proposed Safety Program
- _____ Establish Materials Testing requirements
- _____ Determine if all necessary Permits are in place
- _____ Determine if all necessary Insurance and Bonds are in order and receive copy of Insurance certificate listing District as an additional insured.
- _____ Discuss record drawings
- _____ Discuss critical work sequencing
- _____ Construction Inspection Retainer received
- _____ Final Plans, signed and stamped, received
- _____ Financial guarantee in place

PRE-CONSTRUCTION CONFERENCE CHECKLIST**(Y = Yes N = No NA = Not Applicable)****PROJECT NAME:** _____

- _____ Names of all Conference Attendees recorded
- _____ Contact names and numbers exchanged
- _____ Review Project Schedule and determine frequency of schedule updates
- _____ Determine schedule for Progress Meetings
- _____ Identify any Submittals that may be required and submittal schedule and protocols
- _____ Identify any Traffic Control Plans that may be needed
- _____ Review Inspection Notification requirements and activities requiring inspection.
- _____ Review Construction Impact Mitigation Requirements
- _____ Discuss coordination with other contractors and regulatory agencies
- _____ Determine if construction easement agreements are properly executed
- _____ Review Contractor's proposed Safety Program
- _____ Establish Materials Testing requirements
- _____ Determine if all necessary Permits are in place
- _____ Determine if all necessary Insurance and Bonds are in order and receive copy of Insurance certificate listing District as an additional insured.
- _____ Discuss record drawings
- _____ Discuss critical work sequencing
- _____ Construction Inspection Retainer received
- _____ Final Plans, signed and stamped, received
- _____ Financial guarantee in place

CONSTRUCTION PHASE CHECKLIST

(Y = Yes N = No NA = Not Applicable)

PROJECT NAME: _____

Pre-Construction

- _____ Project Schedule submitted
- _____ List of Contacts provided
- _____ Traffic Control Plan provided
- _____ Materials Testing Plan provided
- _____ Pre-Construction Conference held

Construction

- _____ 48-Hour Notification for all connections to District infrastructure
- _____ Shop Drawings and other submittals provided
- _____ Satisfactory mitigation of construction impacts

FINAL ACCEPTANCE CHECKLIST**(Y = Yes N = No NA = Not Applicable)****PROJECT NAME:** _____

Once the project construction phase is completed, final acceptance of the facilities by the District shall be in accordance with the requirements of the District's Codes and Standards Project Protocols Section 2.5 – Final Acceptance, and the following checklist.

When the developer considers the entire work ready for its intended use, the developer shall notify the District in writing that the entire work is substantially complete and request the District prepare an "Agreement for Dedication of Improvements" (ADI). This written request shall be accompanied by all required documentation and information outlined in this checklist. When the submittal is complete, the District will draft the ADI which will dedicate the improvements to the District, establish the date of substantial completion and move the project from the construction phase into the warranty phase.

Constructed per District standards and approved design drawings

- _____ All outstanding work or punch list items completed
- _____ Restoration of previous conditions including surface feature restoration completed
- _____ Final Inspection of all facilities completed by District Personnel
- _____ All acceptance testing completed and documents filed
 - _____ Air test
 - _____ Lamp test
 - _____ Mandrel test
 - _____ Pressure testing as necessary
 - _____ Manholes, vaults, valve boxes, etc. inspected – grouting, invert construction, surfacing and collars completed
 - _____ All specialty construction completed to meet design requirements and to District requirements; O & M manuals and product literature provided, operator training provided as required
- _____ Facilities cleaned and ready for use

Developer Submittals and Information

- _____ Lien waiver releases or bond to cover outstanding claims provided
- _____ Materials testing reports provided
- _____ Project photographs provided in digital form as have been required or requested during construction
- _____ Accurate, stamped, as-built plans provided with the following:

- A post construction survey shall be completed and plans revised to reflect the surveyed information
- Plans shall be stamped by a Colorado Registered Professional Engineer
- Plans shall depict all constructed facilities in both plan and profile
- Plans shall include background information such as major constructed facilities including roadways, buildings, drainage features, other major utilities, and most importantly all easements and right of ways to be dedicated to the district.
- Plans shall be provided in both paper and AutoCAD 2002 electronic format

_____ Final plats provided as an electronic overlay over the as-built plans

Financial Issues

_____ All Reimbursement agreement funds are reconciled and paid prior to the commencement of the warranty period

Legal and Administrative Issues

_____ The developer and the District have completed an “Agreement for Dedication of Improvements” (ADI). This agreement will:

- Establish the Date of Substantial completion
- Formally dedicate and accept the constructed facilities into the District
- Release the construction phase financial sureties established in the DIA
- Establish the warranty requirements and ensure a warranty surety is provided

WARRANTY PERIOD CHECKLIST

(Y = Yes N = No NA = Not Applicable)

PROJECT NAME: _____

_____ Warranty Punchlist Compiled

_____ Warranty Punchlist Completed

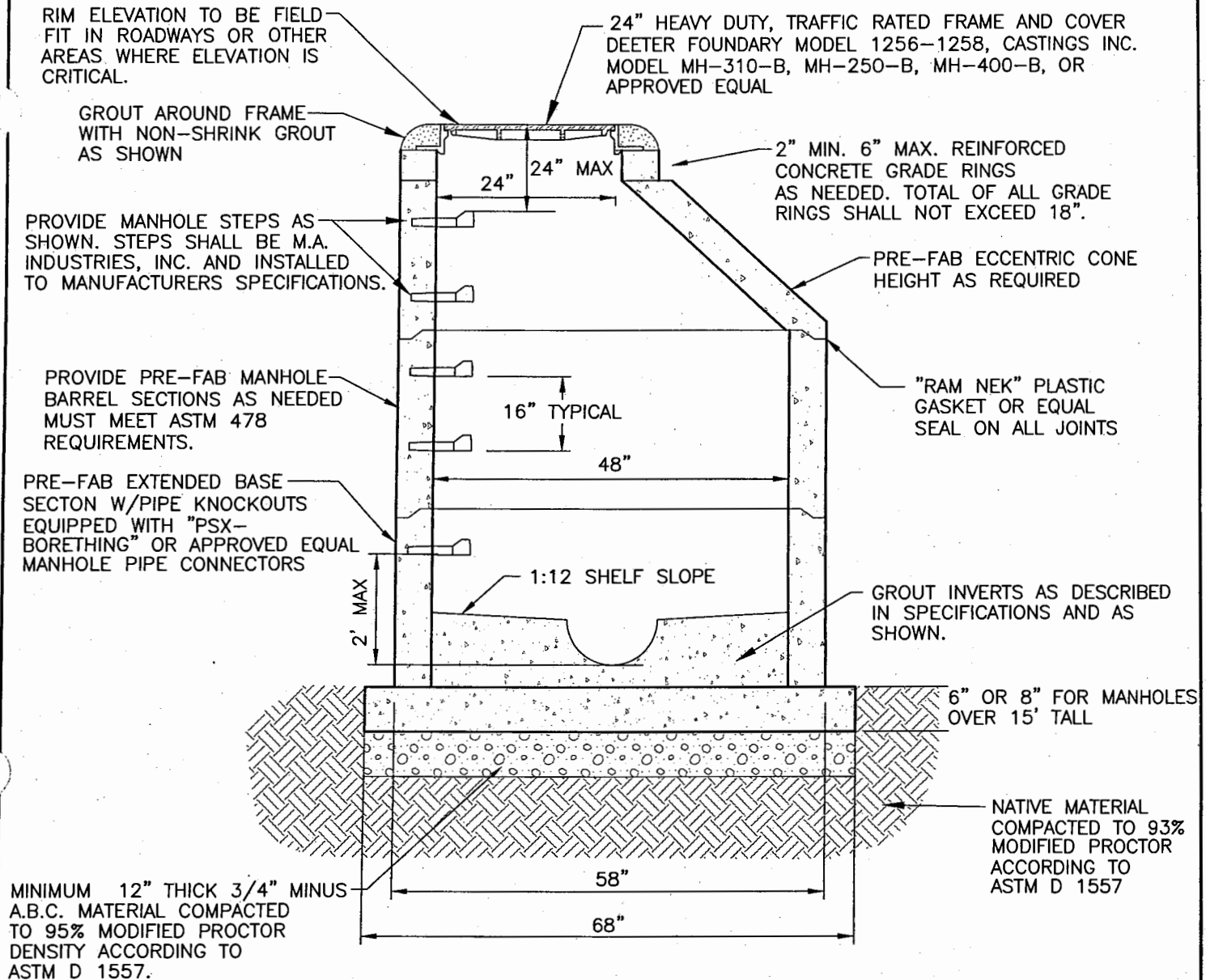
_____ Warranty CCTV Completed

_____ Final Financial Guarantee Refunded

_____ Project Completed

**APPENDIX C
STANDARD DETAILS****WASTEWATER SYSTEM**

1. Standard Sewer Manhole Detail
2. Drop Sewer Manhole Detail
3. Drop Sewer Connection Detail
4. Flat Top Manhole Detail
5. Cast in Place Manhole Base Detail
6. New Pipe Penetration Detail
7. Manhole Collar Detail
8. Typical Trench and Bedding Detail
9. Sewer Crossing and Encasement Detail
10. Pipe Casing Detail
11. Sewer Service Detail
12. Gravity Clean-Out Detail
13. Pressure Clean-Out Detail
14. Valve Box Detail
15. Valve Box Collar Detail
16. Thrust Block Detail - I
17. Thrust Block Detail - II
18. Grease Interceptor Detail
19. Sand and Oil Interceptor Detail
20. Lift Station Detail
21. Typical Access & Maintenance Road Detail



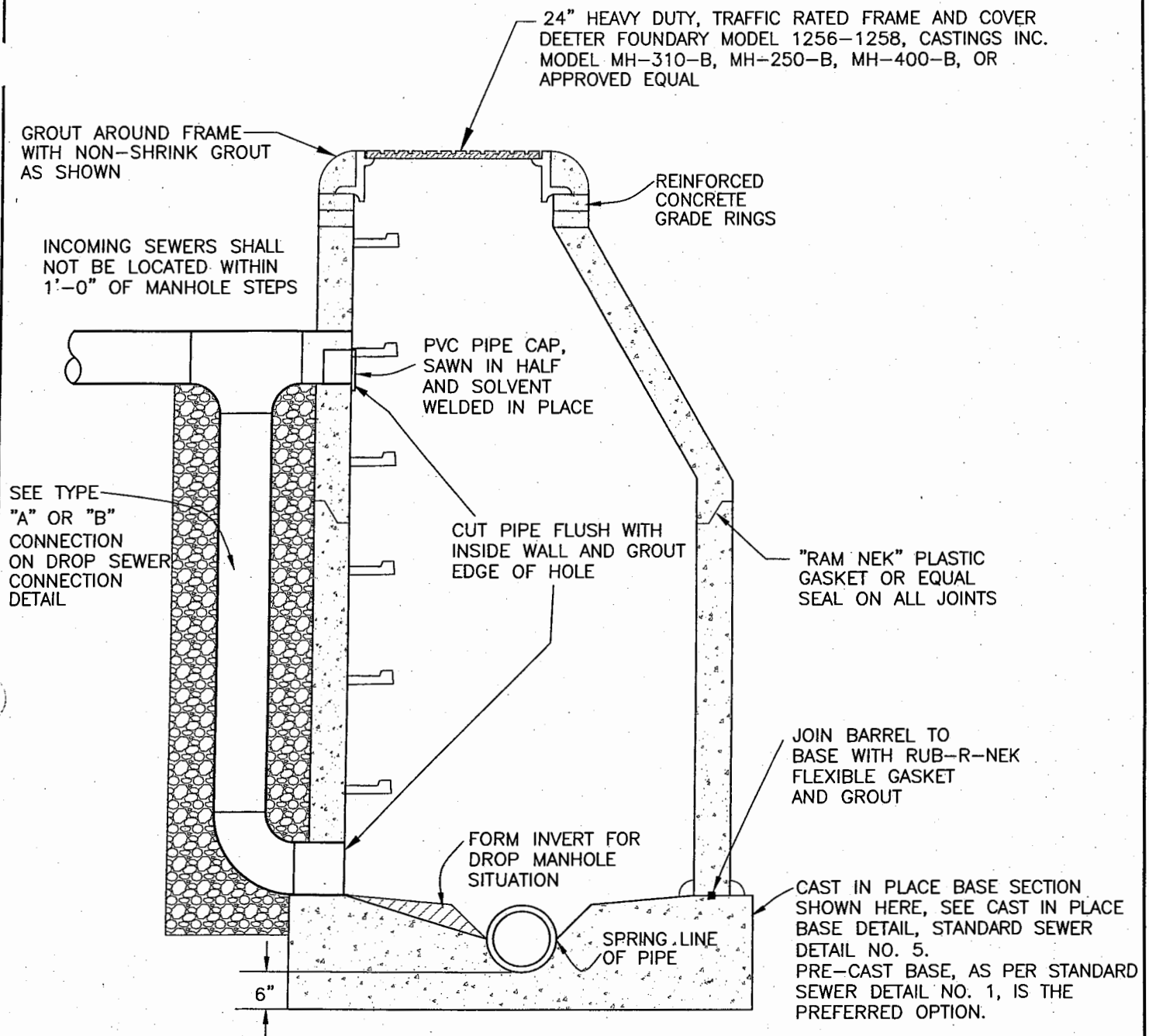
NOTES:

1. 4' MANHOLES SHALL BE USED FOR PIPES UP TO 21" DIAMETER.
2. 5' MANHOLES SHALL BE USED FOR PIPES FROM 24"-36" DIAMETER.
3. SPECIAL MANHOLES SHALL BE USED FOR PIPES LARGER THAN 36" DIAMETER.
4. MANHOLES LESS THAN OR EQUAL TO 5' FROM TOP OF CASTING TO INVERT SHALL HAVE FLAT TOPS WITH CONCENTRIC OPENING. ALL ADJUSTING RINGS, CASTINGS, INVERTS, BOTTOMS, ETC., SHALL BE SIMILAR TO SHOWN MANHOLE.
5. IF MANHOLE BASE SECTION IS TO BE PLACED ON NON-SUITABLE SOILS AS DESCRIBED IN THE SPECIFICATIONS, OR IN HIGH GROUNDWATER CONDITIONS, OR AT THE DISCRETION OF THE ENGINEER, OVER EXCAVATION MAY BE REQUIRED AS DESCRIBED IN THE SPECIFICATIONS

**SOUTH DURANGO
SANITATION DISTRICT**

**STANDARD SEWER DETAIL NO. 1
SEWER MANHOLE DETAIL**

DATE: 6/17/04 SCALE: N.T.S.
CAD FILE NAME: SEWER01.DWG



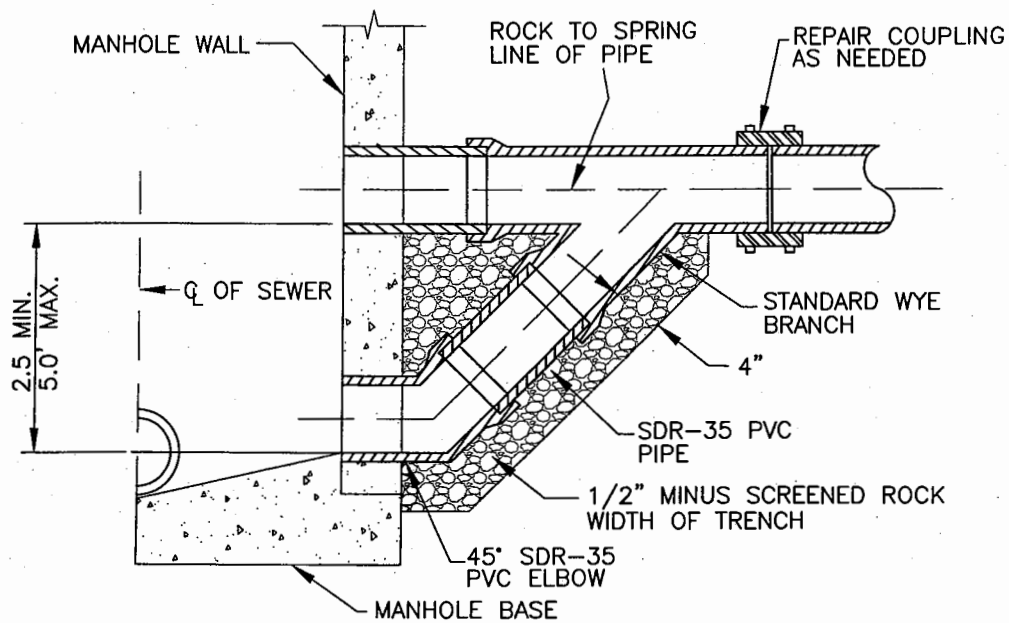
NOTES:

1. DROP MANHOLE SHALL BE PROVIDED WHERE SEWER ENTERS M.H. 18" OR MORE ABOVE LOWEST INVERT OF MANHOLE.
2. SEE NOTES ON STANDARD SEWER MANHOLE DETAIL.

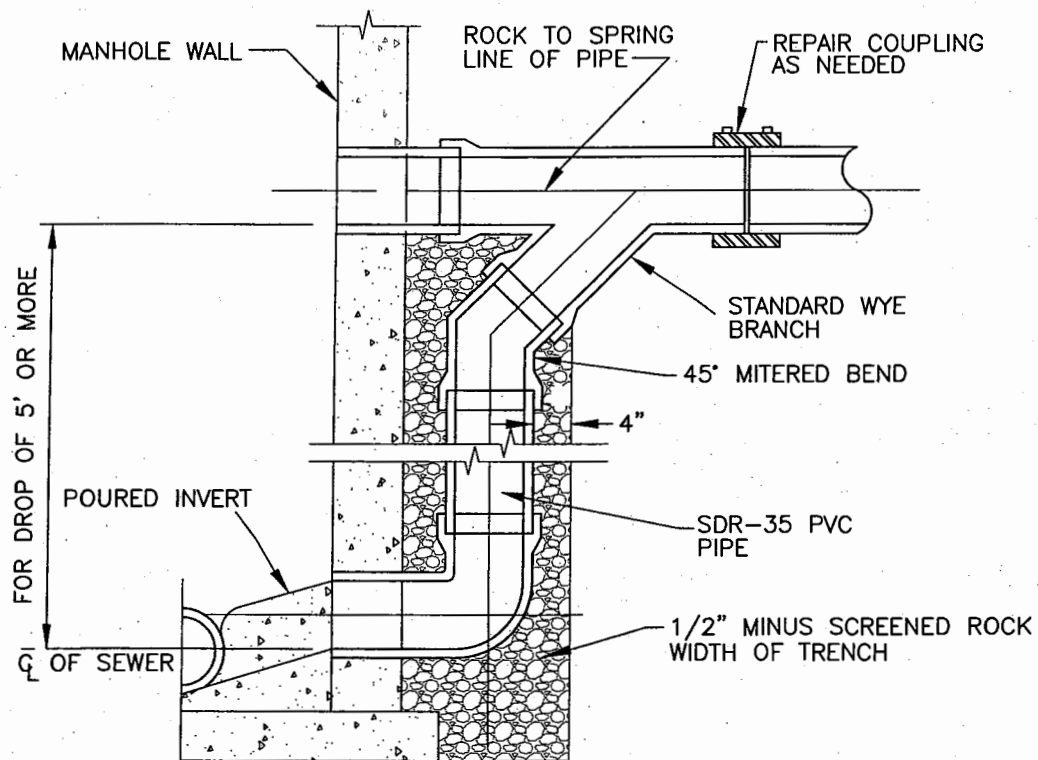
***SOUTH DURANGO
SANITATION DISTRICT***

**STANDARD SEWER DETAIL NO. 2
DROP SEWER MANHOLE DETAIL**

DATE: 6/17/04 SCALE: N.T.S.
CAD FILE NAME: SEWER02.DWG



TYPE 'A'
2.5' - 5' DROP

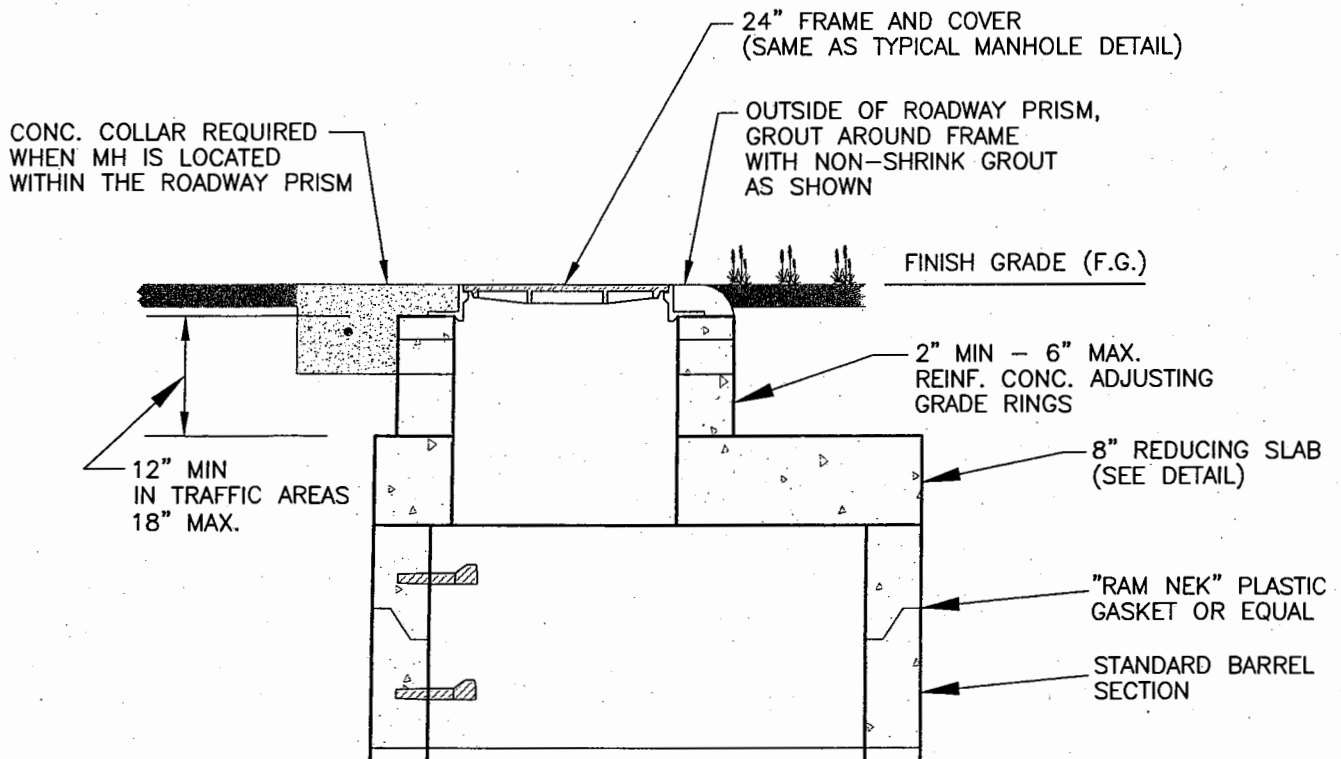


TYPE 'B'
DROP 5' OR MORE

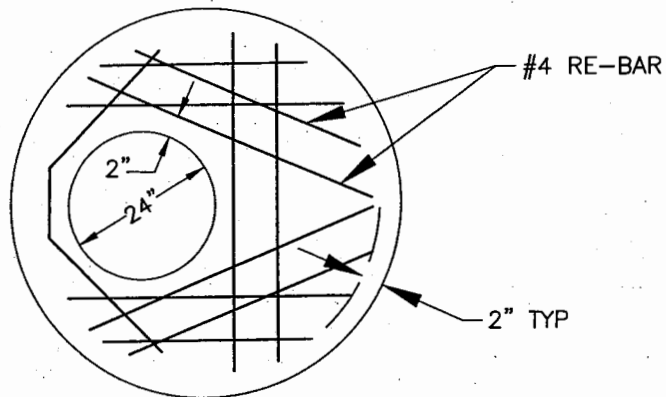
**SOUTH DURANGO
SANITATION DISTRICT**

STANDARD SEWER DETAIL NO. 3
DROP SEWER CONNECTION DETAIL

DATE: 6/17/04 SCALE: N.T.S.
CAD FILE NAME: SEWER03.DWG



FLAT TOP MANHOLE DETAIL



8" THICK CONC. SLAB W/REINF.
PLACED 2" CLEAR OF BOTTOM FACE

MANHOLE REDUCING SLAB DETAIL

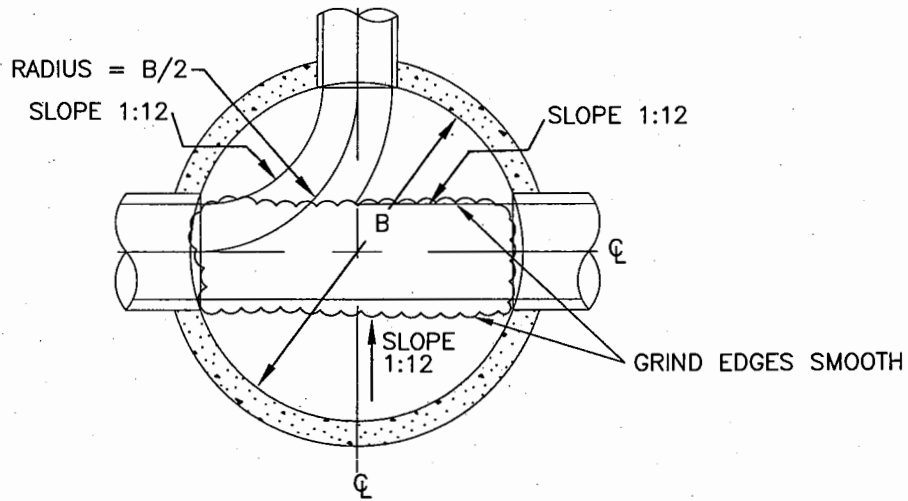
NOTES:

1. 4' MANHOLES SHALL BE USED FOR PIPES UP TO 21" DIAMETER.
2. 5' MANHOLES SHALL BE USED FOR PIPES FROM 24"-36" DIAMETER.
3. SPECIAL MANHOLES SHALL BE USED FOR PIPES LARGER THAN 36" DIAMETER.
4. MANHOLES LESS THAN OR EQUAL TO 5' FROM TOP OF CASTING TO INVERT SHALL HAVE FLAT TOPS WITH CONCENTRIC OPENING.

***SOUTH DURANGO
SANITATION DISTRICT***

**STANDARD SEWER DETAIL NO. 4
FLAT TOP MANHOLE DETAIL**

DATE: 6/17/04 SCALE: N.T.S.
CAD FILE NAME: SEWER04.DWG



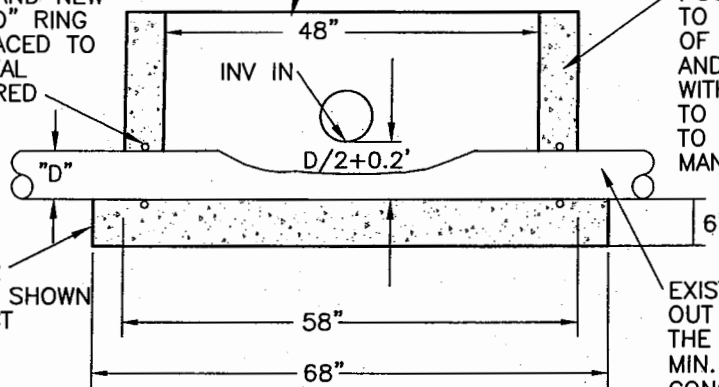
PLAN

POUR INSIDE OF BASE TO PROVIDE A SMOOTHLY CHanneled FLOW LINE TRANSITION FROM THE NEW TO THE EXISTING PIPE ALSO PROVIDE A BENCH POURED AT 2" ABOVE THE TOP OF THE EXISTING PIPE ON BOTH SIDES THAT SLOPES FROM THE WALL BACK TO THE MAIN OPENING AT APPROX. 12:1 SLOPE CONTRACTOR SHALL CONTACT ENGINEER TO EVALUATE CONDITIONS PRIOR TO PLACING CONCRETE

SEAL AROUND EXISTING AND NEW PIPES WITH STANDARD "O" RING STYLE PIPE GASKETS PLACED TO FORM A WATER TIGHT SEAL ONCE THE BASE IS POURED AS SHOWN

POUR THE BASE SECTION TO AT LEAST 6" ABOVE THE TOP OF THE NEW PIPE AS SHOWN AND FORM A FLAT ROUND SURFACE WITH A STEEL GRADE FORM TO PROVIDE A LEVEL FLAT SURFACE TO MATE TO A PRE-FABRICATED MANHOLE BARREL SECTION ABOVE

CONTRACTOR SHALL POUR ENTIRE BASE SECTION AS SHOWN THERE SHALL BE AT LEAST 6" OF CONCRETE BELOW THE EXISTING PIPE



EXISTING SEWER MAIN, CUT OUT CROWN TO AT LEAST $1/2$ THE PIPE DIAMETER AND PROVIDE A MIN. 6" WIDE 3' LONG OPENING, THE CONCRETE SHALL BE POURED FIRST THEN CUT OUT AND GRIND THE EDGES OF THE OPENING SMOOTH

SECTION

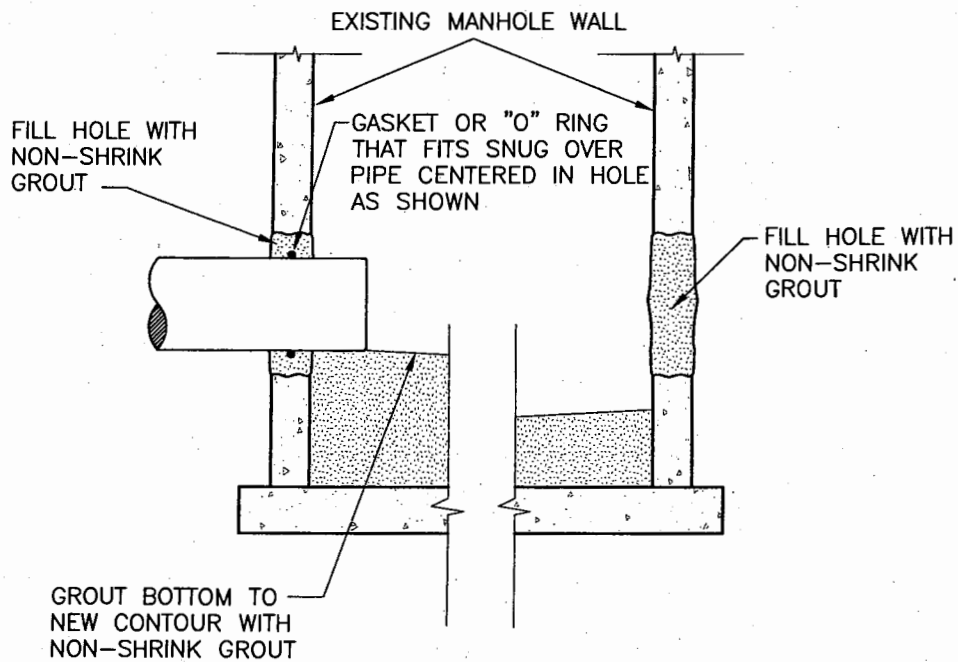
NOTE:

PRE-CAST BASE SECTIONS ARE RECOMENDED FOR ALL NEW CONSTRUCTION. CAST IN PLACE BASE SECTIONS WILL BE ALLOWED AT CONNECTIONS WITH EXISTING MAINS AND IN SPECIAL CONDITIONS WITH THE ENGINEER'S APPROVAL.

**SOUTH DURANGO
SANITATION DISTRICT**

**STANDARD SEWER DETAIL NO. 5
CAST IN PLACE MANHOLE BASE DETAIL**

DATE: 6/17/04 SCALE: N.T.S.
CAD FILE NAME: SEWER05.DWG

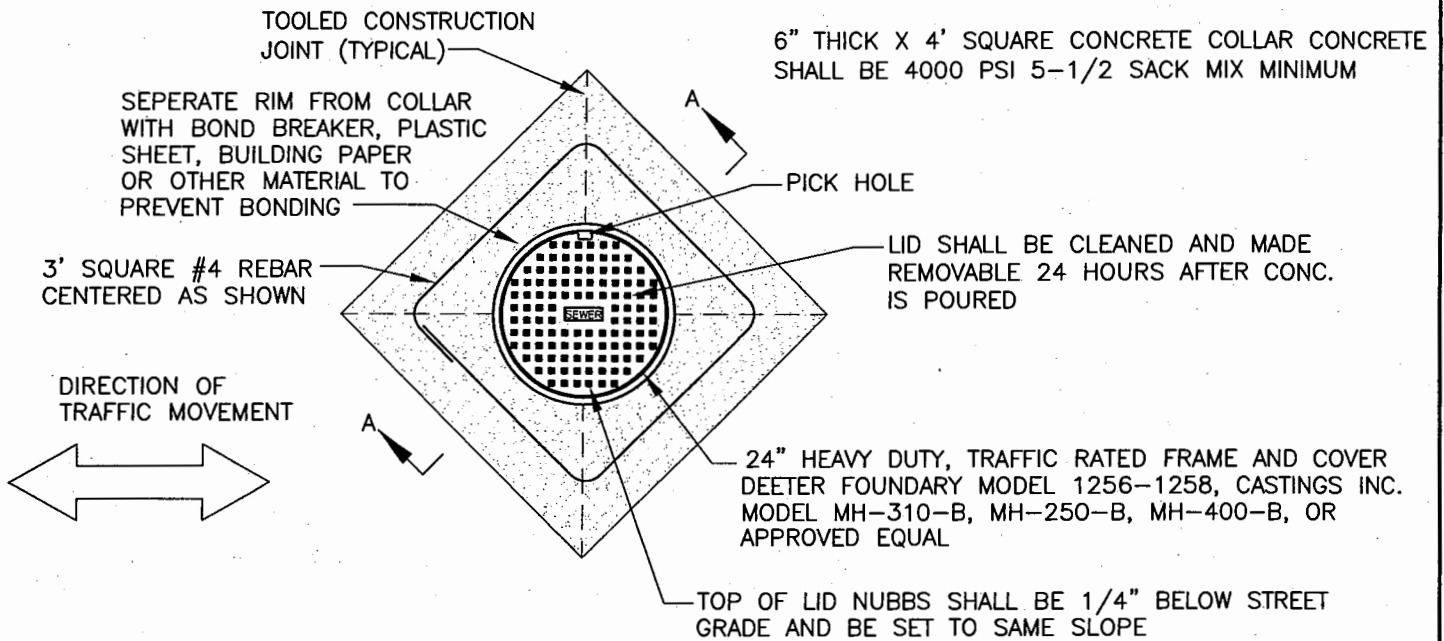


NOTE: CUT NEW HOLE IN THE EXISTING MANHOLE WALL FOR NEW PIPE PENETRATION AS NECESSARY. CLEAN ALL CONCRETE SURFACES BEFORE APPLYING GROUT

***SOUTH DURANGO
SANITATION DISTRICT***

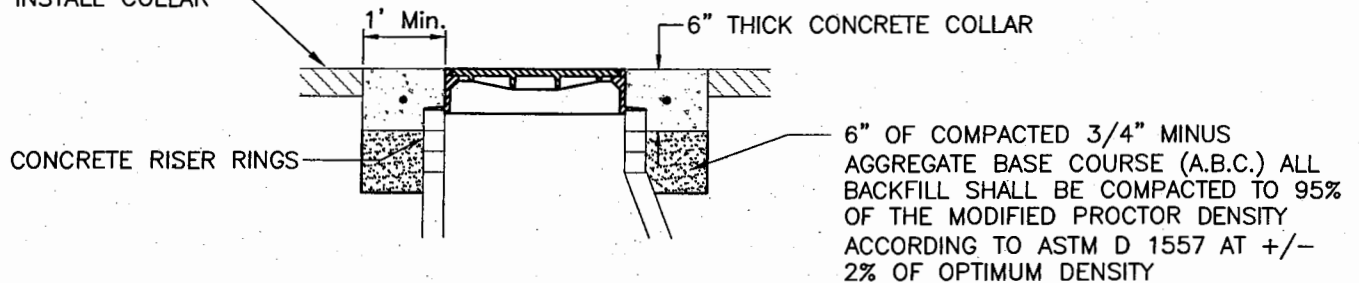
**STANDARD SEWER DETAIL NO. 6
NEW PIPE PENETRATION DETAIL**

DATE: 6/17/04 | SCALE: N.T.S.
CAD FILE NAME: SEWERO6.DWG



PLAN

NEW OR EXISTING PAVEMENT.
IF EXISTING, SAW CUT PAVEMENT
FOR CLEAN STRAIGHT EDGE. TO
INSTALL COLLAR

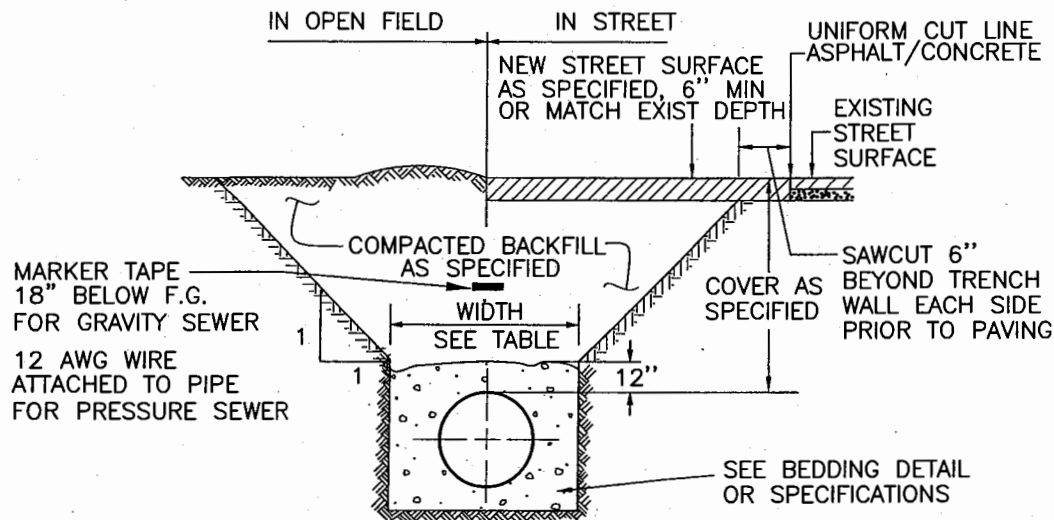


SECTION A-A

***SOUTH DURANGO
SANITATION DISTRICT***

**STANDARD SEWER DETAIL NO. 7
MANHOLE COLLAR DETAIL**

DATE: 6/17/04 SCALE: N.T.S.
CAD FILE NAME: SEWER07.DWG



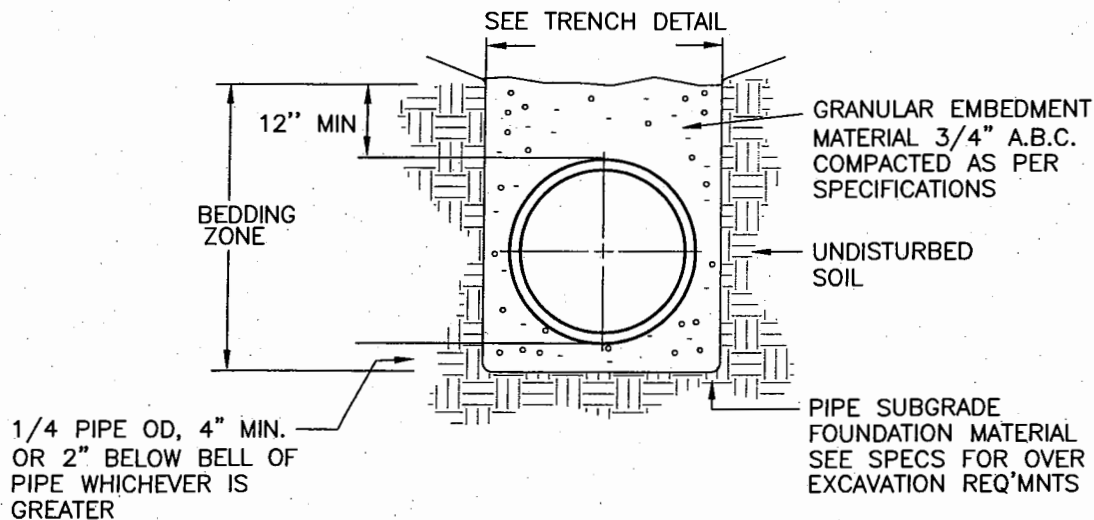
TRENCH WIDTH

PIPE DIAMETER	MINIMUM WIDTH	MAXIMUM WIDTH
4"	1'-4"	2'-4"
6"	1'-6"	2'-6"
8"	1'-8"	2'-8"
10"	1'-10"	2'-10"
12"	2'-0"	3'-0"
18"	2'-6"	3'-6"

FOR TRENCHES GREATER THAN 5 FEET IN DEPTH, SIDEWALLS SHALL BE SLOPED AT 45° ANGLE OR SUITABLY BRACED OR SHEETED AS NECESSARY FOR THE SAFETY OF THE WORKERS AND THE PROTECTION OF OTHER UTILITIES AS REQUIRED BY OSHA OR IN UNSTABLE SOIL CONDITIONS, SLOPE TRENCH WALLS ACCORDING TO GEOTECHNICAL RECOMMENDATIONS.

A HORIZONTAL CLEARANCE OF 2 FEET SHALL BE MAINTAINED BETWEEN DISTRICT PIPES AND ALL OTHER FACILITIES THAT WILL SHARE THE SAME TRENCH

TYPICAL TRENCH DETAIL



PIPE BEDDING DETAIL

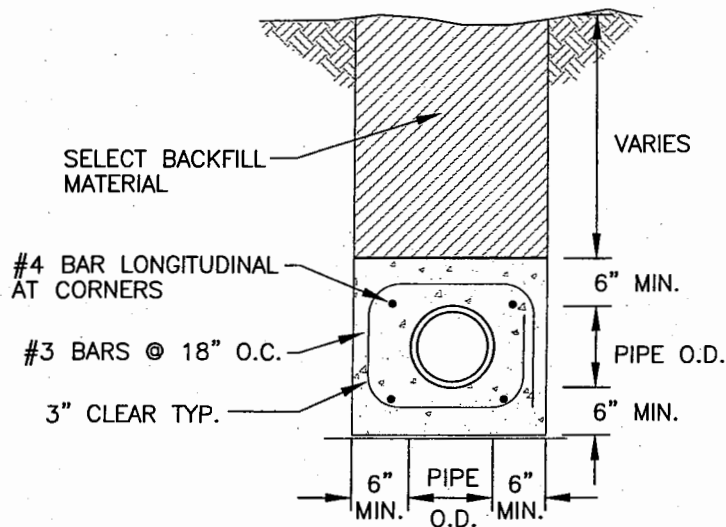
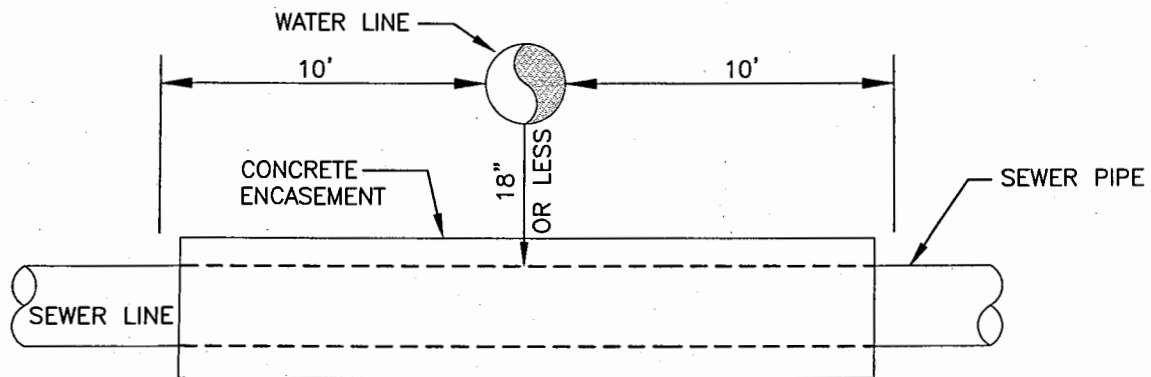
NOTES:

1. MARKER TAPE SHALL BE 6" WIDE, GREEN WITH BLACK LETTERING STATING THE FOLLOWING AS A MINIMUM, "CAUTION SEWER".

***SOUTH DURANGO
SANITATION DISTRICT***

**STANDARD SEWER DETAIL NO. 8
TYPICAL TRENCH AND BEDDING DETAIL**

DATE: 6/17/04 SCALE: N.T.S.
CAD FILE NAME: SEWER08.DWG



NOTES:

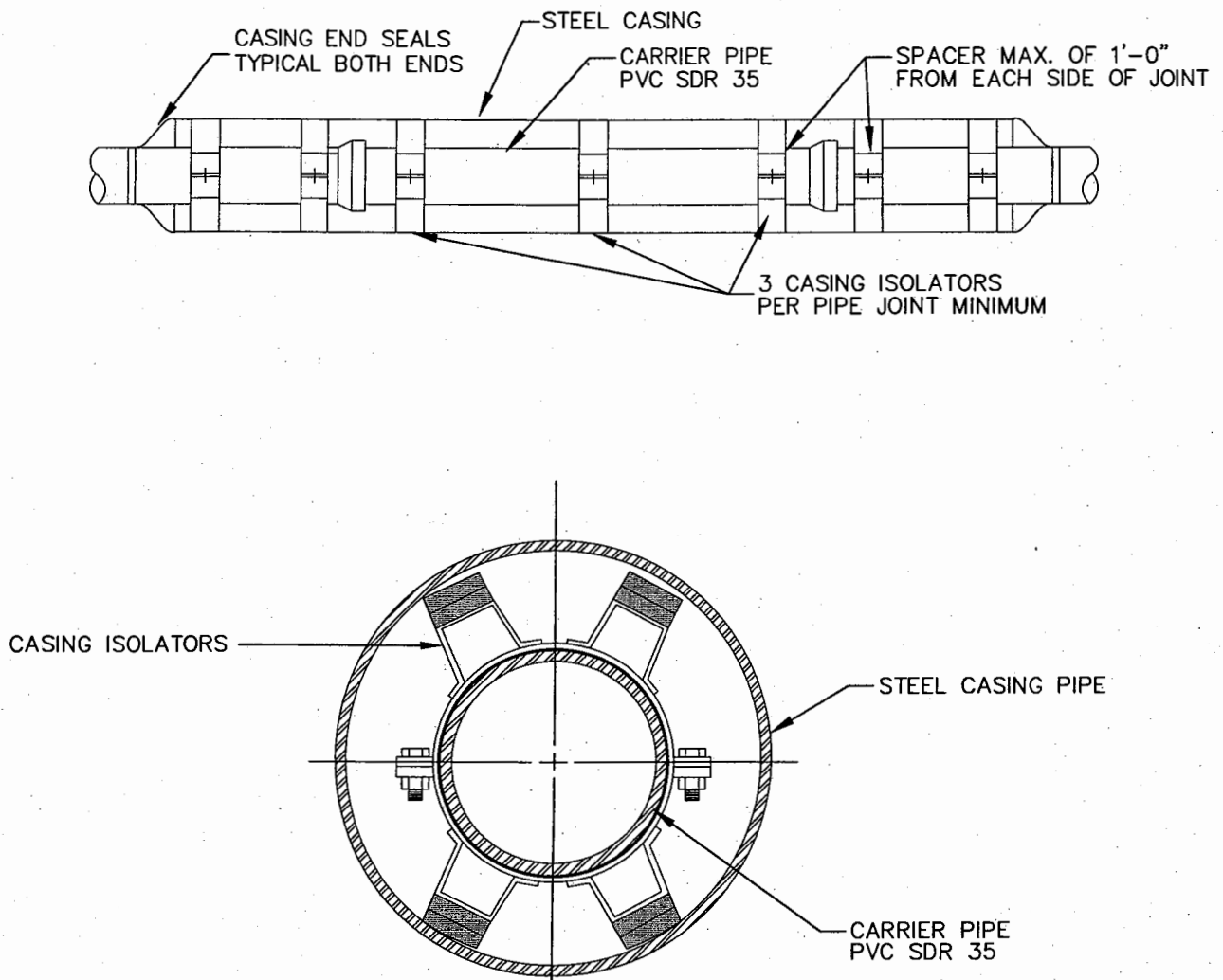
1. THE DISTRICT SHALL REVIEW THIS DETAIL FOR USE ON A CASE BY CASE BASIS. SPECIAL ENCASEMENTS MAY BE REQUIRED AT CREEK CROSSINGS AND CONDUIT CROSSINGS.

2. WHEN SEWER MAIN IS LOCATED ABOVE WATER MAIN, ALWAYS PROVIDE PROTECTION.

***SOUTH DURANGO
SANITATION DISTRICT***

**STANDARD SEWER DETAIL NO. 9
SEWER CROSSING AND ENCASEMENT DETAIL**

DATE: 6/17/04 | SCALE: N.T.S.
CAD FILE NAME: SEWER09.DWG



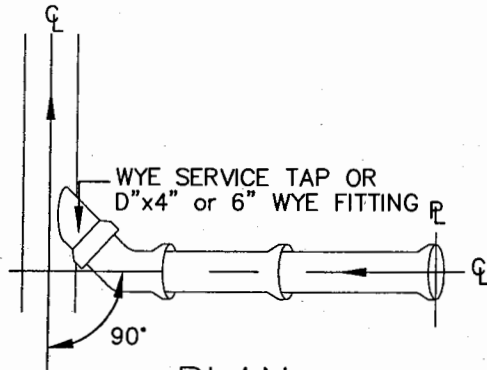
NOTE:

WHERE INFORMATION ON THIS DETAIL CONFLICTS WITH REQUIREMENTS OF REGULATORY AGENCIES WHO ALSO HAVE JURISDICTION OVER THIS WORK, THE MORE STRINGENT REQUIREMENTS SHALL APPLY.

***SOUTH DURANGO
SANITATION DISTRICT***

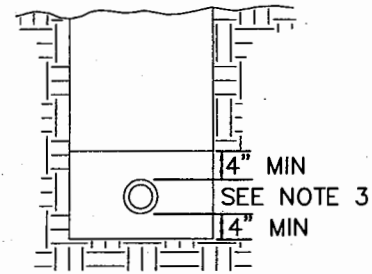
**STANDARD SEWER DETAIL NO. 10
PIPE CASING DETAIL**

DATE: 6/17/04	SCALE: N.T.S.
CAD FILE NAME: SEWER10.DWG	

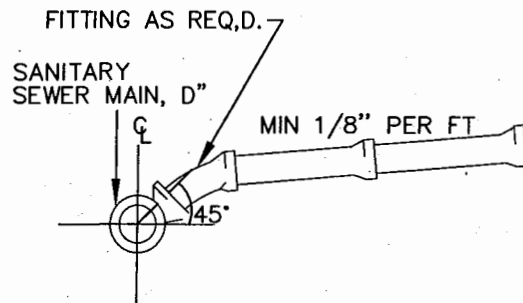


PLAN

MINIMUM TRENCH WIDTH SHALL BE THE DIAMETER OF THE PIPE PLUS 8"

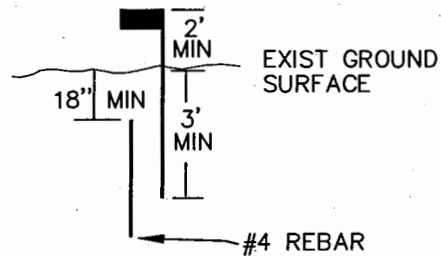


CROSS SECTION



PROFILE

GREEN METAL TEE POST



MARKER POST

(AT SERVICE STUB OUT)

NOTES:

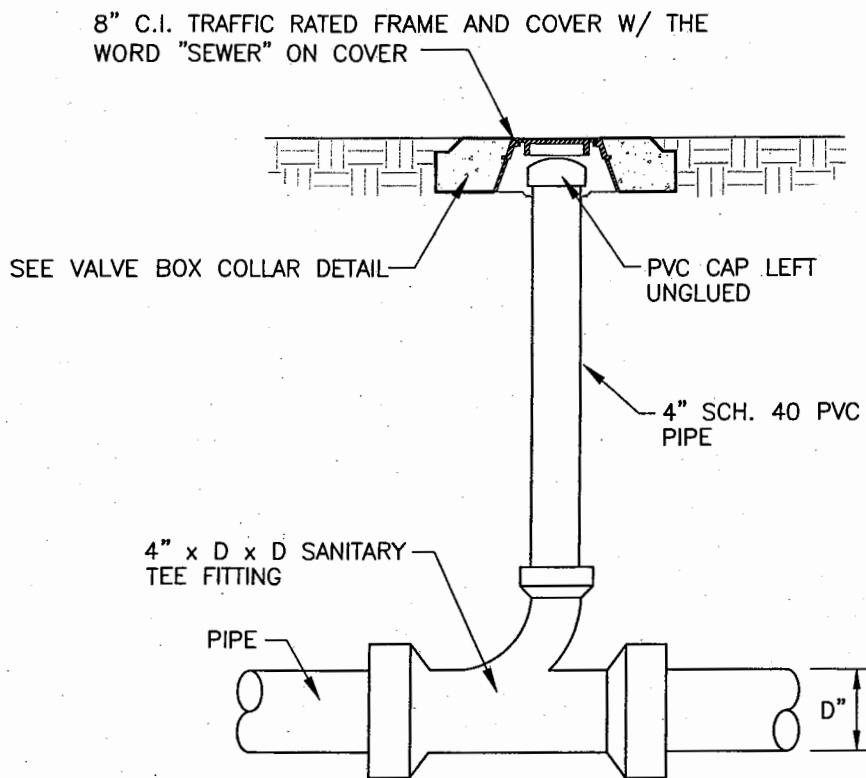
1. ALL SERVICE LINES SHALL BE 4" MINIMUM IN DIAMETER.
2. THE MINIMUM SLOPE FOR 4" OR 6" SERVICE LINES SHALL BE 1/8" PER FOOT.
3. BEDDING FOR HOUSE CONNECTION WITHIN DISTRICT R.O.W. SHALL BE THE SAME AS FOR SEWER MAIN, LAID TO A MINIMUM DEPTH OF 4" BELOW THE PIPE INVERT AND 4" ABOVE THE TOP OF THE PIPE.
4. SERVICE LINE WILL BE PLUGGED AT THE PROPERTY LINE WITH APPROPRIATE PLUG FOR TYPE OF LINE INSTALLED UNTIL CONNECTED TO BUILDING. AFTER ABANDONMENT OF A SERVICE LINE IT MUST BE PLUGGED 5' INSIDE THE PROPERTY LINE.
5. CLEANOUT SHALL BE INSTALLED AT PROPERTY LINE IN ACCORDANCE WITH STANDARD SEWER DETAIL NO. 12
6. COMPACTION OF BACKFILL SHALL BE AS STATED IN THE TYPICAL TRENCH DETAIL FOR MAINS.

***SOUTH DURANGO
SANITATION DISTRICT***

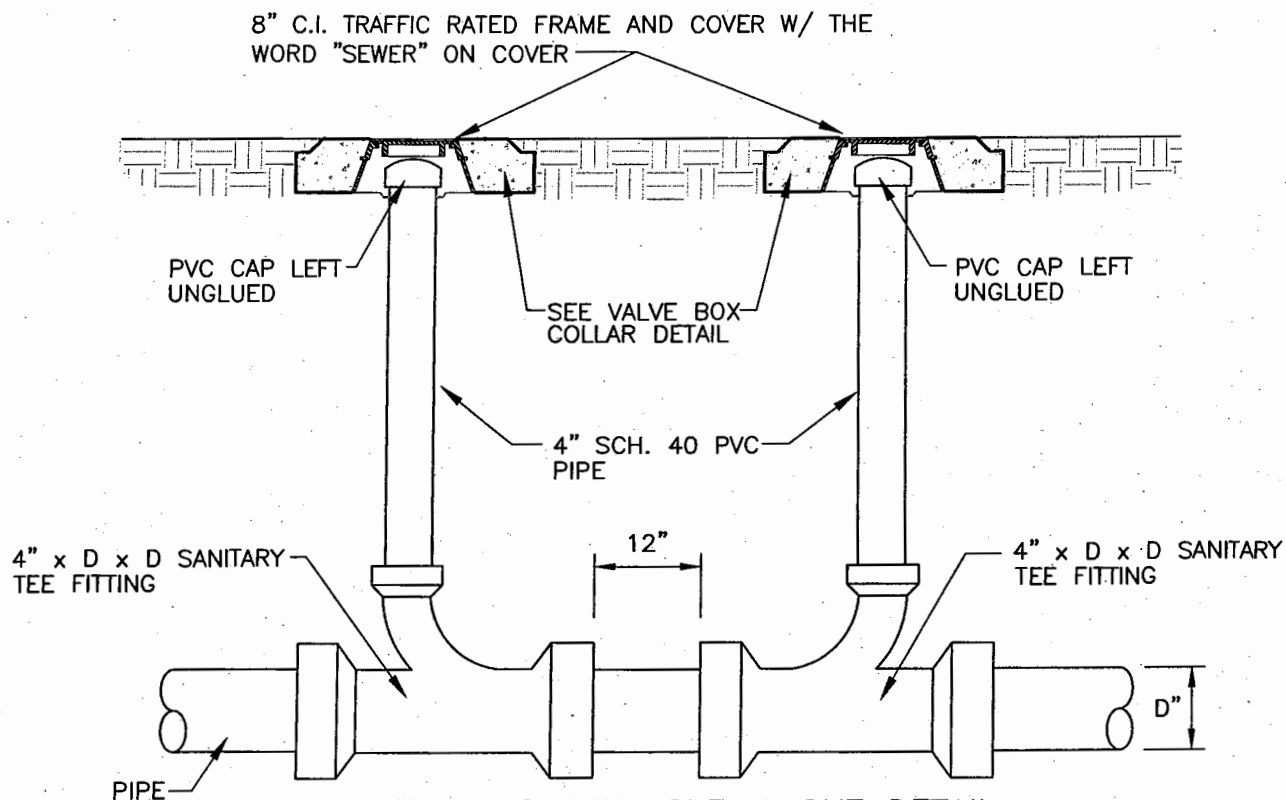
**STANDARD SEWER DETAIL NO. 11
SEWER SERVICE DETAIL**

DATE: 6/17/04 SCALE: N.T.S.

CAD FILE NAME: SEWER11.DWG



GRAVITY SINGLE CLEAN-OUT DETAIL

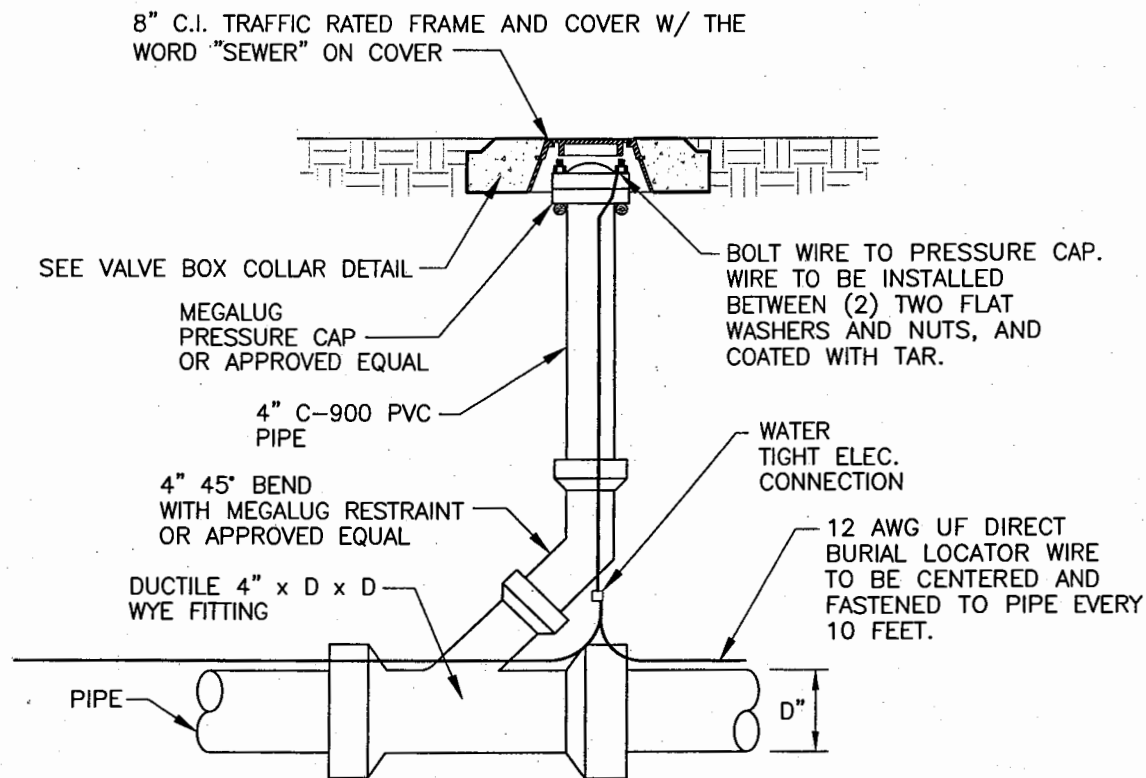


GRAVITY TWO-WAY CLEAN-OUT DETAIL

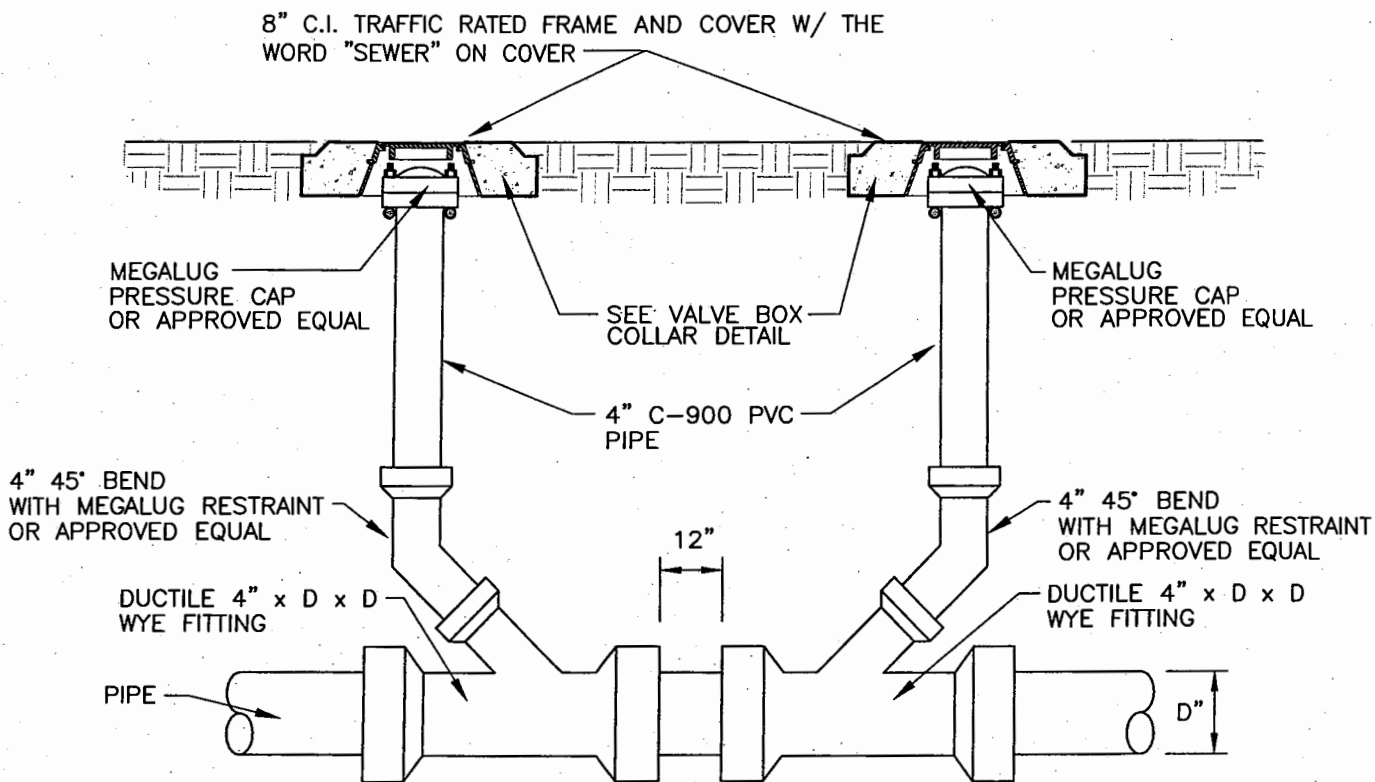
***SOUTH DURANGO
SANITATION DISTRICT***

**STANDARD SEWER DETAIL NO. 12
GRAVITY CLEAN-OUT DETAIL**

DATE: 6/17/04 SCALE: N.T.S.
CAD FILE NAME: SEWER12.DWG



PRESSURE SINGLE CLEAN-OUT DETAIL



PRESSURE TWO-WAY CLEAN-OUT DETAIL

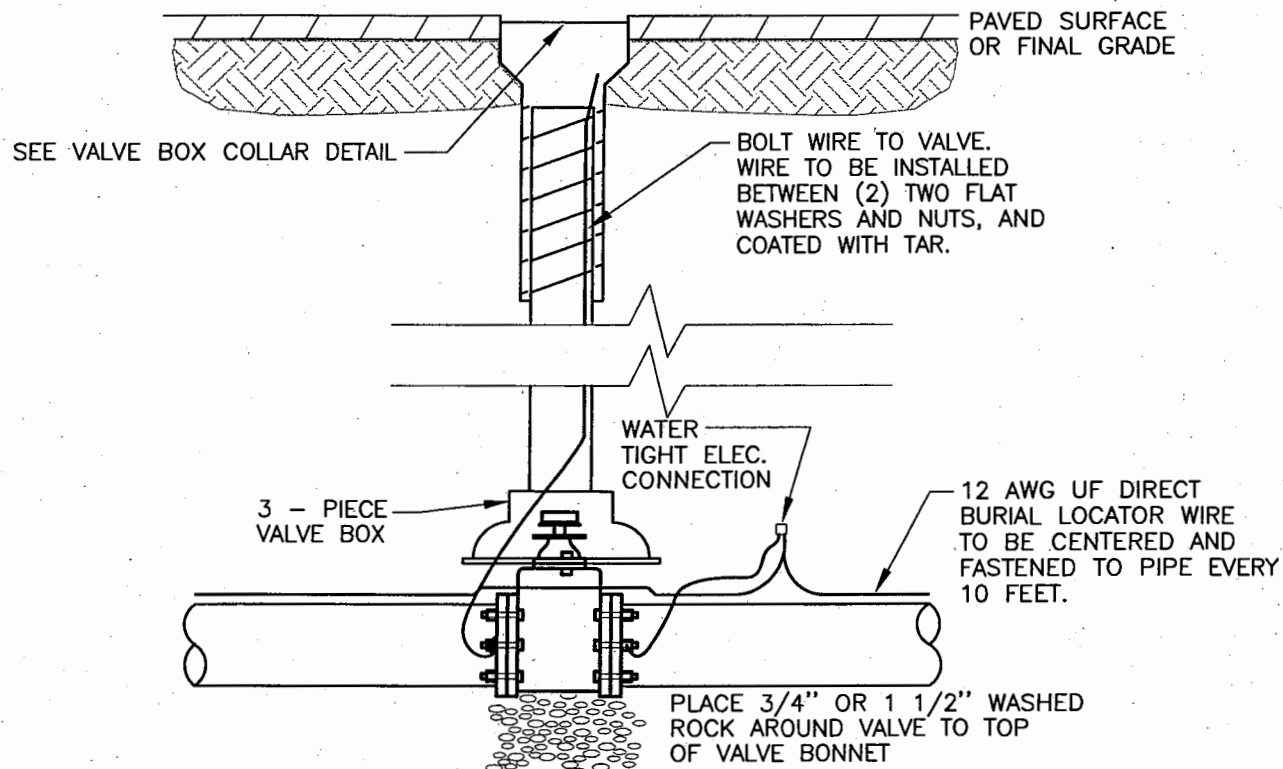
NOTES:

1. ALL JOINTS ARE TO BE MECHANICAL JOINTS WITH MEGALUG GLANDS.
2. CLEANOUTS ARE REQUIRED EVERY 100 FT AND AT ALL CHANGES IN DIRECTION.
3. 12 AWG UF LOCATOR WIRE SHALL BE INSTALLED ON PRESSURE TWO-WAY CLEAN-OUT AS SHOWN ON PRESSURE SINGLE CLEAN-OUT DETAIL.

***SOUTH DURANGO
SANITATION DISTRICT***

**STANDARD SEWER DETAIL NO. 13
PRESSURE CLEAN-OUT DETAIL**

DATE: 6/17/04 SCALE: N.T.S.
CAD FILE NAME: SEWER13.DWG



NOTES:

1. OPERATING NUT SHALL BE EXTENDED WITHIN 4 FEET OF SURFACE.
2. EXTENSION STEMS REQUIRED WHERE VALVE IS AT DEPTH GREATER THAN 5 FEET.

***SOUTH DURANGO
SANITATION DISTRICT***

**STANDARD SEWER DETAIL NO. 14
VALVE BOX DETAIL**

DATE: 6/17/04 | SCALE: N.T.S.
CAD FILE NAME: SEWER14.DWG

TYLER 6850 SERIES ADJUSTABLE
CAST IRON RISER AND DROP LID
MARKED "SEWER".

NEW OR EXISTING PAVEMENT.
IF EXISTING, SAW CUT PAVEMENT
FOR CLEAN STRAIGHT EDGE.

6" THICK X 18" SQUARE
CONCRETE COLLAR, CONCRETE
SHALL BE 4000 PSI 5-1/2
SACK MIX MINIMUM

6" OF 3/4" AGGREGATE BASE
COURSE, COMPACTED TO AT LEAST 95
% OF THE MAXIMUM MODIFIED
PROCTOR DENSITY AT A MOISTURE
CONTENT NEAR OPTIMUM, ACCORDING
TO ASTM D 1557

SECTION A-A

BOND BREAKER, PLASTIC
SHEET, BUILDING PAPER
OR OTHER MATERIAL TO
PREVENT BONDING

6" THICK X 18" SQUARE CONCRETE COLLAR, CONCRETE
SHALL BE 4000 PSI 5-1/2 SACK MIX MINIMUM

DIRECTION OF
TRAFFIC MOVEMENT

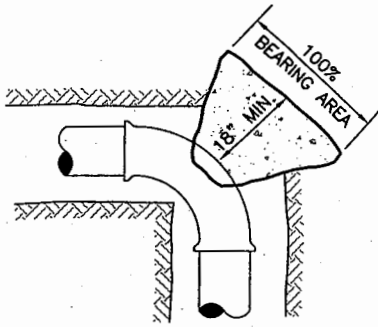
PLAN

***SOUTH DURANGO
SANITATION DISTRICT***

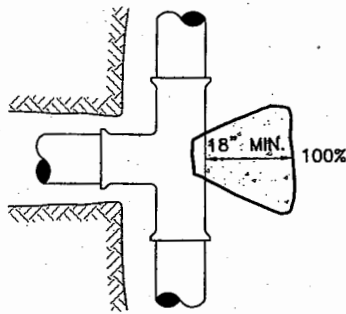
**STANDARD SEWER DETAIL NO. 15
VALVE BOX COLLAR DETAIL**

DATE: 6/17/04 | SCALE: N.T.S.

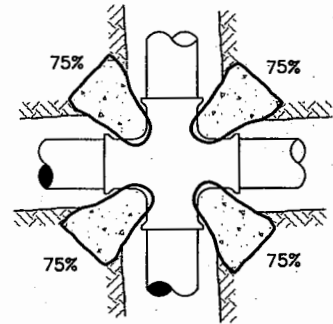
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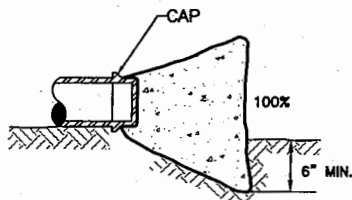
HORIZONTAL BEND



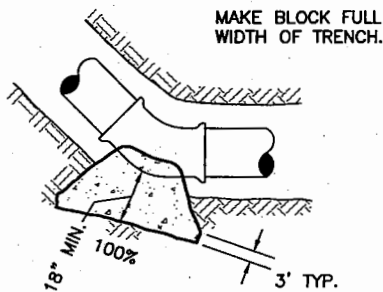
TEE



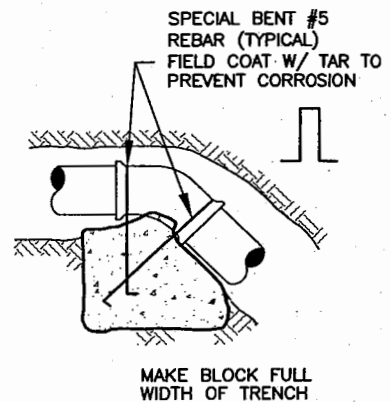
CROSS



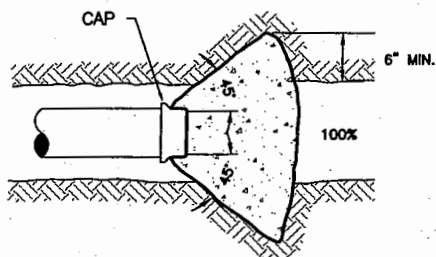
SECTION VIEW



VERTICAL BEND - UP

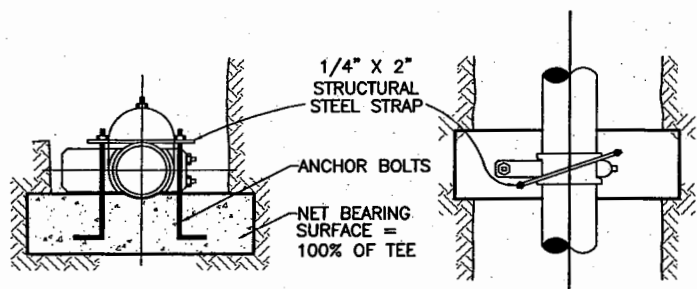


VERTICAL BEND - DOWN



TOP VIEW

DEAD END



TYPICAL VALVE

NOTES:

- 1) SEE THRUST BLOCK DETAIL - II FOR NOTES AND SCHEDULES
- 2) VALUE (100%) AT THRUST BLOCK INDICATES PERCENT OF TOTAL THRUST TO BE APPLIED TO DETERMINE THE APPROPRIATE BEARING AREA

***SOUTH DURANGO
SANITATION DISTRICT***

**STANDARD SEWER DETAIL NO. 16
THRUST BLOCK DETAIL - I**

DATE: 6/17/04 | SCALE: N.T.S.
CAD FILE NAME: SEWER16.DWG

LBS OF THRUST PER PSI OF WATER PRESSURE AT VARIOUS FITTINGS				
NOMINAL PIPE SIZE (Inches)	DEAD ENDS WYES & TEES	90 DEGREE BENDS	45 DEGREE BENDS	22 1/2 DEGREE BENDS OR LESS
4"	19	27	15	7
6"	39	55	30	15
8"	57	94	51	26
10"	109	154	84	43

EXAMPLES

10-INCH HORIZONTAL 45-DEGREE BEND AT 200 PSI
 FROM TABLE, THRUST = $84 * 200 = 16,800$ LBS
 ASSUME SOIL BEARING STRENGTH = 2000 LBS/SQ. FT.
 REQUIRED BEARING AREA OF THRUST BLOCK = $16,800/2,000 = 8.40$
 SQ. FT.

10-INCH DOWNWARD VERTICAL 22.5-DEGREE BEND AT 200 PSI
 FROM TABLE, THRUST = $43 * 200 = 8,600$ LBS
 WEIGHT OF CONCRETE = 150 LBS/CUBIC FOOT
 SIZE OF CONCRETE THRUST BLOCK = $8,600/150 = 57.3$ CU. FT. =
 2.12 CU YDS

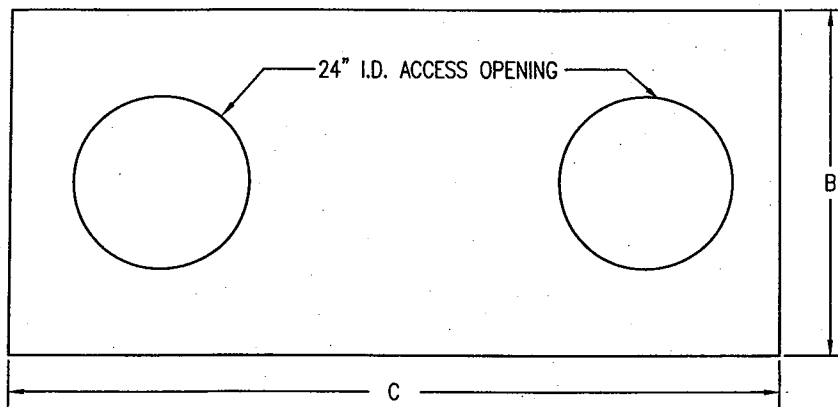
NOTES

1. USE THE MAXIMUM INTERNAL PRESSURE ANTICIPATED (I.E. HYDROSTATIC TEST PRESSURE, POSSIBLE SURGE PRESSURE DUE TO PUMP OR VALVE SHUT-OFF, ETC)
2. SEE SOILS REPORT FOR BEARING STRENGTH OF SOIL. IN THE ABSENCE OF A SOILS REPORT ASSUME 2,000 PSF.
3. CONCRETE THRUST BLOCKS TO BE 2,000 PSI STRENGTH AT 28-DAYS
4. THRUST BLOCKS TO BEAR ON UNDISTURBED EARTH. IF NOT POSSIBLE, MECHANICAL RESTRAINTS SHALL BE USED.
5. DO NOT EXTEND CONCRETE BEYOND THE FITTING JOINTS.
6. INSTALL POLYETHYLENE BOND BREAKER BETWEEN PIPE AND CONCRETE.
7. IN ADDITION TO THRUST BLOCKS, MECHANICAL RESTRAINTS (MEGA-LUGS, OR EQUAL) SHALL BE USED AT ALL VALVES, BENDS, FITTINGS WITH MECHANICAL OR PUSH-ON TYPE CONNECTIONS, AND DEAD ENDS.

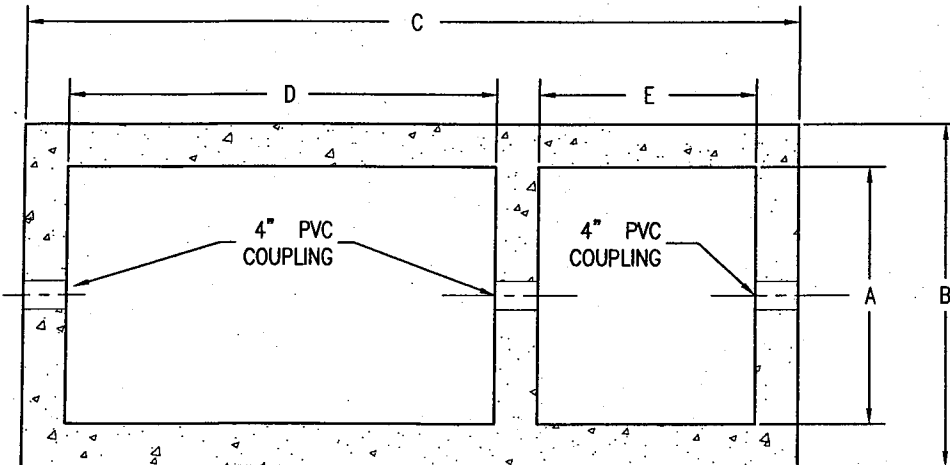
***SOUTH DURANGO
SANITATION DISTRICT***

**STANDARD SEWER DETAIL NO. 17
THRUST BLOCK DETAIL - II**

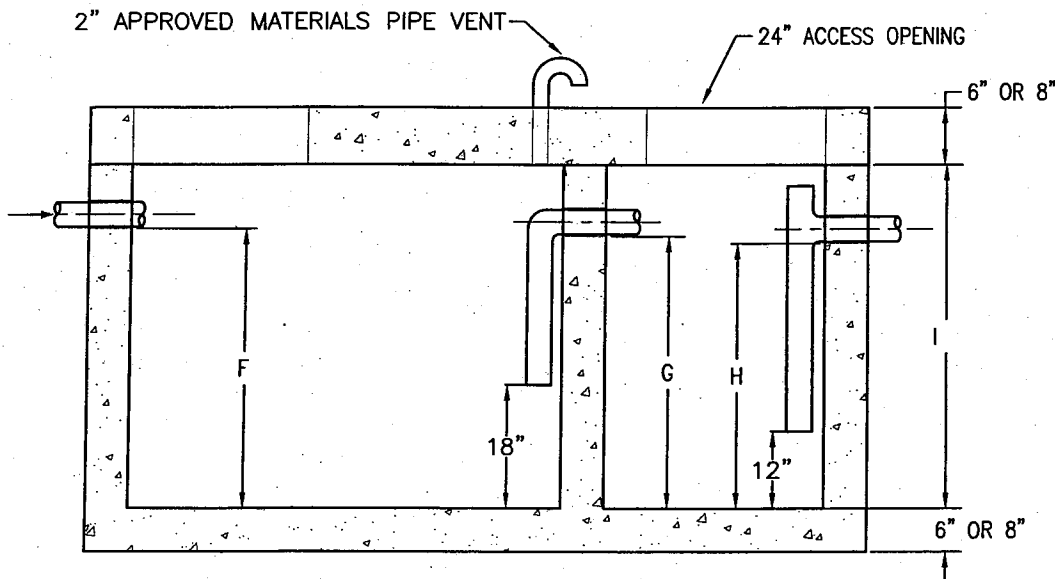
DATE: 6/17/04 SCALE: N.T.S.
 CAD FILE NAME: SEWER17.DWG



TOP VIEW OF GREASE TRAP LID



PLAN



SECTION

NOTES:

1. SECONDARY COMPARTMENT HAS VOLUME EQUAL TO 1/3 OF TOTAL CAPACITY.
2. ALL PIPE AND FITTINGS TO BE APPROVED MATERIALS

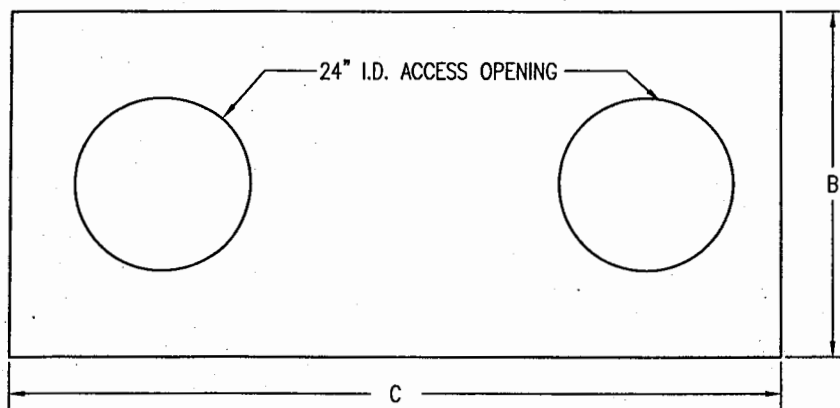
TANK CAPACITY (GALLONS)	TANK DIMENSIONS (INCHES)								
	A	B	C	D	E	F	G	H	I
500	36	48	108	60	30	38	37	36	48
1000	49	61	115	64	33	53	52	51	63
1500	60	72	138	80	40	50	49	48	60
2000	60	72	138	80	40	66	65	64	72

***SOUTH DURANGO
SANITATION DISTRICT***

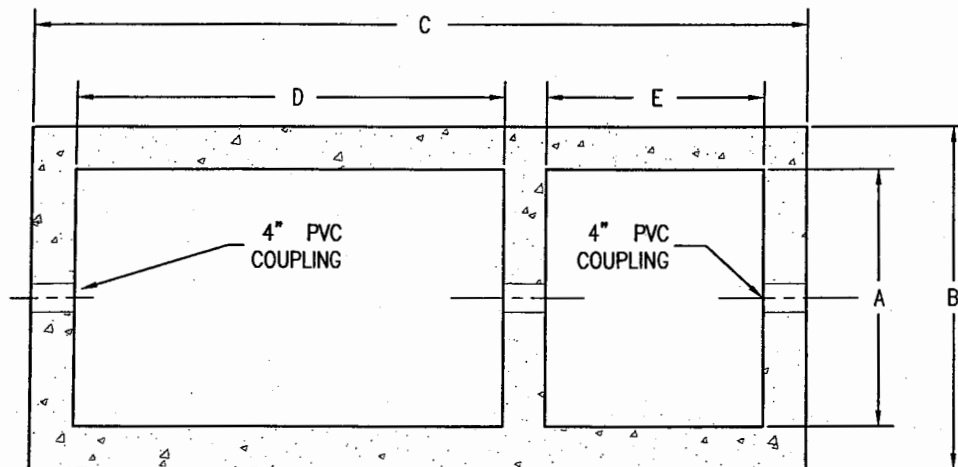
**STANDARD SEWER DETAIL NO. 18
GREASE INTERCEPTOR DETAIL**

DATE: 6/17/04 SCALE: N.T.S.

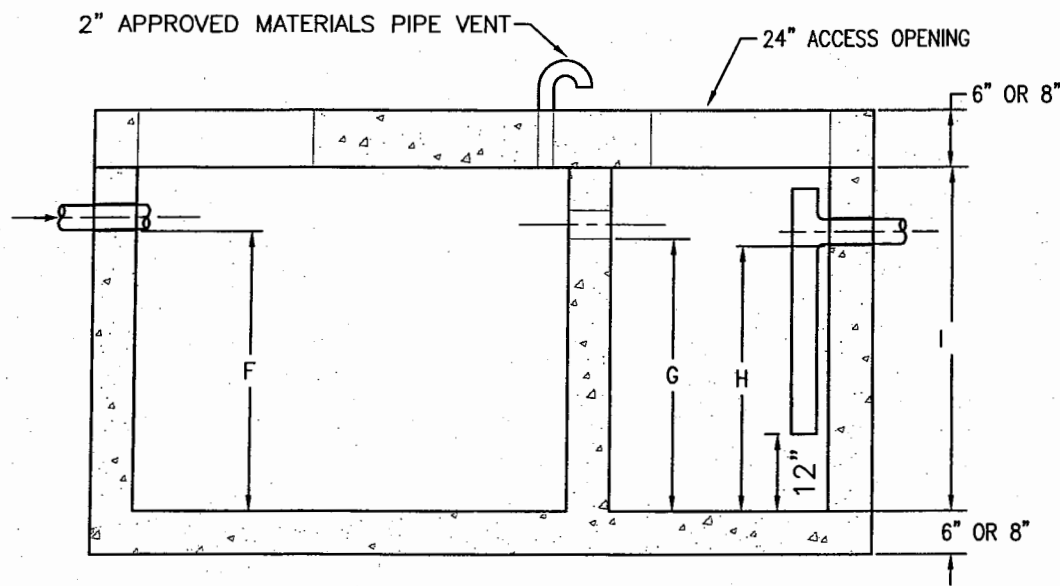
CAD FILE NAME: SEWER18.DWG



TOP VIEW OF GREASE TRAP LID



PLAN



SECTION

TANK CAPACITY (GALLONS)	TANK DIMENSIONS (INCHES)								
	A	B	C	D	E	F	G	H	I
500	36	48	108	60	30	38	37	36	48
1000	49	61	115	64	33	53	52	51	63
1500	60	72	138	80	40	50	49	48	60
2000	60	72	138	80	40	66	65	64	72

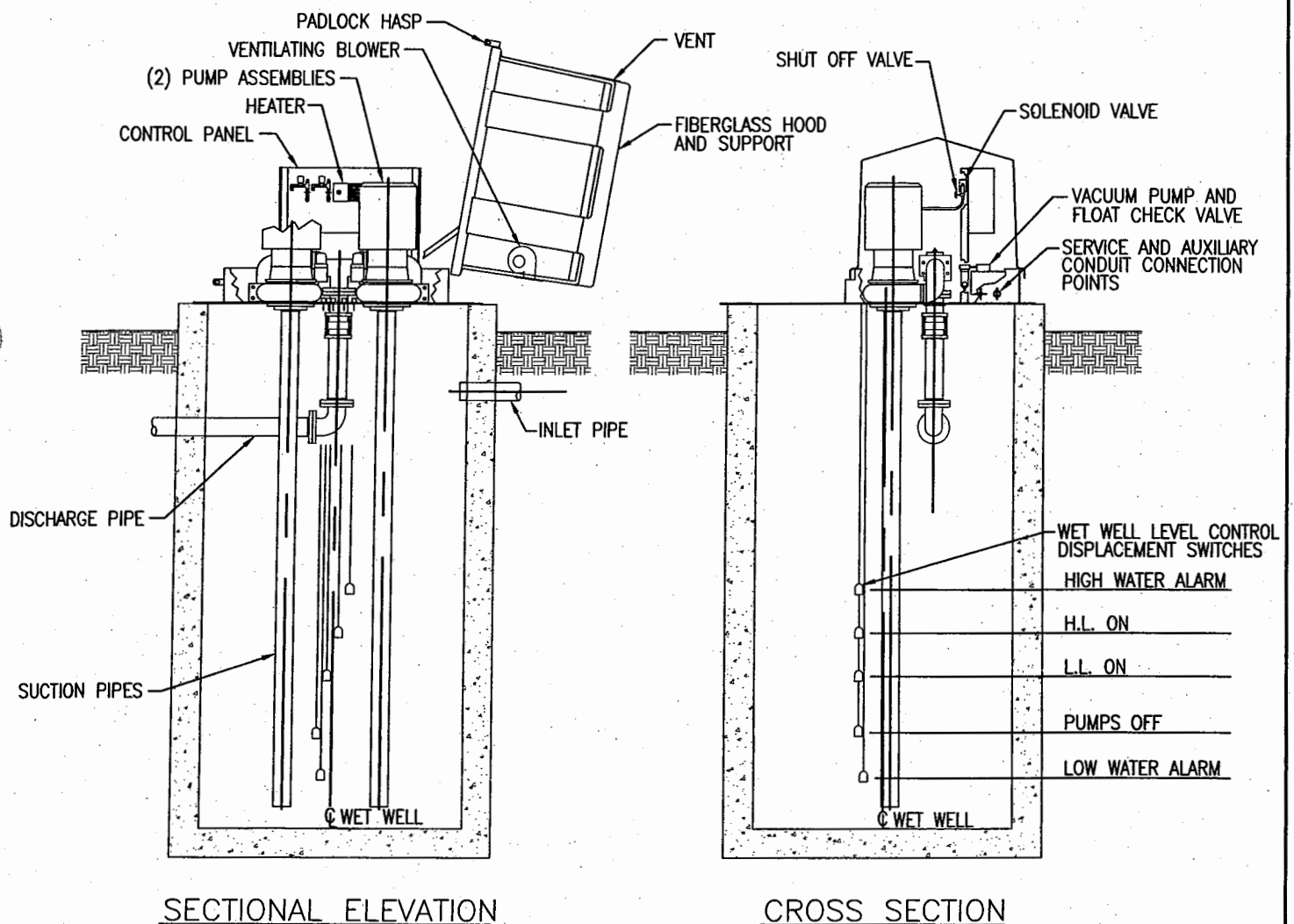
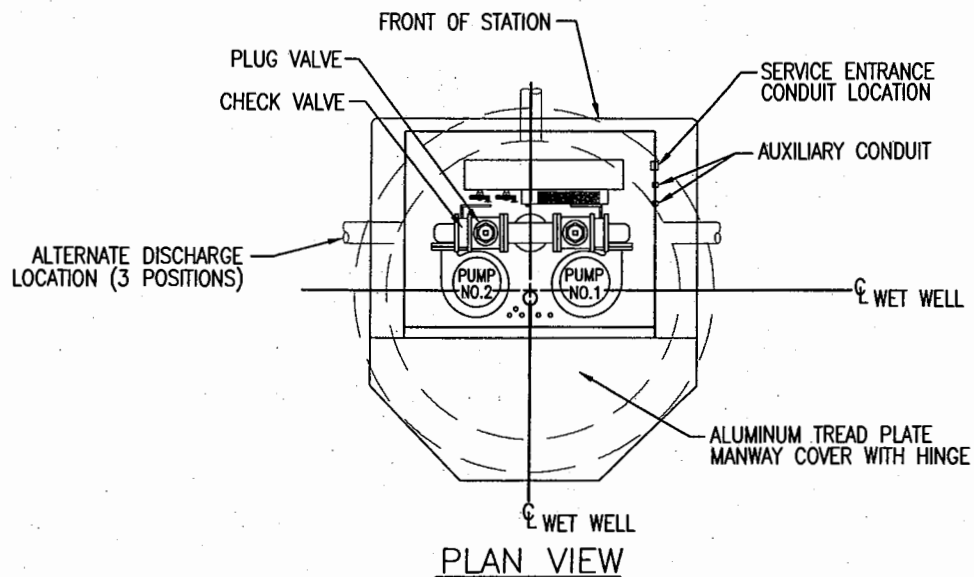
NOTES:

1. SECONDARY COMPARTMENT HAS VOLUME EQUAL TO 1/3 OF TOTAL CAPACITY.
2. ALL PIPE AND FITTINGS TO BE APPROVED MATERIALS

***SOUTH DURANGO
SANITATION DISTRICT***

**STANDARD SEWER DETAIL NO. 19
SAND AND OIL INTERCEPTOR DETAIL**

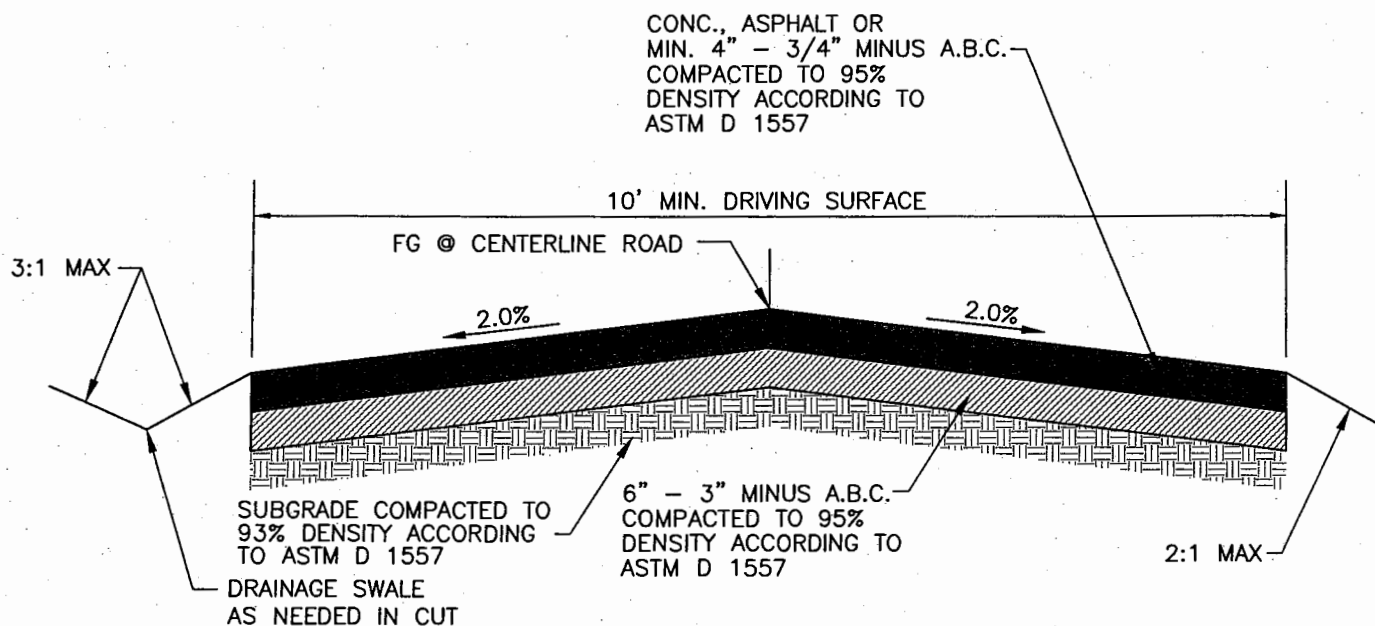
DATE: 6/17/04 SCALE: N.T.S.
CAD FILE NAME: SEWER19.DWG



***SOUTH DURANGO
SANITATION DISTRICT***

**STANDARD SEWER DETAIL NO. 20
LIFT STATION DETAIL**

DATE: 6/17/04 SCALE: N.T.S.
CAD FILE NAME: SEWER20.DWG



NEW ACCESS/MAINTENANCE ROAD TYPICAL SECTION
NTS

***SOUTH DURANGO
SANITATION DISTRICT***

**STANDARD SEWER DETAIL NO. 21
TYPICAL ACCESS & MAINTENANCE ROAD DETAIL**

DATE: 6/17/04 | SCALE: N.T.S.
CAD FILE NAME: SEWER21.DWG

**APPENDIX D
TECHNICAL SPECIFICATIONS**

Number	Title
02140	Dewatering
02200	Earthwork
02540	Precast Concrete Manholes and Vaults
02565	Ductile Iron Pipe (AWWA C151)
02595	8" - 15" PVC Pipe (ASTM D3034, type SDR-35)
02596	18" - 27" PVC Pipe (ASTM F679, type SDR-35)
02597	4" – 12" PVC Pressure Pipe (AWWA C900)
02622	Pipeline and Manhole Testing
15200	Valves, General
15203	Check Valves
15206	Gate Valves
15207	Plug Valves
15230	Miscellaneous Valves

SECTION 02140 DEWATERING

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall remove and exclude water from all trench and structure excavations. The CONTRACTOR shall be responsible for securing all the necessary permits required to complete the work of this Section.

1.2 CONTRACTOR SUBMITTALS

- A. Prior to commencement of excavation, the CONTRACTOR shall submit a detailed plan and operation schedule for dewatering of excavations. The CONTRACTOR may be required to demonstrate the system proposed and to verify that adequate equipment, personnel, and materials are provided to dewater the excavations at all locations and times. The CONTRACTOR's dewatering plan is subject to review by the ENGINEER.

1.3 QUALITY CONTROL

- A. It shall be the sole responsibility of the CONTRACTOR to control the rate and effect of the dewatering in such a manner as to avoid all objectionable settlement and subsidence.
- B. All dewatering operations shall be adequate to assure the integrity of the finished project and shall be the responsibility of the CONTRACTOR.
- C. Where critical structures or facilities exist immediately adjacent to areas of proposed dewatering, reference points shall be established and observed at frequent intervals to detect any settlement which may develop. The responsibility for conducting the dewatering operation in a manner which will protect adjacent structures and facilities rests solely with the CONTRACTOR. The cost of repairing any damage to adjacent structures and restoration of facilities shall be the responsibility of the CONTRACTOR.

PART 2 -- PRODUCTS

2.1 EQUIPMENT

- A. Dewatering, where required, may include the use of well points, sump pumps, temporary pipelines for water disposal, rock or gravel placement, and other means. Standby pumping equipment shall be maintained on the jobsite.

PART 3 -- EXECUTION

3.1 GENERAL REQUIREMENTS

- A. The CONTRACTOR shall provide all equipment necessary for dewatering. It shall have on hand, at all times, sufficient pumping equipment and machinery in good working condition and shall have available, at all times, competent workmen for the operation of the pumping equipment. Adequate standby equipment shall be kept available at all times to insure efficient dewatering and maintenance of dewatering operation during power failure.

- B. Dewatering for structures and pipelines shall commence when groundwater is first encountered, and shall be continuous until such times as water can be allowed to rise in accordance with the provisions of this Section or other requirements.
- C. At all times, site grading shall promote drainage. Surface runoff shall be diverted from excavations. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and be pumped or drained by gravity from the excavation to maintain a bottom free from standing water.
- D. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.
- E. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with drain rock.
- F. The CONTRACTOR shall maintain the water level below the bottom of excavation in all work areas where groundwater occurs during excavation construction, backfilling, and up to acceptance.
- G. Flotation shall be prevented by the CONTRACTOR by maintaining a positive and continuous removal of water. The CONTRACTOR shall be fully responsible and liable for all damages which may result from failure to adequately keep excavations dewatered.
- H. If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering and shall be sandpacked and/or other means used to prevent pumping of fine sands or silts from the subsurface. A continual check by the CONTRACTOR shall be maintained to ensure that the subsurface soil is not being removed by the dewatering operation.
- I. The CONTRACTOR shall dispose of water from the WORK in a suitable manner without damage to adjacent property. CONTRACTOR shall be responsible for obtaining any permits that may be necessary to dispose of water. No water shall be drained into work built or under construction without prior consent of the ENGINEER. Water shall be filtered using an approved method to remove sand and fine-sized soil particles before disposal into any drainage system.
- J. The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures, pipelines, and sewers.
- K. Dewatering of trenches and other excavations shall be considered as incidental to the construction of the WORK and all costs thereof shall be included in the various contract prices in the Bid Forms, unless a separate bid item has been established for dewatering.

- END OF SECTION -

SECTION 02200 EARTHWORK

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. This section discusses all earthwork required as part of the construction including, but not limited to, the loosening, removing, loading, transporting, depositing, and compacting in its final location of all materials wet and dry, as required for the purposes of completing the work. Earthwork shall also include, but not be limited to, the furnishing, placing, and removing of sheeting and bracing necessary to safely support the sides of all excavation; all pumping, ditching, draining, and other required measures for the removal or exclusion of water from the excavation; the supporting of structures above and below the ground; all backfilling around structures and all backfilling of trenches and pits; the disposal of excess excavated materials; borrow of materials to make up deficiencies for fills; and all other incidental earthwork.
- B. The CONTRACTOR's attention is directed to the provisions of Subpart P, Section 1926.652 of the OSHA Safety and Health Standards for Construction, which require that all banks and trenches over 4 feet high shall be shored or sloped to the angle of repose

1.2 QUALITY ASSURANCE

- A. **General:** All soils testing will be done by a testing laboratory of the OWNER's choice at the OWNER's expense except as specified in Paragraph 1.2C below.
- B. Where soil material is required to be compacted to a percentage of maximum density, the maximum density at optimum moisture content will be determined in accordance with ASTM D 1557 (modified proctor). Where cohesionless, free draining soil material is required to be compacted to a percentage of relative density, the calculation of relative density will be determined in accordance with ASTM D 4253 and D 4254. Field density in-place tests will be performed in accordance with ASTM D 1556, ASTM D 2922, or by such other means acceptable to the ENGINEER.
- C. In case the tests of the fill or backfill show non-compliance with the required density, the CONTRACTOR shall accomplish such remedy as may be required to insure compliance. Subsequent testing to show compliance shall be by a testing laboratory selected by the OWNER and shall be at the CONTRACTOR's expense.
- D. Particle size analysis of soils and aggregates will be performed using ASTM D 422.
- E. Determination of sand equivalent value will be performed using ASTM D 2419.
- F. **Unified Soil Classification System:** References in these specifications to soil classification types and standards shall be as set forth in ASTM D 2487.

PART 2 -- PRODUCTS

2.1 SUITABLE FILL AND BACKFILL MATERIAL REQUIREMENTS

- A. **General:** Fill, backfill, and embankment materials shall be suitable selected or processed clean, fine earth, rock, or sand, free from grass, roots, brush, or other vegetation.

- B. Fill and backfill materials to be placed within 6 inches of any structure or pipe shall be free of rocks or unbroken masses of earth materials having a maximum dimension larger than 3 inches.
- C. **Suitable Materials:** Soils not classified as unsuitable as defined in Paragraph entitled, "Unsuitable Material" herein, are defined as suitable materials and may be used in fills, backfilling, and embankment construction subject to the specified limitations. In addition, when acceptable to the ENGINEER, some of the material listed as unsuitable may be used when thoroughly mixed with suitable material to form a stable composite.
- D. Suitable materials may be obtained from on-site excavations, may be processed on-site materials, or may be imported. If imported materials are required to meet the requirements of this Section or to meet the quantity requirements of the project the CONTRACTOR shall provide the imported materials at no additional expense to the OWNER, unless a unit price item is included for imported materials in the bidding schedule.
- E. The following types of suitable materials are designated and defined as follows
1. **One inch minus granular backfill:** Crushed rock, gravel, or sand with 100 percent passing a 1-inch sieve and a sand equivalent value not less than 50.
 2. **One-half inch minus granular backfill:** Crushed rock, gravel, or sand with 100 percent passing a 1/2-inch sieve and a sand equivalent value not less than 50.
 3. **Sand backfill:** Sand with 100 percent passing a 3/8-inch sieve, at least 90 percent passing a Number 4 sieve, and a sand equivalent value not less than 30.
 4. **Coarse rock backfill:** Crushed rock or gravel with 100 percent passing a 1-inch sieve and not more than 10 percent passing a Number 4 sieve.
 5. **Pea gravel backfill:** Crushed rock or gravel with 100 percent passing a 1/2-inch sieve and not more than 10 percent passing a Number 4 sieve.
 6. **Coarse drain-rock:** Crushed rock or gravel meeting the following gradation requirements:

<u>Sieve Size</u>	<u>Percentage Passing</u>
2-inch	100
1-1/2-inch	90 - 100
1-inch	20 - 55
3/4-inch	0 - 15
No. 200	0 - 3

7. **Aggregate base:** Crushed rock aggregate base material of such nature that it can be compacted readily by watering and rolling to form a firm, stable base for pavements. At the option of the CONTRACTOR, the grading for either the 1-1/2-inch maximum size or 3/4-inch maximum size shall be used. The sand equivalent value shall be not less than 22, and the material shall meet the following gradation requirements:

<u>Sieve Size</u>	<u>Percentage Passing</u>	
	<u>1-1/2-inch Max.</u>	<u>3/4-inch Max.</u>
2-inch	100	-
1-1/2-inch	90 - 100	-
1-inch	-	100
3/4-inch	50 - 85	90 - 100
No. 4	25 - 45	35 - 55

No. 30
No. 200

10 - 25
2 - 9

10 - 30
2 - 9

8. **Graded drain-rock:** Drain-rock shall be crushed rock or gravel, durable and free from slaking or decomposition under the action of alternate wetting or drying. The material shall be uniformly graded and shall meet the following gradation requirements:

<u>Sieve Size</u>	<u>Percentage Passing</u>
1-inch	100
3/4-inch	90 - 100
3/8-inch	40 - 100
No. 4	25 - 40
No. 8	18 - 33
No. 30	5 - 15
No. 50	0 - 7
No. 200	0 - 3

The drain-rock shall have a sand equivalent value not less than 75. The finish graded surface of the drain-rock immediately beneath structures shall be stabilized to provide a firm, smooth surface upon which to construct reinforced concrete floor slabs.

9. **Suitable Native Soil:** Any other suitable material as defined herein.
10. **Cement-treated backfill:** Material which consists of granular soils which has been cement-treated so that the cement content of the material is not less than 5 percent by weight when tested in accordance with ASTM D 2901. The ultimate compressive strength at 28 days shall be not less than 400 psi when tested in accordance with ASTM D 1633.
11. **Topsoil:** Stockpiled topsoil material which has been obtained at the site by removing soil to a depth not exceeding 2 feet. Removal of the topsoil shall be done after the area has been stripped of vegetation and debris as specified.
12. **Class I crushed stone:** Manufactured angular, granular crushed stone, rock, or slag, with 100 percent passing a 1-inch sieve and less than 5 percent passing a Number 4 sieve.
13. **Aggregate subbase:** Crushed rock aggregate subbase material that can be compacted readily by watering and rolling to form a firm stable base. The sand equivalent value shall be not less than 18 and shall meet the following requirements:

<u>Sieve Size</u>	<u>Percentage Passing</u>
3-inch	100
2-1/2 inch	87 - 100
No. 4	35 - 95
No. 200	0 - 29

14. **Trench plug:** Low permeability fill material, a clay material having a minimum plasticity index of 10.

2.2 UNSUITABLE MATERIAL

- A. Unsuitable materials include the materials listed below:

1. Soils which, when classified under ASTM D 2487, fall in the classifications of Pt, OH, CH, MH, or OL.
2. Soils which cannot be compacted sufficiently to achieve the density specified for the intended use.
3. Soils that contain greater concentrations of chloride or sulfate ions, or have a soil resistivity or pH less than the existing on-site soils.
4. Topsoil, except as allowed below.

2.3 USE OF FILL, BACKFILL, AND EMBANKMENT MATERIAL TYPES

- A. The CONTRACTOR shall use the types of materials as designated herein for all required fill, backfill, and embankment construction hereunder.
- B. Where these Specifications conflict with the requirements of any local agency having jurisdiction, or with the requirements of a material manufacturer, the ENGINEER shall be immediately notified. In case of conflict therewith, the CONTRACTOR shall use the most stringent requirement, as determined by the ENGINEER.
- C. Fill and backfill types shall be used in accordance with the following provisions:
 1. Embankment fills shall be constructed of suitable native material acceptable to the ENGINEER, or any mixture of imported materials as directed by ENGINEER.
 2. Pipe zone backfill, as defined under "Pipe and Utility Trench Backfill" herein, shall consist of the materials specified on the drawings and details. Where pipelines are installed on grades exceeding 4 percent, and where backfill materials are graded such that there is less than 10 percent passing a Number 4 sieve, trench plugs of clay material shall be provided at maximum intervals of 200 feet or as shown on the Drawings.
 3. Trench zone backfill for pipelines as defined under "Pipe and Utility Trench Backfill" shall be suitable native backfill material or any imported materials or any mixture thereof, except topsoil, acceptable to the ENGINEER.
 4. Final backfill material for pipelines under paved areas, as defined under "Pipe and Utility Trench Backfill" shall be granular material acceptable to the ENGINEER, typically aggregate base course. Final backfill under areas not paved shall be the same material as that used for trench backfill, except topsoil.
 5. Trench backfill and final backfill for pipelines under structures shall be the same material as used in the pipe zone, except where concrete encasement is required by the Contract Documents.
 6. Aggregate base materials under pavements shall be constructed to the thicknesses shown or specified. Where specified or shown, aggregate subbase shall be as specified.
 7. Backfill around structures shall be any non-expansive 6" minus native or imported material, or any mixture thereof, as specified and approved by the ENGINEER.
 8. Backfill materials beneath structures shall be as follows:

- a. Under structures where groundwater must be removed to allow placement of fill or concrete, coarse drain-rock material shall be used.
 - b. Under all other structures, minus 1-1/2 inch crushed rock material or aggregate base course shall be used.
9. Backfill used to replace pipeline trench over-excavation shall be a layer coarse drain-rock material with a 6-inch top filter layer of sand material or filter fabric to prevent migration of fines for wet trench conditions or the same material as used for the pipe zone backfill if the trench conditions are not wet. Filter fabric shall be **Mirafi 140 N, Mirafi 700X**, or equal.
10. The top 6 inches of fill on embankment fills, cut slopes, and around all structures, and all other embankment fills shall consist of Type K material, topsoil.

PART 3 -- EXECUTION

3.1 EXCAVATION - GENERAL

- A. **General:** Except when specifically provided to the contrary, excavation shall include the removal of all materials of whatever nature encountered, including all obstructions of any nature that would interfere with the proper execution and completion of the WORK. The removal of said materials shall conform to the lines and grades indicated or ordered. Unless otherwise indicated, the entire construction site shall be stripped of all vegetation and debris, and such material shall be removed from the site prior to performing any excavation or placing any fill. The CONTRACTOR shall furnish, place, and maintain all supports and shoring that may be required for the sides of the excavations. Excavations shall be sloped or otherwise supported in a safe manner in accordance with applicable State safety requirements and the requirements of OSHA Safety and Health Standards for Construction (29CFR1926).
- B. **Removal and Exclusion of Water:** The CONTRACTOR shall remove and exclude water, including stormwater, groundwater, irrigation water, and wastewater, from all excavations. Dewatering wells, wellpoints, sump pumps, or other means shall be used to remove water and continuously maintain groundwater at a level at least two feet below the bottom of excavations before the excavation work begins at each location. Water shall be removed and excluded until backfilling is complete and all field soils testing has been completed. Dewatering shall be in accordance with Specification 02140 – Dewatering.

3.2 STRUCTURE, ROADWAY, AND EMBANKMENT EXCAVATION

- A. **Excavation Beneath Structures and Embankments:** Except where otherwise specified for a particular structure or ordered by the ENGINEER, excavation shall be carried to the grade of the bottom of the footing or slab. Where shown or ordered, areas beneath structures or fills shall be over-excavated. The subgrade areas beneath embankments shall be excavated to remove not less than the top 6 inches of native material and where such subgrade is sloped, the native material shall be benched. When such over-excavation is shown, both over-excavation and subsequent backfill to the required grade shall be performed by the CONTRACTOR. When such over-excavation is not shown but is ordered by the ENGINEER, such over-excavation and any resulting backfill will be paid for under a separate unit price bid item if such bid item has been established; otherwise payment will be made in accordance with a negotiated price. After the required excavation or over-excavation has been completed, the exposed surface shall be scarified to a depth of 6 inches, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain 95 percent of maximum density.

- B. **Excavation Beneath Paved Areas:** Excavation under areas to be paved shall extend to the bottom of the aggregate base or subbase, if such base is called for; otherwise it shall extend to the paving thickness. After the required excavation has been completed, the top 12 inches of exposed surface shall be scarified, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain 95 percent of maximum density. The finished subgrade shall be even, self-draining, and in conformance with the slope of the finished pavement. Areas that could accumulate standing water shall be re-graded to provide a self-draining subgrade.
- C. **Notification of ENGINEER:** The CONTRACTOR shall notify the ENGINEER at least 3 days in advance of completion of any structure excavation and shall allow the ENGINEER a review period of at least one day before the exposed foundation is scarified and compacted or is covered with backfill or with any construction materials.

3.3 PIPELINE AND UTILITY TRENCH EXCAVATION

- A. **General:** Unless otherwise shown or ordered, excavation for pipelines and utilities shall be open-cut trenches. Trench widths shall be kept as narrow as is practical for the method of pipe zone densification selected by the CONTRACTOR, but shall have a minimum width at the bottom of the trench equal to the outside diameter of the pipe plus 24 inches for mechanical compaction methods and 18 inches for water consolidation methods. The maximum width at the top of the pipe shall be equal to the outside diameter of the pipe plus 36 inches for pipe diameters 18 inches and larger and to the outside diameter of the pipe plus 24 inches for pipe diameters less than 18 inches, or as shown on the Drawings.
- B. **Trench Bottom:** Except when pipe bedding is required, the bottom of the trench shall be excavated uniformly to the grade of the bottom of the pipe. The trench bottom shall be given a final trim, using a string line for establishing grade, such that each pipe section when first laid will be continually in contact with the ground along the extreme bottom of the pipe. Rounding out the trench to form a cradle for the pipe will not be required. Excavations for pipe bells and welding shall be made as required.
- C. **Open Trench:** The maximum amount of open trench permitted in any one location shall be 500 feet, or the length necessary to accommodate the amount of pipe installed in a single day, whichever is greater. All trenches shall be fully backfilled at the end of each day or, in lieu thereof, shall be covered by heavy steel plates adequately braced and capable of supporting vehicular traffic in those locations where it is impractical to backfill at the end of each day. The above requirements for backfilling or use of steel plate will be waived in cases where the trench is located further than 100 feet from any traveled roadway or occupied structure. In such cases, however, barricades and warning lights meeting OSHA requirements shall be provided and maintained.
- D. **Trench Over-Excavation:** Where the Drawings indicate that trenches shall be over-excavated, they shall be excavated to the depth shown, and then backfilled to the grade of the bottom of the pipe.
- E. **Over-Excavation:** When ordered by the ENGINEER, whether indicated on the Drawings or not, trenches shall be over-excavated beyond the depth shown. Such over-excavation shall be to the depth ordered. The trench shall then be backfilled to the grade of the bottom of the pipe.
- F. Where pipelines are to be installed in embankment or structure fills, the fill shall be constructed to a level at least one foot above the top of the pipe before the trench is excavated.

- G. If a moveable trench shield is used during excavation operations, the trench width shall be wider than the shield so that the shield is free to be lifted and then moved horizontally without binding against the trench sidewalls. If the trench walls cave in or slough, the trench shall be excavated as an open excavation with sloped sidewalls or with trench shoring, as indicated and as required by the pipe structural design.

3.4 OVER-EXCAVATION NOT ORDERED, SPECIFIED, OR SHOWN

- A. Any over-excavation carried below the grade ordered, specified, or shown, shall be backfilled to the required grade with the specified material and compaction.

3.5 EXCAVATION IN LAWN AREAS

- A. Where excavation occurs in lawn areas, the sod shall be carefully removed, dampened, and stockpiled to preserve it for replacement. Excavated material may be placed on the lawn; provided, that a drop cloth or other suitable method is employed to protect the lawn from damage. The lawn shall not remain covered for more than 72 hours. Immediately after completion of backfilling [and testing of the pipeline], the sod shall be replaced and lightly rolled in a manner so as to restore the lawn as near as possible to its original condition. CONTRACTOR shall provide new sod if stockpiled sod has not been replaced within 72 hours.

3.6 EXCAVATION IN VICINITY OF TREES

- A. Except where trees are shown to be removed, trees shall be protected from injury during construction operations. No tree roots over 2 inches in diameter shall be cut without express permission of the ENGINEER. Trees shall be supported during excavation by any means previously reviewed by the ENGINEER.

3.7 ROCK EXCAVATION

- A. Rock excavation shall include removal and disposal of the following: (1) all boulders measuring 1/3 of a cubic yard or more in volume; (2) all rock material in ledges, bedding deposits, and unstratified masses which cannot be removed without systematic drilling and blasting; (3) concrete or masonry structures which have been abandoned; and (4) conglomerate deposits which are so firmly cemented that they possess the characteristics of solid rock and which cannot be removed without systematic drilling and blasting.
- B. **Explosives and Blasting:** Blasting will not be permitted, except by express permission of the ENGINEER on a case-by-case basis. The use of explosives will be subject to the approval and regulations of all agencies having jurisdiction. If blasting is utilized at the site of the WORK, the CONTRACTOR shall take all precautions and provide all protective measures necessary to prevent damage to property and structures or injury to person. Prior to blasting, the CONTRACTOR shall secure all permits required by law for blasting operations and shall provide any additional hazard insurance required by the OWNER. The CONTRACTOR shall have a fully qualified and experienced blasting foreman in charge of all blasting operations.
- C. The CONTRACTOR will be held responsible for all and shall make good any damage caused by blasting or resulting from its possession or use of explosives on the WORK.
- D. All operations involving the handling, storage, and use of explosives shall be conducted in accordance with the requirements of the OSHA Standards for Construction, and in accordance with all local laws and regulations.

3.8 BACKFILL - GENERAL

- A. Backfill shall not be dropped directly upon any structure or pipe. Backfill shall not be placed around nor upon any structure until the concrete has attained sufficient strength to withstand the loads imposed.
- B. Except for drain-rock materials being placed in over-excavated areas or trenches, backfill shall be placed after all water is removed from the excavation.

3.9 PLACING AND SPREADING OF BACKFILL MATERIALS

- A. Backfill materials shall be placed and spread evenly in layers. When compaction is achieved using mechanical equipment the layers shall be evenly spread so that when compacted each layer shall not exceed 6 inches in thickness.
- B. During spreading each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer. Pipe zone backfill materials shall be manually spread around the pipe so that when compacted the pipe zone backfill will provide uniform bearing and side support.
- C. Where the backfill material moisture content is below the optimum moisture content water shall be added before or during spreading until the proper moisture content is achieved.
- D. Where the backfill material moisture content is too high to permit the specified degree of compaction the material shall be dried until the moisture content is satisfactory.

3.10 COMPACTION OF FILL, BACKFILL, AND EMBANKMENT MATERIALS

- A. All backfill materials as defined herein, where the material is graded such that at least 10 percent passes a No. 4 sieve, shall be mechanically compacted to the specified percentage of maximum density. Equipment that is consistently capable of achieving the required degree of compaction shall be used and each layer shall be compacted over its entire area while the material is at the required moisture content.
- B. Each layer of crushed rock backfill materials shall be compacted by means of at least 2 passes from a flat plate vibratory compactor. When such materials are used for pipe zone backfill, vibratory compaction shall be used at the top of the pipe zone or at vertical intervals of 24 inches, whichever is the least distance from the subgrade.
- C. Flooding, ponding, or jetting shall not be used for fill on roofs, backfill around structures, backfill around reservoir walls, for final backfill materials, or aggregate base materials.
- D. Equipment weighing more than 10,000 pounds shall not be used closer to walls than a horizontal distance equal to the depth of the fill at that time. Hand operated power compaction equipment shall be used where use of heavier equipment is impractical or restricted due to weight limitations.
- E. **Compaction Requirements:** The following compaction test requirements shall be in accordance with ASTM D 1557 for all materials. Where agency or utility company requirements govern, the highest compaction standards shall apply.

<u>Location or Use of Fill</u>	<u>Percentage of Maximum Density</u>
Pipe zone backfill portion above bedding for flexible pipe.	93
Pipe zone backfill bedding and over-excavated zones under bedding/pipe for flexible pipe, including trench plugs.	95
Pipe zone backfill portion above bedding for rigid pipe.	93
Pipe zone backfill bedding and over-excavated zones under bedding/pipe for rigid pipe.	95
Final backfill, beneath paved areas or structures.	95
Final backfill, not beneath paved areas or structures.	93
Trench zone backfill, not beneath paved areas or structures, including trench plugs.	93
Embankments.	90
Embankments, beneath paved areas or structures.	95
Backfill beneath structures.	95
Topsoil	88
Aggregate base or subbase	95

- C. **Trench Backfill Requirements:** The pipe has been structurally designed based upon the trench configuration specified herein.
- D. The CONTRACTOR shall maintain the indicated trench cross section up to a horizontal plane lying 6 inches above the top of the pipe.
- E. If, at any location under said horizontal plane, the CONTRACTOR slopes the trench walls or exceeds the maximum trench widths indicated in the Contract Documents, the pipe zone backfill shall be "improved" or the pipe class increased as specified herein, at no additional cost to the OWNER. "Improved" backfill shall mean sand-cement backfill or other equivalent materials acceptable to the ENGINEER.
- F. If the allowable deflection specified for the pipe is exceeded, the CONTRACTOR shall expose and re-round or replace the pipe, repair all damaged lining and coating, and reinstall the pipe zone material and trench backfill as specified at no additional expense to the OWNER.

3.12 PIPE AND UTILITY TRENCH BACKFILL

- A. **Pipe Zone Backfill:** The pipe zone is defined as that portion of the vertical trench cross-section lying between a plane 6 inches below the bottom surface of the pipe, i.e., the trench subgrade, and a plane at a point 6 inches above the top surface of the pipe. The bedding for flexible pipe is defined as that portion of pipe zone backfill material between the trench subgrade and the bottom of the pipe. The bedding for rigid pipe is defined as that portion of the pipe zone backfill material between the trench subgrade and a level line which varies from the bottom of the pipe to the spring-line as shown.
- B. Bedding shall be provided for all sewers, drainage pipelines, and other gravity flow pipelines. Unless otherwise specified or shown, for other pipelines the bedding may be omitted if all the following conditions exist.
 - 1. The pipe bears on firm, undisturbed native soil which contains only particles that will pass a one-inch sieve.
 - 2. The trench excavation is not through rock or stones.
 - 3. The trench subgrade soils are classified as suitable fill and backfill materials per Paragraph 2.1.
 - 4. The trench subgrade soils have, as a maximum, a moisture content that allows compaction.
- C. Where bedding is required, after compacting the bedding the CONTRACTOR shall perform a final trim using a string-line for establishing grade, such that each pipe section when first laid will be continually in contact with the bedding along the extreme bottom of the pipe. Excavation for pipe bells and welding shall be made as required.
- D. The pipe zone shall be backfilled with the specified backfill material. The CONTRACTOR shall exercise care to prevent damage to the pipeline coating, cathodic bonds, or the pipe itself during the installation and backfill operations.
- E. **Trench Zone Backfill:** After the pipe zone backfill has been placed as specified above, and after all excess water has completely drained from the trench, backfilling of the trench zone may proceed. The trench zone is defined as that portion of the vertical trench cross-section lying between a plane 6 inches above the top surface of the pipe and a plane at a point 18 inches below the finished surface grade, or if the trench is under pavement, 18 inches below the roadway subgrade. If flooding, ponding, or jetting is used the pipe shall be filled with water to prevent flotation.
- F. **Final Backfill:** Final backfill is all backfill in the trench cross-sectional area within 18 inches of finished grade, or if the trench is under pavement, all backfill within 18 inches of the roadway subgrade.

3.13 EMBANKMENT CONSTRUCTION

- A. The area where an embankment is to be constructed shall be cleared of all vegetation, roots and foreign material. Following this, the surface shall be moistened, scarified to a depth of 6 inches, and rolled or otherwise mechanically compacted. Embankment fill material shall be placed and spread evenly in approximately horizontal layers. Each layer shall be moistened or aerated, as necessary. Unless otherwise approved by the ENGINEER, each layer shall not exceed 6 inches of compacted thickness. The embankment fill and the scarified layer of underlying ground shall be compacted to 95 percent of maximum density under structures and paved areas, and 90 percent of maximum density elsewhere.
- B. When an embankment fill is to be made and compacted against hillsides or fill slopes steeper than 4:1, the slopes of hillsides or fills shall be horizontally benched to key the embankment fill to the underlying ground. A minimum of 12 inches normal to the slope of the hillside or fill shall be removed and re-compacted as the embankment fill is brought up in layers. Material thus cut shall be re-compacted along with the new fill material at the CONTRACTOR's expense. Hillside or fill slopes 4:1 or flatter shall be prepared in accordance with Paragraph A, above.
- C. Where embankment or structure fills are constructed over pipelines, the first 4 feet of fill over the pipe shall be constructed using light placement and compaction equipment that does not damage the pipe. Heavy construction equipment shall maintain a minimum distance from the edge of the trench equal to the depth of the trench until at least 4 feet of fill over the pipe has been completed.

- END OF SECTION -

SECTION 02540
PRECAST CONCRETE MANHOLES AND VAULTS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide precast concrete manholes and vaults, complete and in place.

1.2 QUALITY ASSURANCE

- A. **Inspection:** After installation, the CONTRACTOR shall demonstrate that manholes and vaults have been properly installed, level, with tight joints, at the correct elevations and orientations, and that the backfilling has been carried out in accordance with Section 02200 - Earthwork.

PART 2-- PRODUCTS

2.1 MANHOLES

- A. The CONTRACTOR shall provide precast manhole sections and conical sections conforming to ASTM C 478 and the requirements of this Section. Adjusting rings shall be standard items from the manufacturer of the manhole sections. All sections will be reinforced with welded wire mesh per ASTM C 478 and will have a minimum wall thickness of five (5) inches.
- B. Axial length of sections shall be selected to provide the correct total height with the fewest joints.
- C. Conical sections shall be designed to support cast iron frames and covers under an H-20 loading, unless indicated otherwise.
- C. **Design Criteria:** Manhole walls, transitions, conical sections, and base shall be designed per ASTM C 478 for the depths indicated and the following:
 - 1. AASHTO H-20 loading applied to the cover.
 - 2. Unit weight of soil of 120 pcf located above all portions of the manhole.
 - 3. Lateral soil pressure based on saturated soil producing 100 pcf acting on an empty manhole.
 - 4. Internal fluid pressure based on unit weight of 63 pcf with manhole filled from invert to cover with no balancing external soil pressure.
 - 5. Dead load of manhole sections fully supported by the base and transition.
 - 6. Additional reinforcing steel in walls to transfer stresses at openings.
 - 7. The minimum clear distance between the edges of any 2 wall penetrations shall be 12-inches or one-half of the diameter of the smaller penetration, whichever is greater.
- G. Concrete for base and channel formation shall be 3000 psi after 28-days.
- H. Barrel section to sewer pipe connections shall be sealed with resilient connectors complying with

ASTM C 923. Mechanical devices shall be stainless steel.

- I. Manhole steps shall be comprised of 1/2-inch grade 60 steel reinforcement rod encased in polypropylene copolymer plastic. Steps shall have tread width of 14-inches.

2.2 FRAMES AND COVERS

- A. **Castings:** Castings for manhole frames and covers shall be non-rocking and shall conform to the requirements of ASTM A 48, Class 30. Unless otherwise indicated, cast iron covers and frames shall be heavy traffic type, 24-inches in diameter, with embossed lettering saying "Sewer" to meet the requirements of the City or District. Frame and cover shall be designed for H-20 traffic loading.

2.3 VAULTS

- A. The CONTRACTOR shall provide precast vaults designed for the indicated applications and of the sizes indicated.
- B. The minimum structural member thickness for vaults shall be 5-inches. Cement shall be Type V portland cement as specified in ASTM C 150. The minimum 28-day concrete compressive strength shall be 4,000 psi. All reinforcing steel shall be embedded in the concrete with a minimum clear cover as recommended by ACI 318.
- C. Design Loading: Vaults in areas subject to vehicular traffic shall be designed for H-20 traffic loading. Vaults in other areas shall be designed for a vertical live load of 300 psf. Lateral loads on vaults in all areas shall be calculated from:

$$L = 90 h, \text{ plus surcharge of 240 psf in areas of vehicular traffic}$$

$$\text{Where } L = \text{loading in psf}$$

$$h = \text{depth of fill in feet}$$

- D. Where joints are designed in pre-cast concrete vaults, such joints shall be interlocking to secure proper alignment between members and prevent migration of soil through the joint. Structural sections at joints shall be sized sufficiently to reinforce the section against localized distress during transportation and handling and against excess contact bearing pressures through the joint.
- E. Where openings for access to the vault are required, the full clear space opening indicated shall be provided, without obstructions from brackets or supports. For large openings where brackets or supports are designed to protrude into the opening for support of required covers, such brackets or supports shall be designed to be easily removed and replaced with a minimum of effort and without cutting or welding.
- F. Covers for access openings shall be provided. Frames for covers shall be fabricated from steel, galvanized after fabrication, and shall be integrally cast into the vault concrete sections. All covers shall be tight fitting to prevent the entrance of dirt and debris. Where edge seams are permitted, no gaps greater than 1/16-inch between edges will be accepted. All covers, except round, heavy-weight, cast iron manhole covers, shall have securing mechanisms to hold the covers firmly in place against the effects of repetitious live loads such as pedestrian or vehicle traffic.
- G. Where penetration of the pre-cast concrete vault are required for piping, conduit, or ducts, such penetrations shall be accommodated through pre-cast openings or thin-wall knock-out sections.

All openings for penetrations shall be smooth and free of surface irregularities and without exposed steel reinforcing. Vaults need not be designed to resist thrust from piping passing through the vault.

PART -- EXECUTION

3.1 GENERAL

- A. Pre-cast concrete sections shall be transported and handled with care in accordance with the manufacturer's written recommendations. Where lifting devices are provided in pre-cast sections, such lifting devices shall be used as intended. Where no lifting devices are provided, the CONTRACTOR shall follow the manufacturer's recommendations for lifting procedures to provide proper support during lifting.
- B. Buried pre-cast concrete vaults shall be assembled and placed in excavations on properly compacted soil foundations as indicated. Pre-cast concrete vaults shall be set to grade and oriented to provide the required dimensions and clearances from pipes and other structures.
- C. Prior to backfilling, all cracks and voids in pre-cast concrete vaults shall be filled with non-shrink grout or polyurethane sealant, or both. Around pipe and conduit penetrations, openings shall be sealed with polyurethane sealant. With the authorization of the ENGINEER, grout or a closed-cell flexible insulation may be used as filler material prior to placing a final bed of polyurethane sealant.
- D. Steps shall be driven into tapered holes formed in the concrete by inserts from the step manufacturer or 1-inch holes drilled 3-3/4-inches deep into the manhole wall in the field. No more than 6-1/8 inches of plastic arm, measured on the inside of the step, shall be exposed outside the concrete.
- E. Steps shall be installed not more than 1/2 inch out of plumb.

- END OF SECTION -

SECTION 02565
DUCTILE IRON PIPE (AWWA C151, MODIFIED)

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide ductile iron pipe and all appurtenant work, complete in place.

PART 2 -- PRODUCTS

2.1 GENERAL

- A. Mortar-lined and polyethylene-wrapped ductile iron pipe shall conform to ANSI/AWWA C151, C104, and C105, subject to the following supplemental requirements. The pipe shall be of the diameter and class indicated, shall be furnished complete with rubber gaskets as indicated in the Contract Documents, and all specials and fittings shall be provided as required under the Contract Documents.
- B. **Handling and Storage:** The pipe shall be handled by devices acceptable to the ENGINEER, designed and constructed to prevent damage to the pipe coating/exterior. The use of equipment which might injure the pipe coating/exterior will not be permitted. Stockpiled pipe shall be suitably supported and shall be secured to prevent accidental rolling. All other pipe handling equipment and methods shall be acceptable to the ENGINEER.
- C. **Laying Lengths:** Maximum pipe laying lengths shall be 20 ft with shorter lengths provided as required by the Drawings.
- D. **Finish:** The pipe shall have smooth dense interior surfaces and shall be free from fractures, excessive interior surface crazing and roughness.

2.2 PIPE DESIGN CRITERIA

- A. **General:** Ductile iron pipe shall be designed in accordance with the requirements of ANSI/AWWA C150 as applicable and as modified in this Section.
- B. **Pipe Wall Thickness Class.** Unless indicated otherwise on the drawings, the pipe thickness shall be based on Pressure Class 150.

2.3 MATERIALS

- A. **Ductile Iron Pipe:** Pipe materials shall conform to the requirements of ANSI/AWWA C151.
- B. **Cement:** Cement for mortar lining shall conform to the requirements of ANSI/AWWA C104; provided, that cement for mortar lining shall be Type II or V. Cement shall not originate from kilns which burn metal-rich hazardous waste fuel, nor shall a fly ash or pozzolan be used as a cement replacement.
- C. **Polyethylene Sleeve:** Material for the polyethylene sleeve shall conform to the requirements of ANSI/AWWA C105.

2.4 SPECIALS AND FITTINGS

- A. Fittings for ductile iron pipe shall conform to the requirements of ANSI/AWWA C153/A21.53 or ANSI/AWWA C110/A21.10 for diameters 3-inch through 48-inch and shall have a minimum pressure rating of 250 psi.

2.5 DESIGN OF PIPE

- A. **General:** The pipe shall be ductile iron pipe, mortar-lined and polyethylene-wrapped, with rubber-gasketed joints as shown.
- B. The pipe shall be designed, manufactured, tested, inspected, and marked according to applicable requirements previously stated and except as hereinafter modified, shall conform to ANSI/AWWA C151.
- C. **Pipe and Fitting Dimensions:** The pipe and fittings shall be of the diameter shown.
- D. Joint Design
 - 1. Mechanical and push-on joints shall conform to ANSI/AWWA C111/A21.11.
 - 2. Flanged joints shall conform to ANSI/AWWA C115/A21.15.
 - 3. Restrained joints shall be "**Lok-Ring**" **Restrained Joint by American Ductile Iron Pipe, "TR FLEX" Restrained Joint by U.S. Pipe**, or equal.
- E. For bell-and-spigot ends with rubber gaskets, the clearance between the bells and spigots shall be such that when combined with the gasket groove configuration and the gasket itself, will provide watertight joints under all operating conditions when properly installed.
- F. Shop-applied interior linings and exterior coatings shall be held back from the ends of the pipe as shown or as otherwise acceptable to the ENGINEER.

2.6 CEMENT-MORTAR LINING

- A. **Cement-Mortar Lining for Shop Application:** Except as otherwise provided herein, interior surfaces of all ductile iron pipe, fittings, and specials shall be cleaned and lined in the shop with cement-mortar lining applied centrifugally in conformity with ANSI/AWWA C104. During the lining operation and thereafter, the pipe shall be maintained in a round condition by suitable bracing or strutting. The lining machines shall be of a type that has been used successfully for similar work. Every precaution shall be taken to prevent damage to the lining. If lining is damaged or found faulty at delivery site, the damaged or unsatisfactory portions shall be replaced with lining conforming to these Specifications.
- B. The minimum lining thickness shall be as follows:

<u>Nominal Pipe Diameter (in)</u>	<u>Minimum Lining Thickness (in)</u>
3-12	1/8
14-24	3/16

- C. **Protection of Pipe Lining/Interior:** All shop-applied cement mortar lining shall be given a seal coat of asphaltic material in conformance with ANSI/AWWA C104.

2.7 EXTERIOR COATING OF PIPE

- A. **Exterior Coating of Exposed Piping:** The exterior surfaces of pipe which will be exposed to the atmosphere inside structures or above ground shall be thoroughly cleaned and then given a shop coat of rust-inhibitive primer conforming to the requirements of Section 09800, "Protective Coating."
- B. **Exterior Coating of Buried Piping:** The exterior coating shall be an asphaltic coating approximately 1 mil thick with 8 mil polyethelene sleeve sealed around the pipe and fittings.

PART 3 -- EXECUTION

3.1 INSTALLATION OF PIPE

- A. **Handling and Storage:** All pipe, fittings, etc., shall be carefully handled and protected against damage, impact shocks, and free fall. All pipe handling equipment shall be acceptable to the ENGINEER. Pipe shall not be placed directly on rough ground but shall be supported in a manner which will protect the pipe against injury whenever stored at the trench site or elsewhere. No pipe shall be installed where the lining or coating show defects that may be harmful as determined by the ENGINEER. Such damaged lining or coating shall be repaired, or a new undamaged pipe shall be furnished and installed.
- B. All pipe damaged prior to Substantial Completion shall be repaired or replaced by the CONTRACTOR.
- C. The CONTRACTOR shall inspect each pipe and fitting prior to installation to insure that there are no damaged portions of the pipe.
- D. Before placement of pipe in the trench, each pipe or fitting shall be thoroughly cleaned of any foreign substance, which may have collected thereon and shall be kept clean at all times thereafter. For this purpose, the openings of all pipes and fittings in the trench shall be closed during any interruption to the WORK.
- E. **Pipe Laying:** The pipe shall be installed in accordance with ANSI/AWWA C600.
- F. Pipe shall be laid directly on the imported bedding material. No blocking will be permitted, and the bedding shall be such that it forms a continuous, solid bearing for the full length of the pipe. Excavations shall be made as needed to facilitate removal of handling devices after the pipe is laid. Bell holes shall be formed at the ends of the pipe to prevent point loading at the bells or couplings. Excavation shall be made as needed outside the normal trench section at field joints to permit adequate access to the joints for field connection operations and for application of coating on field joints.
- G. Each section of pipe 24 inches in diameter and larger shall be laid in the order and position shown on the laying schedule. In laying pipe, it shall be laid to the set line and grade, within approximately one inch plus or minus. On grades of zero slope, the intent is to lay to grade.
- H. Where necessary to raise or lower the pipe due to unforeseen obstructions or other causes, the ENGINEER may change the alignment and/or the grades. Such change shall be made by the deflection of joints, by the use of bevel adapters, or by the use of additional fittings. However, in no case shall the deflection in the joint exceed the maximum deflection recommended by the pipe manufacturer. No joint shall be misfit any amount which will be detrimental to the strength and water tightness of the finished joint.

- I. Except for short runs which may be permitted by the ENGINEER, pipes shall be laid uphill on grades exceeding 10 percent. Pipe which is laid on a downhill grade shall be blocked and held in place until sufficient support is furnished by the following pipe to prevent movement. All bends shall be properly installed as shown.
- J. **Cold Weather Protection:** No pipe shall be installed upon a foundation into which frost has penetrated or at any time that there is a danger of the formation of ice or penetration of frost at the bottom of the excavation. No pipe shall be laid unless it can be established that the trench will be backfilled before the formation of ice and frost occurs.
- K. **Pipe and Specials Protection:** The openings of all pipe and specials shall be protected with suitable bulkheads to prevent unauthorized access by persons, animals, water or any undesirable substance. At all times, means shall be provided to prevent the pipe from floating.
- L. **Pipe Cleanup:** As pipe laying progresses, the CONTRACTOR shall keep the pipe interior free of all debris. The CONTRACTOR shall completely clean the interior of the pipe of all sand, dirt, mortar splatter and any other debris following completion of pipe laying, pointing of joints and any necessary interior repairs prior to testing and disinfecting the completed pipeline.

3.2 RUBBER GASKETED JOINTS

- A. **Rubber Gasketed Joints:** Immediately before jointing pipe, the bell end of the pipe shall be thoroughly cleaned, and a clean rubber gasket lubricated with an approved vegetable-based lubricant shall be placed in the bell groove. The spigot end of the pipe shall be carefully cleaned and lubricated with a vegetable-based lubricant. The spigot end of the pipe section shall then be inserted into the bell of the previously laid joint and telescoped into its proper position. Tilting of the pipe to insert the spigot into the bell will not be permitted.

3.3 POLYETHYLENE SLEEVE UNBONDED COATING

- A. Buried ductile iron pipe shall be polyethylene encased in accordance with the requirements of ANSI/AWWA C105/A21.5.

3.4 INSTALLATION OF PIPE APPURTENANCES

- A. **Protection of Appurtenances:** Where the joining pipe is tape-coated, buried appurtenances shall be coated with cold-applied tape in accordance with ANSI/AWWA C209, Type II. Where pipe is encased in polyethylene sleeves, buried appurtenances shall also be encased in polyethylene.
- B. **Installation of Valves:** All valves shall be handled in a manner to prevent any injury or damage to any part of the valve. All joints shall be thoroughly cleaned and prepared prior to installation. The CONTRACTOR shall adjust all stem packing and operate each valve prior to installation to insure proper operation.
- C. All valves shall be installed so that the valve stems are plumb and in the location shown.

3.5 FIELD TESTING

- A. Pipes shall be tested in accordance with Section 02622 – “Pipeline and Manhole Testing”.

- END OF SECTION -

SECTION 02595
4"-15" PVC NON-PRESSURE PIPE (SDR-35)

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide PVC solid wall non-pressure pipe and appurtenant work, complete and in place.
- B. This Section covers pipe from 4 to 15 inches diameter nominal size.

PART 2 -- PRODUCTS

2.1 GENERAL

- A. Pipe shall be continuously and permanently marked with the manufacturer's name, pipe size, and minimum pipe stiffness in psi.

2.2 PIPE

- A. Pipe shall conform to the requirements of ASTM D 3034 - Type PSM Poly Vinyl Chloride Sewer Pipe and Fittings, SDR 35. Material for PVC pipe shall conform to the requirements of ASTM D 1784 - Rigid Poly Vinyl Chloride Compounds and Chlorinated Poly Vinyl Chloride (CPVC) Compounds, for cell classification 12454-B or 12454-C as defined therein. The manufacturer shall test a sample from each batch according to ASTM D 2444 - Test Method for Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight).
- B. Joints shall conform to ASTM D 3212 - Joints for Drain and Sewer Plastic Pipe Using Flexible Elastomeric Seals. Elastomeric seals for compression type joints shall conform to the requirements of ASTM F 477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe or ASTM F 913 - Thermoplastic Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

2.3 FITTINGS

- A. All fittings shall conform to the requirements of ASTM D 3034. The ring groove and gasket ring shall be compatible with PVC pipe ends. The flanged fittings shall be compatible with cast-iron or ductile iron pipe fittings.
- B. The stiffness of the fittings shall be not less than the stiffness of adjoining pipe.

2.4 BEDDING MATERIAL

- A. Unless otherwise indicated, material used for pipe bedding shall conform to Section 02200 - Earthwork.

2.5 FLEXIBLE COUPLINGS

- A. Flexible couplings shall be neoprene, full-circle, clamp-on type conforming to ASTM C 425 - Compression Joints for Vitrified Clay Pipe and Fittings and provided with two stainless steel band screw-clamps to secure the coupling tightly to entering and exiting pipes. All screw-clamp hardware shall be Type 304 or Type 316 stainless steel. Neoprene material shall be suitable for sewage service.

PART 3 -- EXECUTION

3.1 TRENCHING AND BACKFILL

- A. Trench excavation and backfill shall conform to the requirements of Section 02200 - Earthwork and the Drawings.

3.2 LAYING PIPE

- A. Pipe shall be installed in accordance with the requirements of ASTM D 2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications and as indicated. Pipe sections shall be closely jointed to form a smooth flow line. Immediately before placing each section of pipe in final position for jointings, the bedding for the pipe shall be checked for firmness and uniformity of slope.
- B. Handling
 - 1. Handling of the PVC pipe shall be done with implements, tools, and facilities as recommended by the pipe manufacturer to insure that the pipe is not damaged in any manner during storage, transit, loading, unloading, and installation.
 - 2. Pipe shall be inspected both prior to and after installation in the ditch and all defective lengths shall be rejected and immediately removed from the working area.
 - 3. Fittings shall be lowered into trench by means of rope, cable, chain, or other means without damage. Cable, rope, or other devices used for lowering fitting into trench, shall be attached around exterior of fitting for handling. Under no circumstances shall the cable, rope, or other device be attached through the fitting interior for handling or shall pipe or fittings be dropped or dumped into the trench.
- C. Cutting and machining of the pipe shall be accomplished in accordance with the pipe manufacturer's standard procedures. Pipe shall not be cut with a cold chisel, standard iron pipe cutter, nor any other method that may fracture the pipe or will produce ragged, uneven edges.
- D. All foreign matter or dirt shall be removed from the interior of the pipe before lowering into position in the trench. Pipe shall be kept clean during and after laying. All openings in the pipe line shall be closed with water tight expandable type sewer plugs or PVC test plugs at the end of each day's operation or whenever the pipe openings are left unattended. The use of burlap, wood, or other similar temporary plugs will not be permitted.
- E. Adequate protection and maintenance of all underground and surface utility structures, drains, sewers, and other obstructions encountered in the progress of the WORK shall be the CONTRACTOR'S responsibility.
- F. Where the grade or alignment of the pipe is obstructed by existing utility structures such as conduits, ducts, pipes, branch connections to main sewers, or main drains, the obstruction shall be permanently supported, relocated, removed, or reconstructed by the CONTRACTOR in cooperation with owners of such utility structures. Unless otherwise indicated, protection of existing utility structures shall be the CONTRACTOR'S responsibility.

3.3 FIELD JOINTING

- A. Each pipe compression type joint shall be joined with a lock-in rubber ring and a ring groove that is designed to resist displacement during pipe insertion.

- B. The ring and the ring seat inside the bell shall be wiped clean before the gasket is inserted. A thin film of lubricant shall be applied to the exposed surface of the ring and to the outside of the clean pipe end. Lubricant other than that furnished with the pipe shall not be used. The end of the pipe shall be then forced into the ring to complete the joint.
- C. The pipe shall not be deflected either vertically or horizontally in excess of the printed recommendations of the manufacturer of the coupling.
- D. Fittings shall be carefully connected to pipe, and joint shall be checked to insure a sound and proper joint.
- E. When pipe laying is not in progress, the open ends of the pipe shall be closed to prevent trench water from entering pipe. Adequate backfill shall be deposited on pipe to prevent floating of pipe. Any pipe which has floated shall be removed from the trench, cleaned, and relaid in an acceptable manner. No pipe shall be laid when, in the opinion of the ENGINEER, the trench conditions or weather are unsuitable.

3.4 TESTING

- A. Field testing of gravity sewer pipe shall conform to the requirements of Section 02622 – “Pipeline and Manhole Testing.”

- END OF SECTION -

SECTION 02596
18"-27" PVC NON-PRESSURE PIPE (SDR-35)

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide PVC solid wall non-pressure pipe and appurtenant work, complete and in place.
- B. This Section covers pipe from 18 to 27 inches diameter nominal size.

PART 2 -- PRODUCTS

2.1 GENERAL

- A. Pipe shall be continuously and permanently marked with the manufacturer's name, pipe size, PVC minimum cell classification, pipe stiffness designation, and the designation ASTM F 679.

2.2 PIPE

- A. All PVC pipe shall be joined by compression joints unless otherwise shown or specified, and shall conform to the following requirements:
 - 1. Polyvinyl chloride pipe (PVC) shall conform to the requirements of ASTM F 679, SDR 35. Material for PVC pipe shall conform to the requirements of ASTM D 1784 for Class 12364-C or 12454-C as defined therein. Maximum filler content shall be 10 percent.
 - 2. Rubber gaskets for compression type joints for PVC pipe and fittings shall conform to the requirements of ASTM F 477.

2.3 FITTINGS

- A. All fittings for PVC pipe shall conform to the requirements of ASTM F 679. The ring groove and gasket ring shall be compatible with PVC pipe ends.
- B. The minimum wall thickness of the fittings shall be not less than the minimum wall thickness of the equivalent size of pipe.

2.4 BEDDING MATERIAL

- A. Unless otherwise specified or shown, all material used for pipe bedding shall conform to the requirements for "Embedment Materials" as specified in ASTM D 2321.

PART 3 -- EXECUTION

3.1 GENERAL

- A. All laying, jointing, testing for defects and for leakage shall be performed in the presence of the ENGINEER, and shall be subject to his approval before acceptance. All material found during the progress to have defects will be rejected and the CONTRACTOR shall promptly remove such defective materials from the site of the work.

- B. Installation shall conform to the requirements of ASTM D 2321 and to the supplementary requirements or modifications specified herein. Wherever the provisions of this Section and the requirements of ASTM D 2321 are in conflict, the more stringent provision shall apply.
- C. The internal diameter of the pipe barrel shall not be reduced by more than 3 percent of its base diameter when measured after backfilling and compacting but prior to final paving. If this amount of allowable pipe deflection is exceeded, the CONTRACTOR shall uncover the pipe and shall improve the quality of the pipe zone backfill material and/or compaction to the extent that the allowable pipe deflection is not exceeded. Excessive deflection shall be checked for by pulling a mandrel through the pipe, or by other methods acceptable to the ENGINEER.

3.2 TRENCHING AND BACKFILL

- A. Trench excavation and backfill shall conform to the requirements of Section 02200 - Earthwork, and as specified herein.
- B. The minimum depth of cover over the top of the pipe shall be 48-inches unless otherwise shown.

3.3 LAYING PIPE

- A. The pipe shall be installed in accordance with the requirements of ASTM D 2321 and as specified herein and shown and the sections shall be closely jointed to form a smooth flow line. Immediately before placing each section of pipe in final position for jointing, the bedding for the pipe shall be checked for firmness and uniformity of surface.
- B. Proper implements, tools, and facilities as recommended by the pipe manufacturer's standard printed installation instructions shall be provided and used by the CONTRACTOR for safe and efficient execution of the work. All pipe, fittings, valves, and accessories shall be carefully lowered into the trench by means of derrick, ropes, or other suitable equipment in such a manner as to prevent damage to pipe and fittings. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.
- C. Cutting and machining of the pipe shall be accomplished in accordance with the pipe manufacturer's standard procedures for this operation. Pipe shall not be cut with a cold chisel, standard iron pipe cutter, nor any other method that may fracture the pipe or will produce ragged, uneven edges.
- D. The pipe and accessories shall be inspected for defects prior to lowering into the trench. Any defective, damaged or unsound pipe shall be repaired or replaced. All foreign matter or dirt shall be removed from the interior of the pipe before lowering into position in the trench. Pipe shall be kept clean during and after laying. All openings in the pipe line shall be closed with water tight expandable type sewer plugs or PVC test plugs at the end of each day's operation or whenever the pipe openings are left unattended. The use of burlap, wood, or other similar temporary plugs will not be permitted.
- E. Adequate protection and maintenance of all underground and surface utility structures, drains, sewers, and other obstructions encountered in the progress of the work shall be furnished by the CONTRACTOR at its own expense.
- F. Where the grade or alignment of the pipe is obstructed by existing utility structures such as conduits, ducts, pipes, branch connections to main sewers, or main drains, the obstruction shall be permanently supported, relocated, removed, or reconstructed by the CONTRACTOR in cooperation with owners of such utility structures. Unless otherwise indicated, this work shall be performed at the CONTRACTOR'S expense.

3.4 HANDLING

- A. Handling of the PVC pipe shall be done with care to insure that the pipe is not damaged in any manner during storage, transit, loading, unloading, and installation.
- B. Pipe shall be inspected both prior to and after installation in the ditch and all defective lengths shall be rejected and immediately removed from the working area.

3.5 FIELD JOINTING

- A. Each pipe compression type joint shall be joined with a lock-in rubber ring and a ring groove that is designed to resist displacement during pipe insertion.
- B. The ring and the ring seat inside the bell shall be wiped clean before the gasket is inserted. At this time a thin film of lubricant shall be applied to the exposed surface of the ring and to the outside of the clean pipe end. Lubricant other than that furnished with the pipe shall not be used. The end of the pipe shall be then forced into the ring to complete the joint.
- C. The pipe shall not be deflected either vertically or horizontally in excess of the printed recommendations of the manufacturer of the coupling.
- D. When pipe laying is not in progress, the open ends of the pipe shall be closed to prevent trench water from entering pipe. Adequate backfill shall be deposited on pipe to prevent floating of pipe. Any pipe which has floated shall be removed from the trench, cleaned, and relaid in an acceptable manner. No pipe shall be laid when, in the opinion of the ENGINEER, the trench conditions or weather are unsuitable for such work.

3.6 INSTALLATION OF BENDS, TEES, AND REDUCERS

- A. Fittings shall be installed utilizing standard installation procedures. Fittings shall be lowered into trench by means of rope, cable, chain, or other acceptable means without damage to the fittings. Cable, rope, or other devices used for lowering fitting into trench, shall be attached around exterior of fitting for handling. Under no circumstances shall the cable, rope or other device be attached through the fitting's interior for handling. Fittings shall be carefully connected to pipe or other facility, and joint shall be checked to insure a sound and proper joint.

3.7 ANCHOR BLOCKS

- A. Anchor blocks shall be installed in accordance with the details shown.

3.8 TESTING

- A. Field testing of gravity sewer pipe shall conform to the requirements of Section 02622 – “Pipeline and Manhole Testing.”

- END OF SECTION -

SECTION 02597
4"-12" PVC PRESSURE PIPE (AWWA C900, MODIFIED)

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide polyvinyl chloride (PVC) pressure pipe, complete in place.
- B. This Section covers pipe from 4 to 12 inches in diameter.

PART 2 -- PRODUCTS

2.1 GENERAL

- A. PVC pressure pipe (4-inch through 12-inch) shall conform to the applicable requirements of ANSI/AWWA C900 subject to additional requirements herein.

2.2 PIPE DESIGN CRITERIA

- A. **General:** PVC pressure pipe shall be designed in accordance with the requirements of Appendix A of ANSI/AWWA C900, as applicable, and the supplemental requirements in this Section.
- B. **Pipe Thickness Class:** Pipe shall be a minimum of Class 150.

2.3 PIPE

- A. The pipe shall be of the diameter and pressure class specified or shown, shall be furnished complete with rubber gaskets, and all specials and fittings shall be provided as required in the Contract Documents. The dimensions and pressure classes for Dimension Ratios for large PVC pressure pipe with Cast-Iron Pipe Equivalent O.D.'s shall conform to the requirements of AWWA C900.
- B. **Joints:** Joints for the buried PVC pipe shall be either an integral bell manufactured on the pipe or a separate coupling both employing a rubber ring joint. The bell and coupling shall be the same thickness as of the pipe barrel, or greater thickness. The sealing ring groove in the coupling shall be of the same design as the groove in cast iron fittings and valves available from local water works supply distributors. Where indicated, restrained joint pipe shall be ductile iron pipe. No restrained joint PVC pipe will be allowed.
- C. **Joint Deflection:** Deflection at the joint shall not exceed 80% of the maximum deflection recommended by the manufacturer. No deflection of the joint shall be allowed for joints which are over-belled or not belled to the stop mark.

2.4 FITTINGS

- A. Fittings shall be ductile iron and shall conform to the requirements of AWWA C110, Class 250. PVC pipe fittings shall be mechanical joint.
- B. Each fitting shall be clearly labeled to identify its size and pressure class.

PART 3 -- EXECUTION

3.1 GENERAL

- A. Laying, jointing, testing for defects and for leakage shall be performed in the presence of the ENGINEER, and shall be subject to approval before acceptance. Material found to have defects will be rejected and the CONTRACTOR shall promptly remove such defective materials from the Site.
- B. Installation shall conform to the requirements of AWWA M23, instructions furnished by the pipe manufacturer, and to the supplementary requirements herein. Wherever the provisions of this Section and the aforementioned requirements are in conflict, the more stringent provision shall apply.

3.2 HANDLING AND STORAGE

- A. **Handling:** Pipe, fittings and accessories shall be carefully inspected before and after installation and those found defective shall be rejected. Pipe and fittings shall be free from fins and burrs. Before being placed in position, pipe, fittings, and accessories shall be cleaned, and shall be maintained in a clean condition. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe, fittings or any other material be dropped or dumped into trenches.
- B. **Storage:** Pipe should be stored, if possible, at the Site in unit packages provided by the manufacturer. Caution should be exercised to avoid compression damage or deformation to bell ends of the pipe. Pipe should be stored in such a way as to prevent sagging or bending and be protected from exposure to direct sunlight by covering with an opaque material while permitting adequate air circulation above and around the pipe. Gaskets should be stored in a cool, dark place out of the direct rays of the sun, preferably in original cartons.

3.3 TRENCHING AND BACKFILL

- A. Trench excavation and backfill shall conform to the requirements of Section 02200 - Earthwork.

3.4 INSTALLATION

- A. Bell-and-spigot pipe shall be laid with the bell end pointing in the direction of laying. Pipe shall be graded in straight lines, taking care to avoid the formation of any dips or low points. Pipe shall not be laid when the conditions of trench or weather are unsuitable. At the end of each days work, open ends of pipe shall be closed temporarily with wood blocks or bulkheads.
- B. Pipe shall be supported at its proper elevation and grade, care being taken to secure firm and uniform support. Wood support blocking will not be permitted. The full length of each section of pipe and fittings shall rest solidly on the pipe bed, with recessed excavation to accommodate bells, joints, and couplings. Anchors and supports shall be provided where indicated and where necessary for fastening work into place. Fittings shall be independently supported.
- C. Short lengths of pipe shall be used in and out of each rigid joint or rigid structure. Piping that does not allow sufficient space for proper installation of jointing material shall be replaced by one of proper dimensions. Blocking or wedging between bells and spigots will not be permitted.
- D. Joints shall be installed according to manufacturer's recommendations. Trenches shall be kept free of water until joints have been properly made. The maximum combined deflection at any coupling shall not exceed 80% of the manufacturer's recommendations.

- E. Pipe shall be cut by means of saws, power driven abrasive wheels, or pipe cutters, which will produce a square cut. No wedge-type roller cutters will be permitted. After cutting, the end of the pipe shall be beveled using a beveling tool, portable type sander, or abrasive disc.

3.5 INSTALLATION OF COPPER WIRE

- A. Polyvinyl chloride pipelines shall be provided with No. 12 A.W.G. bare copper wire laid along the top of the pipe and held in place with ties, tape or hitches of the same kind of wire spaced not more than 10 feet apart.

3.6 SERVICE CONNECTIONS

- A. **Service Connections:** Direct tapping will not be permitted. Double strap bronze service clamps shall be used for all service connections. Service clamps shall have a bearing area of sufficient width along the axis of the pipe, so that the pipe will not be distorted when the saddle is made tight. An internal shell cutter shall be used to drill through the corporation stop to minimize PVC shavings, retain the coupon, and reduce stress. Single fluted shell cutters or twist drills are not acceptable. Lubricate the cutting and tapping edges of the tool with cutting lubricant. Make the cuts slowly and use the follower very lightly - do not force cutter through pipe wall. Shell cutter shall have sufficient throat depth to handle the heavy wall PVC pipe. Maximum outlet size permitted with service clamps or saddle is 2 inches.
- B. Tapping sleeves and valves shall be used for all outlet sizes greater than 2 inches in diameter. Tapping sleeves shall be assembled and installed in accordance with the manufacturer's recommendations.

3.7 FIELD TESTING AND DISINFECTION

- A. Field testing shall conform to the requirements of Section 02622 – “Pipeline and Manhole Testing.”

- END OF SECTION -

SECTION 02622
PIPELINE AND MANHOLE TESTING

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall perform flushing and testing off all pipelines and manholes as specified herein.
- B. The CONTRACTOR shall provide the ENGINEER with minimum 48-hour notice for all testing.

PART 2 -- PRODUCTS

2.1 MATERIALS REQUIREMENTS

- A. Temporary valves, plugs, bulkheads, and other air pressure testing and water control equipment and materials shall be provided by the CONTRACTOR subject to the ENGINEER's review. No materials shall be used which would be injurious to pipeline structure and future function. Air test gages shall be laboratory-calibrated test gages and shall be recalibrated by a certified laboratory at the CONTRACTOR's expense prior to the leakage test, if required by the ENGINEER.

PART 3 -- EXECUTION

3.1 GENERAL

- A. Unless otherwise indicated, air and water for testing will be furnished by the CONTRACTOR.
- B. Release of water from pipelines, after testing has been completed, shall be performed as approved by the ENGINEER.
- C. All testing operations shall be performed in the presence of the ENGINEER.

3.2 GRAVITY PIPE TESTING

- A. **General:** All gravity sanitary sewer pipes and service laterals shall be tested for exfiltration using the Air Pressure Test, and for deflection using the Lamp Test and the Mandrel Test. One CCTV inspection, at the CONTRACTOR's expense, will also be required. All pipes shall be backfilled prior to testing. All leakage and deflection tests shall be completed and approved prior to placing of permanent resurfacing. When leakage or deflection exceeds the amount allowed by the Specifications, the CONTRACTOR at its expense shall locate the leaks and make the necessary repairs or replacements in accordance with the Specifications to reduce the leakage or infiltration to the specified limits. Any individually detectable leaks shall be repaired, regardless of the results of the tests.

Testing of all gravity flow pipes other than sanitary sewers, such as storm sewers and culverts, shall consist of a physical inspection and lamp test by the Engineer.

- B. **Air Pressure Test:** The CONTRACTOR shall furnish all materials, equipment and labor for making an air test. Air testing equipment shall be approved by the ENGINEER.

Each section of sewer shall be tested between successive manholes by plugging and bracing all openings in the main sewer line and the upper ends of all house connection sewers. Prior to any air pressure testing, all pipe plugs shall be checked with a soap solution to detect any air leakage. If any leaks are found, the air pressure shall be released, the leaks eliminated, and the test procedure started over again.

The final leakage test of the sewer main line and branching house connection sewers, shall be conducted in the presence of the ENGINEER and shall be performed in accordance with the procedures defined in ANSI/ASTM C 828.

All piping will be air tested to 10-psi and will not have a loss of more than 3-psi of air in a 5-minute period.

- C. **Lamp Test:** After backfilling is complete, the CONTRACTOR shall clean each section of piping and check for excessive deflection by flashing a light through the installed pipe between manholes to check for true alignment, obstructions, or crushed or broken pipe. The observed light will be a minimum of $\frac{3}{4}$ of a complete circle of light in the ENGINEER's opinion for the reach to be acceptable. Pipe reaches that do not meet this criteria will be removed and replaced at the CONTRACTOR's expense.
- D. **Mandrel Test:** All flexible and semi-rigid main line pipe shall be tested for deflection, joint displacement, or other obstruction by passing a rigid mandrel through the pipe by hand, not less than 30 days after completion of the trench backfill, but prior to permanent resurfacing. The mandrel shall be a full circle, solid cylinder, or a rigid, non-adjustable, odd-numbered leg (9 leg minimum) steel cylinder, approved by the ENGINEER as to design and manufacture. The circular cross section of the mandrel shall have a diameter of at least 95 percent of the specified average inside pipe diameter of the pipe and the minimum length of the circular portion of the mandrel shall be equal to the nominal diameter of the pipe. Obstructions encountered by the mandrel shall be corrected by the CONTRACTOR.
- E. **CCTV Inspection:** The interior of all piping shall be inspected by Closed Circuit Television (CCTV) at the end of the warranty period, at the expense of the CONTRACTOR. The Contractor will bear all costs incurred in correcting deficiencies found during the CCTV inspection, including the cost of additional CCTV inspection required to verify correction of noted deficiencies.

3.3 PRESSURE PIPE TESTING

- A. All pipelines that will operate under pressure shall be tested for pressure and leakage in accordance with these specifications.
- B. The Contractor shall furnish all labor, equipment, tools, water and other incidental items required to conduct the tests. Test results will not be considered valid without the presence of the Engineer or his representative throughout the test.
- C. Prior to hydrostatic testing, pipelines shall be flushed or blown out as appropriate. The CONTRACTOR shall test all pipelines either in sections or as a unit. No section of the pipeline shall be tested until all field-placed concrete or mortar has attained an age of 48-hours and the pipeline backfilled adequately to prevent any movement or lifting of the pipe. Pavement or other permanent surfaces shall not be placed until all pressure and leakage tests are satisfactorily completed.
- D. The test shall be made by closing valves when available, or by placing temporary bulkheads in the pipe and filling the line slowly with water. The CONTRACTOR shall be responsible for

ascertaining that all test bulkheads are suitably restrained to resist the thrust of the test pressure without damage to, or movement of, the adjacent pipe. Any unharnessed sleeve-type couplings, expansion joints, or other sliding joints shall be restrained or suitably anchored prior to the test, to avoid movement and damage to piping and equipment. The CONTRACTOR shall provide sufficient temporary air tapplings in the pipelines to allow for evacuation of all entrapped air in each pipe segment to be tested. After completion of the tests, such taps shall be permanently plugged. Care shall be taken to see that all air vents are open during filling.

- E. The pipeline shall be filled at a rate which will not cause any surges or exceed the rate at which the air can be released through the air valves at a reasonable velocity and all the air within the pipeline shall be properly purged. After the pipeline or section thereof has been filled, it shall be allowed to stand under a slight pressure for at least 24 hours to allow the concrete or mortar lining, as applicable, to absorb what water it will and to allow the escape of air from any air pockets. During this period, bulkheads, valves, and connections shall be examined for leaks. If leaks are found, corrective measures satisfactory to the ENGINEER shall be taken.
- F. **Pressure Test Procedure:** The hydrostatic test shall consist of holding the test pressure on the pipeline for the specified time period. The pressure and leakage tests may be performed simultaneously or separately. The total time for the combined pressure and leakage tests shall be a minimum of two (2) hours for each section of pipeline. If separate tests are made, the pressure test shall be made first. The duration of the pressure test shall be a minimum of two (2) hours and the duration of the leakage test shall be a minimum of four (4) hours. Unless otherwise indicated, the test pressure for all pipes shall be 150-percent of the operating pressure at the lowest elevation of the test section, or the class designation of the pipe plus fifty (50) psi, whichever is less, except that the minimum test pressure for water distribution lines shall be one hundred fifty (150) psi. All visible leaks shall be repaired in a manner acceptable to the ENGINEER.
- G. **Leakage Test Procedure:** The pressure of the leakage test may be reduced to one hundred and fifty percent (150%) of the maximum working pressure that will occur on that portion of the line.

The specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer. The maximum allowable leakage for pressure pipelines shall be according to the following formula:

$$L = S \times D \times P^{1/2} / 133,200$$

where:

L = leakage (gallons per hour)

S = length (feet), the lesser of the actual length being tested or the maximum length for determining leakage. Maximum length for determining leakage is 2000 feet.

D = pipe diameter (inches)

P = test pressure (psi)

- H. Pipelines that fail to pass the prescribed leakage test will be considered defective WORK, and the CONTRACTOR shall determine the cause of the leakage, shall take corrective measures necessary to repair the leaks, and shall retest the pipelines.

3.4 MANHOLE TESTING

- A. At the ENGINEER'S discretion, all sewer manholes shall be hydrostatically tested for leakage after installation, but prior to being backfilled. Prior to hydrostatic testing, all manholes shall be visually inspected for leaks. All leaks or cracks shall be repaired by the CONTRACTOR, prior to hydrostatic testing, to the satisfaction of the ENGINEER. All pipes entering the manhole shall be sealed at a point outside the manhole walls so as to include testing of the pipe/manhole joints.

The manhole shall be filled with water to a level 2 inches below the top of the frame. Safety lines shall be secured to all plugs utilized. After a period of at least one hour to allow the water level to stabilize, the manhole shall be refilled and the water level shall be checked. The water level shall again be checked after a period of 4 hours. If the water level is reduced by more than 1/4-inch, the leakage shall be considered excessive, and the CONTRACTOR shall be required to make all necessary repairs and retest the manhole. The exterior of the manhole shall be inspected during this period for visible evidence of leakage. Visible moisture, sweating, or beads of water on the exterior of the manhole shall not be considered leakage, but any water running across the surface will be considered leakage and shall be repaired to the satisfaction of the ENGINEER regardless of the volume of water lost.

- END OF SECTION -

**SECTION 15200
VALVES, GENERAL**

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide all valves, actuators, and appurtenances, complete and operable.
- B. The provisions of this Section shall apply to all valves and valve actuators except where otherwise indicated. Valves and actuators in particular locations may require a combination of units, sensors, limit switches, and controls.
- C. Where a valve is to be supported by means other than the piping to which it is attached, the CONTRACTOR shall obtain from the valve manufacturer a design for support and foundation. The design, including drawings and calculations sealed by an engineer, shall be submitted with the Shop Drawings. When the design is approved, the support shall be provided.
- D. **Unit Responsibility:** A single manufacturer shall be made responsible for coordination of design, assembly, testing, and furnishing of each valve; however, the CONTRACTOR shall be responsible to the OWNER for compliance with the requirements of each valve section. Unless indicated otherwise, the responsible manufacturer shall be the manufacturer of the valve.
- E. **Single Manufacturer:** Where two or more valves of the same type and size are required, the valves shall be furnished by the same manufacturer.

PART 2 -- PRODUCTS

2.1 PRODUCTS

- A. **General:** Valves shall be new and of current manufacture. Shut-off valves 6-inches and larger shall have actuators with position indicators. Buried valves shall be provided with valve boxes and covers containing position indicators and valve extensions. Manual shut-off valves mounted higher than 7-feet above working level shall be provided with chain actuators.
- B. **Valve Actuators:** Unless otherwise indicated, valves shall be furnished with manual actuators.
- C. **Protective Coating:** The exterior surfaces of all valves and the wet interior surfaces of ferrous valves of sizes 4 inches and larger shall be coated per manufacturer recommendations. The valve Manufacturer shall certify in writing that the required coating has been applied and tested in the manufacturing plant prior to shipment, in accordance with these Specifications. Flange faces of valves shall not be epoxy coated.
- D. **Valve Testing:** As a minimum, unless otherwise indicated or recommended by the reference Standards, valves 3 inches in diameter and smaller shall be tested in accordance with manufacturer's standard and 4 inches in diameter and larger shall be factory tested as follows:
 - 1. **Hydrostatic Testing:** Valve bodies shall be subjected to internal hydrostatic pressure equivalent to twice the water rated pressure of the valve. Metallic valves rating pressures shall be at 100 degrees F and plastic valves shall be 73 degrees, or at higher temperature according to type of material. During the hydrostatic test, there shall be no leakage through the valve body, end joints, or shaft seals, nor shall any part of the valve be permanently

deformed. The duration shall be sufficient time to allow visual examination for leakage. Test duration shall be at least 10 minutes.

2. **Seat Testing:** Valves shall be tested for leaks in the closed position with the pressure differential across the seat equal to the water rated pressure of the valve. The duration of test shall be sufficient time to allow visual examination for leakage. Test duration shall be at least 10 minutes. Leakage past the closed valve shall not exceed 1 fluid ounce per hour per inch diameter for metal seated valves and drop-tight for resilient seated valves.
 3. **Performance Testing:** All valves shall be shop operated from fully closed to fully open position and reverse under no-flow conditions in order to demonstrate the valve assembly operates properly.
- E. **Certification:** Prior to shipment, the CONTRACTOR shall submit for valves over 12 inches in size, certified, notarized copies of the hydrostatic factory tests, showing compliance with the applicable standards of AWWA, ANSI, or ASTM.
- F. **Valve Marking:** Valve bodies shall be permanently marked in accordance with MSS SP25 - Standard Marking Systems for Valves, Fittings, Flanges, and Unions.

2.2 MATERIALS

- A. **General:** Materials shall be suitable for the intended application. Materials not indicated shall be high-grade standard commercial quality, free from defects and imperfections that might affect the serviceability of the product for the purpose for which it is intended. Unless otherwise indicated, valve and actuator bodies shall conform to the following requirements:
1. **Cast Iron:** Close-grained gray cast iron, conforming to ASTM A 48 - Gray Iron Castings, Class 30, or to ASTM A 126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 2. **Ductile Iron:** ASTM A 536 - Ductile Iron Castings, or to ASTM A 395 - Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
 3. **Steel:** ASTM A 216 - Steel Castings, Carbon Suitable for Fusion Welding for High-Temperature Service, or to ASTM A 515 - Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service.
 4. **Bronze:** ASTM B 62 - Composition Bronze or Ounce Metal Castings, and valve stems not subject to dezincification shall conform to ASTM B 584 - Copper Alloy Sand Castings for General Applications.
 5. **Stainless Steel:** Stainless steel valve and operator bodies and trim shall conform to ASTM A 351 - Steel Castings, Austenitic, for High-Temperature Service, Grade CF8M, or shall be Type 316 stainless steel.
 6. **PVC:** Poly Vinyl Chloride materials for valve body, flanges, and cover shall conform to Cell Classification 12454.
 7. **CPVC:** Chlorinated Poly Vinyl Chloride materials for valve body, flanges, and cover shall conform to Cell Classification 23447.
 8. **NSF Standard 14:** All materials shall be listed for use in contact with potable water.

2.3 VALVE CONSTRUCTION

- A. **Bodies:** Valve bodies shall be cast, molded (in the case of plastic valves), forged, or welded of the materials indicated, with smooth interior passages. Wall thicknesses shall be uniform in agreement with the applicable standards for each type of valve, without casting defects, pinholes, or other defects that could weaken the body. Welds on welded bodies shall be done by certified welders and shall be ground smooth. Valve ends shall be as indicated, and be rated for the maximum temperature and pressure to which the valve will be subjected.
- B. **Bonnets:** Valve bonnets shall be clamped, screwed, or flanged to the body and shall be of the same material, temperature, and pressure rating as the body. The bonnets shall have provision for the stem seal with the necessary glands, packing nuts, or yokes.
- C. **Stems:** Valve stems shall be of the materials indicated, or, if not indicated, of the best commercial material for the specific service, with adjustable stem packing, O-rings, chevron V-type packing, or other suitable seal. Where subject to dezincification, bronze valve stems shall conform to ASTM B 62, containing not more than 5 percent of zinc or more than 2 percent of aluminum, with a minimum tensile strength of 30,000 psi, a minimum yield strength of 14,000 psi, and an elongation of at least 10 percent in 2 inches. Where dezincification is not a problem, bronze conforming to ASTM B 584 may be used, except that zinc content shall not exceed 16 percent.
- D. **Stem Guides:** Stem guides shall be provided, spaced 10-feet on centers unless the manufacturer can demonstrate by calculation that a different spacing is acceptable. Submerged stem guides shall be 304 stainless steel.
- E. **Internal Parts:** Internal parts and valve trim shall be as indicated for each individual valve. Where not indicated, valve trim shall be of Type 316 stainless steel or other best suited material.
- F. **Nuts and Bolts:** Nuts and bolts on valve flanges and supports shall be per manufacturer's recommendations.

2.4 VALVE ACCESSORIES

- A. Valves shall be furnished complete with the accessories required to provide a functional system.

2.5 SPARE PARTS

- A. The CONTRACTOR shall furnish the required spare parts suitably packaged and labeled with the valve name, location, and identification number. The CONTRACTOR shall also furnish the name, address, and telephone number of the nearest distributor for the spare parts of each valve. Spare parts are intended for use by the OWNER, after expiration of the correction of defects period.

2.6 MANUFACTURERS

- A. **Manufacturer's Qualifications:** Valve manufacturers shall have a successful record of not less than 5 years in the manufacture of the valves indicated.

PART 3 -- EXECUTION

3.1 VALVE INSTALLATION

- A. **General:** Valves, actuating units, stem extensions, valve boxes, and accessories shall be installed in accordance with the Manufacturer's written instructions and as indicated. Valves shall be firmly supported to avoid undue stresses on the pipe.
- B. **Access:** Valves shall be installed with easy access for actuation, removal, and maintenance and to avoid interference between valve actuators and structural members, handrails, or other equipment.
- C. **Valve Accessories:** Where combinations of valves, sensors, switches, and controls are indicated, the CONTRACTOR shall properly assemble and install such items so that systems are compatible and operating properly. The relationship between interrelated items shall be clearly noted on Shop Drawing submittals.

- END OF SECTION -

SECTION 15203 CHECK VALVES

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide check valves and appurtenances, complete and operable.
- B. The requirements of Section 15200 - Valves, General apply to this Section.

PART 2 -- PRODUCTS

2.1 SWING CHECK VALVES (3-INCH AND LARGER)

- A. General: Swing check valves for water, sewage, sludge, and general service shall be of the outside lever and spring or weight type, in accordance with ANSI/AWWA C 508 - Swing-Check Valves for Waterworks Service, 2 in. through 24 in. NPS, unless otherwise indicated, with full-opening passages, designed for a water-working pressure of 150 psi. They shall have a flanged cover piece to provide access to the disc.
- B. Body: The valve body and cover shall be of cast iron conforming to ASTM A 126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings, with flanged ends conforming to ANSI/ASME B 16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800, or mechanical joint ends, as indicated.
- C. Disc: The valve disc shall be of cast iron, ductile iron, or bronze conforming to ASTM B 62 - Composition Bronze or Ounce Metal Castings.
- D. Seat and Rings: The valve seat and rings shall be of bronze to conforming ASTM B 62 or B 148 - Aluminum-Bronze Castings, or of Buna-N.
- E. Hinge Pin: The hinge pin shall be of bronze or stainless steel.
- F. Manufacturers, or Equal
 - 1. **American Flow Control (Darling)**
 - 2. **APCO (Valve and Primer Corp.)**
 - 3. **Kennedy Valve**
 - 4. **Mueller Company (Grinnell Corporation)**
 - 5. **Stockham Valves and Fittings**

2.2 SWING CHECK VALVES (2-1/2-INCH AND SMALLER)

- A. General: Swing check valves for steam, water, oil, or gas in sizes 2-1/2-inch and smaller shall be suitable for a steam pressure of 150 psi and a cold water pressure of 300 psi. They shall have screwed ends, unless otherwise indicated, and screwed caps.

- B. Body: The valve body and cap shall be of bronze conforming to ASTM B 61 - Steam or Valve Bronze Castings, or ASTM B 62 with threaded ends conforming to ANSI/ASME B1.20.1 - Pipe Threads, General Purpose (inch).
- C. Disc: Valves for steam service shall have bronze or brass discs conforming to ASTM B 16 - Free-Cutting Brass Rod, Bar, and Shapes for Use in Screw Machines, and for cold water, oil, and gas service replaceable composition discs.
- D. Hinge Pin: The hinge pins shall be of bronze or stainless steel.
- E. Manufacturers, or Equal
 - 1. **Crane Company**
 - 2. **Milwaukee Valve Company**
 - 3. **Stockham Valves and Fittings**
 - 4. **Wm. Powell Company**

2.3 DOUBLE-LEAF CHECK VALVES

- A. General: Double-leaf check valves for air and gas service and where indicated, shall be of the wafer-type designed to fit between ANSI B16.1 flanges for 125-lb rating. The check valve leaves shall be spring-loaded. Flow from one direction shall cause the valve to open, and upon valve shutoff, the spring shall shut the valve leaves before reverse flow starts, acting at a point of zero velocity, for non-slam closure. The spring-tension of each valve shall be designed for the individual operating condition.
- B. Body: The valve body shall be of cast iron conforming to ASTM A 126 with integrally-cast seat, rated for minimum 150-lb working pressure at up to 250 degrees F.
- C. Leaves: The leaves shall be of bronze, aluminum bronze, or ductile iron, revolving on stainless steel or monel hinge pins with retainers.
- D. Seat: The valves shall have resilient seats for bubble-tight shut-off, suitable for temperatures up to 250 degrees F without sticking. The seats shall be Buna-N, Viton, or other suitable material for the intended purpose. The seat rings shall be firmly attached a shoulder cast in the body or to the disc by compression-molding or similar acceptable method.
- E. Springs: The springs shall be of Type 316 stainless steel or Inconel, as best suited for the service condition.
- F. Manufacturers, or Equal
 - 1. **APCO (Valve and Primer Corporation)**
 - 2. **VAL-MATIC (Valve and Manufacturing Corporation)**

2.4 PLASTIC BALL CHECK VALVES

- A. General: Plastic ball check valves for corrosive fluids, in sizes up to 4-inch, shall be used for vertical up-flow conditions only, unless the valves are provided with spring actions.

B. Construction: The valve bodies and balls shall be of polyvinyl chloride (PVC), chlorinated polyvinyl chloride (CPVC), polyvinylidene fluoride (PVDF), or polypropylene (PP) construction, as best suited for each individual service condition. They shall have unions with socket connections, or flanged ends conforming to ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings, class 150. Seals shall have Viton O-rings, and valve design shall minimize possibility of the balls sticking or chattering. The valves shall be suitable for a maximum working non-shock pressure of 150 psi at 73 degrees F.

C. Manufacturers, or Equal

1. **ASAHI-AMERICA**
2. **George Fischer, Inc.**
3. **NIBCO Inc. (Chemtrol Division)**
4. **Spears Mfg. Co. (PVC, CPVC, AND PP only)**

PART 3 -- EXECUTION

3.1 INSTALLATION

A. Check valves shall be installed in accordance with provisions of Section 15200 - Valves, General.

- END OF SECTION -

**SECTION 15206
GATE VALVES**

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide gate valves and appurtenances, complete and operable.
- B. The requirements of Section 15200 - Valves, General apply to this Section.

PART 2 -- PRODUCTS

2.1 GENERAL

- A. Buried valves shall be of the inside screw, non-rising stem type. Unless otherwise indicated, valves shall be furnished with manual actuators. The valve actuators shall be counter-clockwise opening stems.

2.2 METAL-SEATED GATE VALVES (3-INCH AND LARGER)

- A. **Construction:** Metal-seated gate valves for water and sewage service shall conform to ANSI/AWWA C 500 - Metal-Seated Gate Valves for Water Supply Service. The valve bodies shall be of cast iron conforming to ASTM A 126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings, or ductile iron conforming either to ASTM A 395 - Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures, or to ASTM A 536 - Ductile Iron Castings, with flanged, bell and spigot, or mechanical joint-ends as indicated. Body and bonnett wall thickness shall be equal to or greater than the minimum wall thickness as listed in Table 2 of ANSI/AWWA C500. The design working water pressure shall be 200 psig for valves 12 inches and smaller and 150 psig for larger valves. The valves may be of the double-disc type for tighter shut-off, or of the solid-wedge type, with rising or non-rising stem. For sewage or fluids containing solids, an outside thread shall be used. Valves 14-inch and larger installed in vertical pipes shall be fitted with bronze slides, tracks, rollers, and scrapers to assist the travel of the gate assembly. Gate valves 14-inch and larger shall be furnished with bypass assemblies.
- B. **Actuators:** Unless otherwise indicated, gate valves shall have manual actuators.
- C. Manufacturers, or Equal
 - 1. **American Flow Control**
 - 2. **Clow Valve Co.**
 - 3. **Crane Valves**
 - 4. **Kennedy Valve**
 - 5. **M & H Valve Company**
 - 6. **Milwaukee Valve Company, Inc.**
 - 7. **Mueller Company (Grinnell Corp.)**

8. **Stockham Valves and Fittings**

2.3 **RESILIENT-SEATED GATE VALVES (3- TO 16-INCH)**

- A. **General:** Resilient-seated gate valves may be provided in lieu of metal-seated double-disc or solid-disc gate valves, at the discretion of the ENGINEER.
- B. **Construction:** Resilient-seated gate valves shall conform to ANSI/AWWA C 509 - Resilient-Seated Gate Valves for Water and Sewerage Systems. The valves shall be suitable for a design working water pressure of 200 psig, with flanged, bell and spigot, or mechanical joint ends. The valve body, bonnet, and disc shall be of cast iron or ductile iron and the disc or body shall be rubber-coated. Body and bonnet wall thickness shall be equal to or greater than the minimum wall thickness as listed in Table 2 of ANSI/AWWA C509. The stem, stem nuts, glands, and bushings shall be of bronze, with the stem seal per ANSI/AWWA C 509.
- C. **Actuators:** Unless otherwise indicated, resilient-seated gate valves shall have manual actuators.
- D. **Manufacturers, or Equal**
 - 1. **American Flow Control**
 - 2. **Clow Valve Co.**
 - 3. **Kennedy Valve**
 - 4. **M & H Valve Company**
 - 5. **Mueller Company (Grinnell Corp.)**
 - 6. **Stockham Valves and Fittings**
 - 7. **US Pipe**

2.4 **GATE VALVES (SMALLER THAN 3-INCH)**

- A. **Construction:** Gate valves, smaller than 3-inch, for general purpose use, shall be non-rising stem, heavy-duty type for industrial service, with screwed or soldered ends to match the piping. The bodies shall have union bonnets of bronze conforming to ASTM B 62 - Composition Bronze or Ounce Metal Castings. The stems shall be of bronze conforming to ASTM B 62, or ASTM B 371 - Specification for Copper-Zinc-Silicon Alloy Rod. The solid wedges shall be of bronze conforming to ASTM B 62. The valves shall have malleable iron handwheels, unless otherwise indicated, and stem seals shall be of Teflon-impregnated or other acceptable non-asbestos packing. All valves shall have a pressure rating of minimum 125 psi steam, and 200 psi coldwater, unless otherwise indicated.
- B. **Manufacturers, or Equal**
 - 1. **Crane Company**
 - 2. **Milwaukee Valve Company**
 - 3. **Wm. Powell Company**
 - 4. **Stockham Valves and Fittings**

5. **Walworth Company**

2.5 PLASTIC GATE VALVES (1-1/2- TO 14-INCH)

- A. **Construction:** Plastic gate valves shall have PVC bodies with ANSI 150 lb. flanged ends, and polypropylene or CPVC-SBR-lined wedges for tight shut-off. The non-rising stem shall be of PVC or Type 304 stainless steel construction, with O-ring seal. The valves shall have a coldwater pressure rating of 150 psig for sizes 1-1/2- through 8-inch, 110 psig for size 10-inch, and 70 psig for sizes 12- and 14-inch.
- B. **Actuators:** Unless otherwise indicated, PVC gate valves shall have manual handwheel actuators with position indicators.
- C. Manufacturers, or Equal
 - 1. **ASAHI/America**
 - 2. **Spears Mfg. Co.**

PART 3 -- EXECUTION

3.1 GENERAL

- A. Gate valves shall be installed in accordance with the provisions of Section 15200. Care shall be taken that valves in plastic lines are well supported at each end of the valve.

- END OF SECTION -

SECTION 15207 PLUG VALVES

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide plug valves and appurtenances, complete and operable.
- B. The requirements of Section 15200 - Valves, General apply to this Section.

PART 2 -- PRODUCTS

2.1 ECCENTRIC PLUG VALVES (1/2-INCH to 72-INCH)

- A. **Construction:** Eccentric plug valves shall be of the non-lubricated, eccentric plug design with cast iron bodies conforming to ASTM A 126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings, with ANSI 125 lb. flanged ends for valves 3-inch and larger, and screwed or flanged ends for smaller sizes. The plugs and shafts shall be of cast iron or ductile iron conforming to ASTM A 536 - Specification for Ductile Iron Castings, and the plugs shall be lined with a resilient coating, best suited for the specific service. The body shall be lined with a suitable elastomer, where required for a special service, or it shall be epoxy-lined. The seats shall be of nickel or stainless steel welded to the body. Eccentric plug valves for digester gas service shall have Type 316 stainless steel plugs and suitable resilient seating like Buna-N, Hycar, or equal. All top and bottom shaft bearings shall be of permanently lubricated stainless steel, or Teflon coated stainless steel. Grit seals of Teflon, Nylatron, or similar suitable material shall be at the top and bottom plug journals. Valves up to and including 20-inch in size shall have an unobstructed port area of not less than 80 percent of full pipe area, and not less than 70 percent for larger valves. All eccentric plug valves shall have a pressure rating of not less than 150 psi WOG, for bubble-tight shut-off in the standard flow direction, and 25 psi WOG in the reverse flow direction. When equipped with worm gear actuator, the pressure rating shall be 150 psi WOG in both directions. The stem seal shall consist of field adjustable packing, replaceable without removal of the actuator, or of self-adjusting U-cup packing.
- B. **Actuators:** Unless otherwise indicated, valves shall be furnished with manual actuators.
- C. Manufacturers, or Equal
 - 1. **DeZurik Corporation**
 - 2. **Clow Valve Company**

PART 3 -- EXECUTION

3.1 INSTALLATION

- A. All plug valves shall be installed in strict accordance with the Manufacturer's published recommendations and the applicable provisions of Section 15200.
- B. **Eccentric Plug Valves:** Unless otherwise directed, the following rules shall be observed for the installation of eccentric plug valves on sewage, sludge, or other liquid systems containing solids, silt, or fine sand:

1. The valves shall be positioned with the stem in the horizontal direction.
2. In horizontal pipelines, the plug shall swing upwards when opening, to permit flushing out of solids.
3. The orientation of the valve shall prevent the valve body from filling up with solids when closed; however, where the pressure differential through the valve exceeds 25 psi, the higher pressure for valves without worm gear, electric, or air operators shall be through the valve to force the plug against the seat.
4. Valves which may be closed for extended periods (stand-by, bypass, or drain lines) and valves with reversed flow (higher pressure on downstream side, forcing the plug away from its seat), shall be equipped with worm gear operators for all sizes.
5. For special applications or when in doubt, consult with the Manufacturer prior to installation.

- END OF SECTION -

**SECTION 15230
MISCELLANEOUS VALVES**

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide all miscellaneous valves and appurtenances, complete and operable.
- B. The requirements of Section 15200 - Valves, General, apply to this Section.

PART 2 -- PRODUCTS

2.1 AIR-VACUUM AND AIR-RELEASE VALVES

- A. **Air and Vacuum Valves:** Air and vacuum valves shall be capable of venting large quantities of air while pipelines are being filled, and allowing air to re-enter while pipelines are being drained. They shall be of the size indicated, with flanged or screwed ends to match piping. Bodies shall be of high-strength cast iron. The float, seat, and all moving parts shall be constructed of Type 316 stainless steel. Seat washers and gaskets shall be of a material insuring water tightness with a minimum of maintenance. Valves shall be designed for minimum 150 psi water-working pressure, unless otherwise indicated.
- B. **Air-Release Valves:** Air-release valves shall vent accumulating air while system is in service and under pressure and be of the size indicated and shall meet the same general requirements as indicated for air and vacuum valves except that the vacuum feature will not be required. Valves shall be designed for a minimum water-working pressure of 150 psi, unless otherwise indicated.
- C. **Combination Air Valves:** Combination air valves shall combine the characteristics of air and vacuum valves and air release valves by exhausting accumulated air in systems under pressure and releasing or re-admitting large quantities of air while a system is being filled or drained, respectively. Valves shall have the same general requirements as indicated for air and vacuum valves.
- D. **Sewage Air Release Valves:** Sewage air release valves shall vent accumulating gases during system operation. Valves shall have long float stems and bodies to minimize clogging. The same general requirements shall apply as indicated for air and vacuum valves. Each sewage air release valve shall be furnished with the following backwash accessories, fully assembled on the valve:
 - 1. Inlet shut-off valve.
 - 2. Blow-off valve.
 - 3. Clear water inlet valve.
 - 4. Rubber supply hose.
 - 5. Quick disconnect couplings.
- E. Manufacturers, or Equal

1. APCO (Valve and Primer Corporation)
2. Crispin - Multiplex Manufacturing Company
3. GA Industries
4. Val-Matic (Valve and Manufacturing Corporation)

2.2 CORPORATION STOPS

- A. Unless otherwise indicated, corporation stops shall be made of solid brass for key operation, with screwed ends with corporation thread or iron pipe thread, as required.
- B. Manufacturer, or Equal
 1. Ford Meter Box Company, Inc.
 2. James Jones Company (Watts, ACV)
 3. Mueller Company (Grinnell Corporation)

2.3 SOLENOID VALVES

- A. Solenoid valves shall be of the size, type, and class indicated and shall be designed for not less than 150 psi water-working pressure. Valves for water, air, or gas service shall have brass or bronze body with screwed ends, stainless steel trim and spring, Teflon or other resilient seals with material best suited for the temperature and fluid handled. Unless otherwise indicated, for chemicals and all corrosive fluids, solenoid valves with PVC, CPVC, polypropylene (PP), polyvinylidene fluoride (PVDF), or Teflon materials of construction, suitable for the specific application shall be provided. Enclosures shall be NEMA rated as determined by the District's Engineer. All coil ratings shall be for continuous duty. For electrical characteristics see electrical drawings or specifications.
- B. Manufacturers, or Equal
 1. For general duty
 - a. Automatic Switch Co. (ASCO), Model "RED HAT"
 - b. Skinner Valve (Parker Hannifin Corporation)
 - c. Magnatrol Valve Corporation
 - d. J. D. Gould Co.
 2. Metallic valves for corrosive fluids
 - a. Valcor Engineering Corporation
 3. Plastic valves for corrosive fluids
 - a. GF Plastic Systems, Inc.
 - b. Spears Mfg. Co.

PART 3 -- EXECUTION

3.1 INSTALLATION

- A. Valves shall be installed in accordance with the manufacturer's printed recommendations, and with provisions of Section 15200.

- END OF SECTION -

APPENDIX E

FORMS

1. Application for Service
2. Application for Service Response
3. Plan Review Retainer Invoice
4. Construction Service Retainer Invoice
5. Reimbursement Agreement
6. Final Acceptance Letter
7. Grease/Oil/Sand Interceptor Maintenance Agreement

**SOUTH DURANGO SANITATION DISTRICT
P.O. BOX 2024, DURANGO, CO 81302
(970) 382-2623**

**SOUTH DURANGO SANITATION DISTRICT
APPLICATION FOR SERVICE**

Please complete the entire form and submit it to the District with attachments.

1. Project Name: _____

2. Business Name (if applicable): _____

3. Owner's Name(s): _____

4. Owner's Contact Information (mailing address, phone number(s), e-mail):

5. Engineer's Name and Contact Information (if applicable):

6. Description of Project (attach narrative and any preliminary plans or specs):

Project Address: _____

Legal description (or attach deed): _____

La Plata County Assessor Schedule No. (Get from Tax Notice): _____

Type of Existing or Proposed Structures in the project:

_____ Single Family Residential

Number of Units _____

_____ Multi-Family Residential (includes permanent mobile home spaces)

Type of Units (town homes, mobiles, condos, etc.): _____

Number of Units under 700 square feet: _____

Number of Units over 700 square feet: _____

_____ Commercial

Type of Business _____

Total number of square feet _____

_____ If School or Day Care Center, provide number of students: _____

**SOUTH DURANGO SANITATION DISTRICT
P.O. BOX 2024, DURANGO, CO 81302
(970) 382-2623**

If Restaurant or Bar, provide max number of seats per fire code and hours of operation:

If Camper/Trailer Park, provide information on number of hook-ups with plumbing and number of sanitary dump stations: _____

If Hotel or Motel, provide total number of rooms and number of rooms with kitchens:

If not typical domestic wastewater, identify wastewater characteristics including BOD5, Total Suspended Solids, and other atypical characteristics: _____

Other information to enable an accurate determination of projected sewage flows: _____

- 7. Other useful information about the premises or project:** (If project involves more than a simple sewer service connection, describe infrastructure to be dedicated to the District in separate design documents that address all components of the proposed sewer system.)

- 8. Will Tap Fee be paid by Owner listed in Item 3 above, or by subsequent buyers of the individual units?** _____

- 9. Proposed Project Construction Start Date:** _____

- 10. Proposed Connection Point(s) to the District's sewer:** _____

- 11. I hereby certify that all the information on or accompanying this application is true and complete to the best of my knowledge:**

Date: _____

Owner's Printed Name: _____

Owner's Signature: _____

IMPORTANT: This application must be approved and Plant Investment Fees paid before a connection is made. Connections must be in accordance with the District's Codes & Standards.

SOUTH DURANGO SANITATION DISTRICT

Owner's Name
Owner's Address

Re: Application for Service Approved/Denied for Project Name

Dear _____:

The South Durango Sanitation District has approved/denied your Sewer Tap Application.

If denied:

The application has been denied for the following reasons:

- Xxx
- Xxx
- Xxx

The District has also determined that a Reimbursement Agreement will be required for your project to ensure that the District's costs for plan review and construction inspection are paid for by the Owner and not by the District's customers. The District will send you a draft Reimbursement Agreement for your review along with a Plan Review Cost Estimate. This cost estimate will be based on the preliminary plans and specifications submitted with your Application for Service. Once the agreement is signed and the Plan Review Retainer is submitted, the Design Phase of the project may begin. Please refer to the District's Codes & Standards regarding subsequent steps in the project process.

We thank you for working with the District on this matter. Please contact us at (970) 382-2623 if you have any further questions.

Sincerely,

District Manager

**SOUTH DURANGO SANITATION DISTRICT
REIMBURSEMENT AGREEMENT
PLAN REVIEW RETAINER INVOICE**

DATE: _____

FOR: _____
(Name of Project)

(Name of Owner)

(Owner's address, telephone, fax, e-mail)

1. In accordance with the terms of the Reimbursement Agreement dated _____ between the South Durango Sanitation District and the above-named Owner, the Owner agrees, upon receipt of a plan review cost estimate from the District, to provide a plan review retainer to cover 100-percent of the estimated costs of plan review. The retainer must be received by the District before plan review will commence. The Owner further agrees that the plan review fee may be increased, and that the Owner shall pay for said increase in fee, if the actual cost of review exceeds the plan review cost estimate. The District agrees to refund any excess plan review retainer funds that remain after the final plans and specifications have been approved.
2. The Plan Review Cost Estimate is \$ _____
3. The Owner shall pay the amount shown in Item 2, before the District will begin review of the plans and specifications for the above-referenced project.

DATE PAID: _____

AMOUNT PAID: _____

CHECK NO.: _____

**SOUTH DURANGO SANITATION DISTRICT
REIMBURSEMENT AGREEMENT
CONSTRUCTION SERVICE RETAINER INVOICE**

DATE: _____

FOR: _____
(Name of Project)

(Name of Owner)

(Owner's address, telephone, fax, e-mail)

1. In accordance with the terms of the Reimbursement Agreement dated _____ between the South Durango Sanitation District and the above-named Owner, the Owner agrees, upon receipt of a construction service cost estimate from the District, to provide a construction service retainer to cover 100-percent of the estimated costs of construction service. The retainer must be received by the District before authorization to connect to the District's system will be issued. The Owner further agrees to pay for any increase if the actual cost of construction service exceeds the estimate. The District agrees to refund any excess construction service retainer funds that remain after Notification of Final Acceptance has been issued to the Owner by the District.

2. The Construction Service Cost Estimate is \$ _____

3. The Owner shall pay the amount shown in Item 2, before the District will begin construction service for the above-referenced project.

DATE PAID: _____

AMOUNT PAID: _____

CHECK NO.: _____

**SOUTH DURANGO SANITATION DISTRICT
REIMBURSEMENT AGREEMENT**

FOR: _____
(Name of Project)

This Agreement entered into by the South Durango Sanitation District (District) and

(Name of Owner)

(Owner's address, telephone, fax, e-mail)

The Owner agrees with the District as follows:

1. The Owner agrees to furnish information to District about the Project to enable District to determine the terms and conditions for services including plant investment fees and new sanitary sewer facilities.
2. The Owner agrees to design and construct, at no expense to the District, the sanitary sewer facilities necessary to serve the Project.
3. The Owner agrees that all facilities shall be designed and constructed in accordance with the District's Standard Specifications for Material and Installation of Sewer System Improvements.
4. The Owner agrees to reimburse the District for all expenses incurred in the review, approval, construction and inspection of the Project, as well as the expenses incurred in the enforcement of this agreement. Such expenses shall include but not be limited to, engineering fees, inspection costs, testing costs, legal fees, general administrative expenses, and collection costs.
5. Reimbursement shall be made to the District within 15 days after receipt of an invoice for reimbursement (the "due date"). Unpaid invoices for reimbursement shall bear interest at the rate of 12% per annum from the due date until paid.
6. No building permits shall be approved and no facilities shall be accepted by the District for the Project until all invoices for reimbursement have been paid.

Date: _____

By: _____
(South Durango Sanitation District)

By: _____
(Owner)

SOUTH DURANGO SANITATION DISTRICT

PO BOX 2024

DURANGO, CO 81302

(970) 382-2623

Reimbursement Policy

The South Durango Sanitation District Board of Directors has adopted a policy which requires all new development projects to reimburse the expenses incurred by the District which are specifically related to the project. This is consistent with the long-standing District policy that growth pays for growth. Because of the rapid growth in the service area of the District in the last 10 years, the expenses incurred by the District in connection with new development have been quite substantial. It has been determined that those expenses should not be borne by existing customers but should be paid by those seeking new service as a cost of development. Other agencies incurring similar expenses are reimbursed through application and/or permit fees based on the size of the project. The District has found that the size of the project is not an accurate indication of the expenses that may be incurred by the District related to a specific project. The reimbursement of actual expenses is a more equitable reimbursement policy for both the District and the developer.

A Reimbursement Agreement is required for all new development projects. The Agreement includes an explanation of the type of costs that may be incurred by the District in the process of reviewing a new development project. Typically, those expenses are minimal except for larger projects which require detailed engineering review and inspection. The submission of projects which are well designed with clear, detailed information about potential uses related to wastewater flows will help reduce the expenses to the District and keep reimbursement amounts low.

SOUTH DURANGO SANITATION DISTRICT

Owner's Name
Owner's Address

Re: Notification of Final Acceptance for Project Name

Dear _____:

This letter serves as Notification of Final Acceptance for Project Name by the South Durango Sanitation District. The date of this letter will serve as the effective date of this notice. This date will also serve as the start of the one-year warranty period for the work.

If there are any unexpended funds in your Construction Inspection Retainer, a refund check for the remaining balance is enclosed with this letter.

We thank you for working with the District on this matter. Please contact us at (970) 382-2623 if you have any further questions.

Sincerely,

District Manager

**SOUTH DURANGO SANITATION DISTRICT
GREASE/OIL/SAND INTERCEPTOR MAINTENANCE AGREEMENT**

Please complete the entire form and submit it to the District.

1. Business Name (if applicable): _____

2. Owner's Name: _____

3. Business Contact Information: (mailing address, phone number(s), e-mail):

4. Description of Business:

5. Type of Interceptor (Grease, Sand, Oil): _____

6. Size of Interceptor (gallons): _____

7. Proposed Cleaning Frequency: _____

8. Proposed Waste Removal Company (Name, Address, Phone): _____

IMPORTANT: By signing this agreement, Owner authorizes the District to contact the Waste Removal Company to verify that the proposed cleaning frequency is being met. If the Business changes Waste Removal Companies, please notify the District in writing.

Date: _____

Owner's Printed Name: _____

Owner's Signature: _____

Approved: _____

District Manager, South Durango Sanitation District,
PO Box 2420, Durango, CO 81302 (970) 382-2623