

STANDARD SPECIFICATIONS
GRANT COUNTY SANITARY SEWER DISTRICT
Crittenden, Kentucky

(February, 2007)

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SECTION ONE: INTRODUCTION

A. PURPOSE – The purpose of this manual is to provide information and guidance to land owners, land developers, design engineers, and contractors in the construction of sanitary sewer facilities that are to become a part of the Grant County Sanitary Sewer District system. These regulations and procedures are to be followed by any person or corporation in the development of residential subdivisions, shopping centers, industrial developments, sanitary sewer extensions or in any development in which the Developer desires sanitary sewer service from the Grant County Sanitary Sewer District. The goal of this manual is to help insure the protection of the health and welfare of the general public, within the Grant County Sanitary Sewer District through the use of proper design features and construction methods.

B. AUTHORITY – The works and facilities supplying sanitary sewer services within the boundary of the Grant County Sanitary Sewer District as they presently exist and as they may hereafter from time to time be extended was authorized by an order of Grant County Fiscal Court in accordance with Kentucky Revised Statutes, Chapter 278.

C. REFERENCES – Certain technical aspects concerning construction materials and methods of construction are based on the Kentucky Department of Highways, Standard Specifications for Road and Bridge Construction, Latest Edition, hereafter referred to as K.D.H.S.S.

Other standards or specifications referred to are those of the American Society of Testing Materials (ASTM), American Association of State Highway Officials (AASHTO), Portland Cement Association (PCA), American Public Works Association (APWA), the American Water Works Association (AWWA) and Water Environmental Federation (WEF).

Standard drawings showing details of certain improvements, which may be issued by the District, shall be complementary to and a part of this manual.

D. GENERAL REQUIREMENTS – In order to insure that the design and construction of sanitary sewer facilities meet generally accepted engineering design criteria and generally recognized construction methods for such facilities, the Owner or Developer of lands in which sanitary sewer lines are to be constructed that are to be part of the District's System, must employ a Registered Professional Engineer, Registered in the Commonwealth of Kentucky, set out in KRS Chapter 322. The Owner-Developer shall employ the Engineer to:

- (1) Prepare detailed construction drawings.
- (2) Design all sanitary sewer facilities to meet all requirements of the specifications contained herein and meet all local, state and federal regulations.
- (3) Provide information on the number and type of sanitary sewer users.
- (4) Certify to the District that the facilities were constructed in accordance with the approved plans and the detailed specifications contained herein.
- (5) Provide a complete set of "As-Built" drawings to the District.

E. DISTRICT'S AUTHORITY – The District or its designated representative, shall review and approve all plans submitted to the District. The District shall inspect all work and must approve as to the quality and acceptability of materials furnished and work performed before the sanitary sewer facility will be accepted by the District. The District shall interpret the intent of these specifications in a fair and unbiased manner.

Except as otherwise provided herein, the manager of the district wastewater systems shall administer, implement, and enforce the provisions of this chapter.

The manager, bearing proper credentials and identification, shall be permitted to enter properties at any reasonable time for purposes of inspection, observation, measurement, and sampling of the wastewater discharge to ensure that discharge to the district's wastewater facilities is in accordance with the provisions of this chapter.

The manager, bearing proper credentials and identification, shall be permitted to enter all private property at reasonable times, through which the district holds an easement for the purposes of inspection, observation, measurement, sampling, repair, and maintenance of any of the district's wastewater facilities within the easement. All entry and any subsequent work on the easement shall be done in full accordance with the terms of the easement pertaining to the private property involved.

While performing the necessary work on private properties referred to earlier, the manager shall observe all safety rules established by the owner or occupant of the property and applicable to the premises.

During the performance on private properties of inspections, wastewater sampling, or other similar operations, the owner and occupant, without negligence on their part, either willful or wanton conduct, shall be held harmless for personal injury or death of the manager and the loss of or damage to district supplies or equipment; indemnified against loss of or damage to property of the owner or occupant by the manager, and indemnified against liability claims asserted against the owner or occupant for personal injury or death of the manager or for loss of or damages to the owner or occupant to maintain safe conditions as required.

Nothing contained in these specifications or standard drawings intended to conflict with any State or Federal laws or regulations. If any requirement of these specification or standard drawings are found to be in conflict with a State or Federal law or regulations, then the more stringent requirements shall be met. In no case shall the requirements of this manual be less stringent than any existing State or Federal law or regulation.

This manual shall be revised from time to time to insure that the requirements of this manual keep abreast with current State and Federal laws and regulations, approved construction material and recognized construction methods.

F. TAMPERING OR INTERFERING WITH SANITARY SEWER SYSTEM - It shall be unlawful for any person, firm or corporation not authorized by the Grant County Sanitary Sewer District to in any way or manner whatsoever tamper with the district owned and operated sanitary sewer system or any of their appurtenances or facilities, including manholes and pumps or other portions or parts thereof.

It shall be unlawful for any person, firm or corporation to place or cause or permit to be placed any foreign object of any kind or nature into any sewer line, manhole, or other appurtenances or facility of the district owned and operated sanitary sewer system.

It shall be unlawful for any person, firm or corporation to change or cause to be changed the grade or contour of the surface of the area near any sewer line, manhole, or other appurtenances or facility of the district owned and operated sanitary sewer system without first having submitted to the district a plan or sketch and such other information as may be required showing the nature and extent of the proposed changes and having received from the district written permission to make the change.

G. OBLIGATION OF THE DEVELOPER OR CONTRACTOR - The Developer or Contractor shall perform and complete the work to the satisfaction of the District and in accordance with these specifications. The Developer or Contractor shall conduct his work so as to minimize interference with public and private business and traffic. He shall at his own expense, whenever necessary or required, provide barricades, flagmen, maintain lights, and take other precautions as may be necessary to protect life, property, adjacent buildings and structures. The Developer or Contractor shall be liable for all damages and injuries received or sustained by any person, persons or property in consequence of any neglect in safeguarding the work or by any act of neglect or misconduct by him or his agents, subcontractors, employees or workmen.

H. COORDINATION - Coordination with the District is required concerning construction planning and procedure. A minimum of one week notice shall be given to the District prior to the planned beginning of any phase of construction. Developer and/or Contractor shall provide District with a written bar line schedule showing when construction will be performed. Construction shall not begin without the District's written approval of the construction schedule.

I. ACCEPTABLE MATERIALS - Whenever manufactured products, devices or materials are specified under a particular trade name or name of manufacturer, it shall be understood that the specifications are open to other manufacturers upon prior approval the District. Only products comparable in type, quality, utility and price will be considered by the District. Burden of proof of equality shall rest with Developer or Contractor. The District shall be the sole judge of equality and reserves the right to require products or material specified by name.

J. DEFECTIVE MATERIAL AND WORKMANSHIP - Materials not in accordance with the specifications or defective work may be rejected by the District at any time before final approval and acceptance by the District. Failure by the District to reject defective work shall not be construed as an acceptance of same.

K. FINAL INSPECTION - A final inspection will be made by a representative of the District. Final inspection will be made prior to acceptance of any unit for use by the District and only after all improvements are completed. As part of the Final Inspection, the District shall be given a completed set of "As-Built" plans. Connections to the sanitary sewer system shall not be allowed until a copy of the final plat and as-built plans are submitted to Grant County Sanitary Sewer District.

L. EXISTING UTILITIES - All existing utilities shall be shown on the plans submitted to the District for approval. Before proceeding with work, the Developer or Contractor shall verify location of, and possible interference with, existing utilities, arrange for necessary suspension of service, and make arrangements to locate and avoid interference with all utilities. The Developer or Contractor shall protect all utility lines which are to remain in service. The Developer shall bear the entire responsibility for locating, and avoiding existing utilities. The Developer or Contractor shall be responsible for any and all damage done to existing utilities. Damage done to existing utilities shall be repaired promptly, to satisfaction of utility company, at no cost to the District.

M. PUBLIC AND PRIVATE HIGHWAYS AND STREETS – Developer or Contractor shall ascertain and obey all State and County road load limits in order to prevent damage to pavements resulting from his operation.

Developer or Contractor shall, at all times, conduct work in such manner as to insure minimum obstruction to public travel. Convenience of general public and of residents along and adjacent to area of work shall be provided for in a satisfactory manner, consistent with operation and local conditions. Flagmen shall be used at all times where work is being performed adjacent to the roadway.

“Construction” signs shall be placed immediately adjacent to work, in conspicuous positions at such locations as traffic demands. Control Devices (MUTCD) published by U. S. Department of Transportation, Federal Highway Administration, Latest Edition. At any time that streets are required to be closed, Contractor shall notify law enforcement agencies, fire departments, and parties operating emergency vehicles before streets are closed and again as soon as they are reopened. Access to fire hydrants and other fire extinguishing equipment shall be provided and maintained at all times.

Trenches shall be backfilled at end of each day's work. When this is not possible, trenches left open shall be adequately protected with suitable flashing barricades, in compliance with MUTCD.

N. PERMITS, EASEMENTS AND RIGHT OF WAY – The Developer or Contractor shall obtain all easements needed in the name of the Grant County Sanitary Sewer District. The easements shall be filed or shown on preliminary plats before any construction is started. All construction shall be contained within the easement.

Developer or Contractor shall obtain permit from Kentucky Transportation Cabinet for construction within State right-of-way. Contractor shall not begin work in State right-of-way until he has furnished copy for approved encroachment permit to the Sanitary Sewer District. Use of rights-of-way shall be subject to written conditions on permits. Developer or Contractor shall comply with all requirements of access documents, for storage of materials, traffic control, restoration, etc.

Written permission shall be received and furnished to the District for any work on city or county street right-of-ways.

All fees or cost required for permits, licenses, easements and right of ways shall be the responsibility of the Developer or Contractor. The Developer or Contractor shall be required to comply with all state and municipal ordinances, laws and/or codes which may apply.

O. GENERAL GUARANTY – The Developer or Contractor shall guarantee all materials and equipment furnished and work performed for a period of one (1) year from date of acceptance. Developer or Contractor warrants and guarantees for a period of one (1) year from date of acceptance of system that completed system is free from all defects due to faulty materials or workmanship and Developer or Contractor shall promptly make such corrections as may be necessary by reason of such defects including repairs or damage of other parts of system resulting from such defects. The District will give notice of observed defects with reasonable promptness.

P. DEFINITIONS

ACT – The Federal Clean Water Act, as amended.

APPROVED – Material, equipment, workmanship, process or method that has been accepted by the District as suitable for the proposed use.

AS-BUILT – A revised plan showing all sanitary sewer lines, manholes, pump stations and other miscellaneous items actual location. The plan shall be stamped and dated by an Engineer.

ASTM – The American Society for Testing and Materials.

BOD (DENOTING BIOCHEMICAL OXYGEN DEMAND).. The quantity of oxygen used in the biochemical oxidation of organic matter under standard laboratory procedure during days at 20°C, expressed in milligrams per liter.

COMMERICAL USER – Any property occupied by a nonresidential establishment not within the definition of an "Industrial User" and which is connected to the wastewater facilities.

CONTRACTOR – The person, firm, or corporation with whom the Developer, Owner, or Sanitary Sewer Water District has executed an agreement to perform the utility construction for the project.

DEVELOPER – An individual, group of individuals, partnership, firm, association or corporation that is constructing, or having sanitary sewer facilities that are to become a part of, or be connected to the District System.

DISTRICT – Grant County Sanitary Sewer District or an authorized employee or representative of the Grant County Sanitary Sewer District.

EASEMENT – An acquired legal right for the specific use of land owned by others.

ENGINEER – A Registered Professional Engineer, registered in the Commonwealth of Kentucky as set out in KRS Chapter 322.

EPA – The United States Environmental Protection Agency.

GARBAGE – The solid animal and vegetable wastes resulting from the domestic or commercial handling, storage, dispensing, preparation, cooking, and serving of foods.

GROUNDWATER – Water within the earth.

INDUSTRIAL USER – Any nonresidential user identified in Division A, B, D, E, or I of the Standard Industrial Classification Manual. Industrial User also shall include any user that discharges wastewater containing toxic or poisonous substances as defined in § 307 and § 502 of the Clean Water Act, or any substance(s) causing interference in the wastewater facilities. Industrial User shall include any nonresidential user who is subject to national categorical pretreatment standards; has a nondomestic flow of 25,000 gallons or more per average work day; contributes more than 5% of the average dry weather capacity of the wastewater facility; or is determined by the state regulatory agency or the manager to have the potential to adversely affect the wastewater facility.

INTERFERENCE – Inhibition or disruption of any sewer system, wastewater treatment process, sludge disposal system, or their operation, which substantially contributes to a violation of applicable discharge permits.

MANAGER – The manager of the district sanitary sewer system, or an authorized designee.

NATURAL OUTLET – Any outlet into a watercourse, pond, ditch, lake or any other body of surface or groundwater.

NPDES – National Pollutant Discharge Elimination System permit program, whether administered by the EPA or by the state.

OWNER – The person or persons who legally own, lease or occupy private property with wastewater facilities that discharge, or will discharge, to the district wastewater facilities.

PERSON – Any individually, firm, company, association, society, partnership, corporation, municipality, or other similar organization, agency, or group.

pH – The logarithm of the reciprocal of the hydrogen ion concentration expressed in grams per liter of solution, as determined by standard methods.

PRETREATMENT – The reduction of the amount of pollutants, the elimination of pollutants, or the alteration of the nature of pollutant properties in wastewater before discharging from the district's wastewater facilities.

PROPERLY SHREDDED GARBAGE – Garbage that has been shredded such that all particles will be carried freely under flow conditions normally prevailing in the wastewater sewers, with no particle greater than ½-inch in any dimension.

PUBLIC SERVICE COMMISSION – The commission with regulatory jurisdiction over the affected utility as provided for in KRS Ch. 278 et seq.

RATE SCHEDULE – Any individual or joint fare, toll, charge, rental or other compensation for service rendered or to be rendered by any utility, and any rule, regulation, practice, act, requirement or privilege in any way relating to such fare, toll, charge, rental or other compensation, and any schedule or tariff or part of a schedule or tariff thereof.

RESIDENTIAL USER – All premises used only for human residency and that are connected to the wastewater facilities.

SANITARY WASTEWATER – Water discharged from the sanitary conveniences of dwellings, office buildings, industrial plant, or institutions.

SHALL – Means a mandatory requirement.

STANDARD METHODS – The latest edition of Standard Methods for the Examination of Water of Wastewater, published by the American Public Health Association, Water Pollution Control Federation, and American Water Works Association.

STATE – The State or Commonwealth of Kentucky.

STORMWATER – A sewer for conveying storm, surface, and other waters, that are not intended to be transported to a treatment facility.

SURFACE WATER – Water that occurs when the rate of precipitation exceeds the rate at which water may percolate into the soil.

SUSPENDED SOLIDS – The total suspended matter that either floats on the surface or, or is in suspension in, water of wastewater, as determined by 40 CFR 136.

TOXICS – Any of the pollutants designed by federal regulations pursuant to § 307(a)(1) of the Act.

WASTEWATER – A combination of liquid and water-carrier wastes from residents, commercial buildings, industries, and institutions, together with any groundwater, surface water, or storm water that may be present. Also called Sanitary Sewage.

WASTEWATER FACILITY – The combination of sanitary sewers and treatment facilities.

WASTEWATER SEWER – The structures, processes, equipment, and arrangements necessary to collect and transport wastewaters to the treatment facility. Also called Sanitary Sewer System.

WASTEWATER TREATMENT FACILITY – The structures, processes, equipment, and arrangements necessary to treat and discharge wastewater.

WPCF – The Water Pollution Control Federation.

SECTION TWO: PROCEDURES

A. PURPOSE - The purpose of this section is to establish a working relationship between the Owner, Developer, Contractor, Engineer and District by describing the procedure to be followed in initiating and completing the construction of sanitary sewers to be connected to the Grant County Sanitary Sewer Water District.

B. REQUEST FOR SANITARY SEWER SERVICE - The first step in the procedure is for the Owner or Developer to file a request to the Grant County Sanitary Sewer District to connect the proposed facilities to the District's existing facilities. The request shall be submitted by the first of the month for the District to consider it at their next monthly meeting. The request shall be accompanied by a map or plat of the area to be served with existing and proposed streets, roads and lots, with as a minimum 5-foot contours. A copy of the preliminary plat as required by the governing planning commission shall be acceptable as this map.

The District with their Engineer will determine if sanitary sewer services can be provided to serve the proposed development. A letter will be sent to Owner or Developer stating the results of this determination with a copy sent to the governing planning commission or other governing authority. All cost for this determination shall be billed to the Owner or Developer by the District.

C. PLAN SUBMISSION - The Owner or Developer shall submit two sets of plans to the District for review and approval. The plans shall be submitted by the first of the month for the District to consider them at their next meeting. All plans shall be prepared in accordance with requirements contained in these detailed specifications. Any plans submitted that do not completely comply with all requirements of the District shall be returned unapproved with the necessary corrections noted.

Once corrected plans are submitted to the District, the District will issue a letter to the Facilities Construction Branch of the Division of Water stating that they have reviewed the plans, they approve of the plans and they will serve the proposed project. A copy of this letter shall be sent to the Owner or Developer. Final approval of the plans and specifications shall be dependent on receipt of an approval letter from the Facilities Construction Branch of the Division of Water. All cost for the review and approval of the plans shall be billed to the Owner or Developer by the District.

D. CONSTRUCTION PHASE - Construction shall not begin until the approval letter from the Facilities Construction Branch of the Division of Water has been received by the District and a written bar line schedule showing when construction shall be performed has been approved by the District. A minimum of one week notice shall be given to the District prior to the planned beginning of any phase of construction. Any work performed prior to this time shall not be accepted by the District. The construction schedule shall be revised as necessary so the District knows when construction is being performed.

Any deviation or changes from the approved plans shall be approved by the District in writing prior to the deviation or change being performed.

E. INSPECTION BY GRANT COUNTY SANITARY SEWER DISTRICT - For every 300' of line laid, 10' of the line must be exposed. For any ditch with rock; for every 100' of line laid, 10' of the line must be exposed. All service line connections to the main must be exposed. Two days notice is required for the inspection.

F. FINAL INSPECTION – Upon completion of construction a final inspection shall be held by the District. The Owner's or Developer's Engineer shall certify in writing to the District that the project has been constructed in accordance with the approved plans and standard specifications. A set of "As-Built" shall be submitted to the District with the Engineer's certification.

The sanitary sewer line shall not be accepted into the Grant County Sanitary Sewer District system until the following items are provided or completed:

- (1) All items corrected from final inspection
- (2) Engineer's certificate on construction
- (3) "As-Built" plans
- (4) All billing have been paid for the plan review and request for sanitary sewer service.
- (5) All connection fees have been paid per the current tariff as approved by the Public Service Commission.

SECTION THREE: USE OF WASTEWATER FACILITIES

- A. PURPOSE - The purpose of this section is to state the policy on use of the facilities of Grant County Sanitary Sewer District.
- B. DEPOSITING OBJECTIONABLE WASTES PROHIBITED - It shall be unlawful for any person to place, deposit, or permit to be deposited in any unsanitary manner on public or private property within the district, or in any area under the jurisdiction of the district, any human or animal excrement, garbage, or other objectionable waste.
- C. UNAUTHORIZED WASTEWATER DISCHARGES PROHIBITED - Wastewater discharges to the district's wastewater facilities are not authorized unless approved by the manager in accordance with provisions of this Section.
- D. CONNECTION TO SEWER REQUIRED - The Owner of any house, building, or property used for human occupancy, employment, recreation, or other purposes under the jurisdiction of this chapter and abutting on any street, alley, or rights-of-way in which there is or may be located a wastewater sewer connected to the treatment facility of the district, is required at the owner's expense to install suitable toilet facilities therein and to connect facilities directly to the proper sewer in accordance with the provisions of this chapter, within ____ days after date of official notice to do so provided the proper wastewater sewer is within ____ feet of any house, building, or property used for human occupancy, employment, recreation, or other purpose.
- E. DISCHARGE OF STORMWATER AND OTHER UNPOLLUTED DRAINAGE - All uncontaminated discharges of storm water, surface water, groundwater, roof runoff, subsurface drainage, or other waters not required to be treated in the treatment facility shall be made to storm sewers or natural outlets designed for discharges. Any connection, drain, or arrangement that will permit waters to enter any other sanitary sewer be deemed to be in violation of this section.
- F. RESTRICTED DISCHARGES - No person shall discharge or cause to be discharged to any of the district's sanitary sewer or wastewater facilities any substances, materials, waters, or waste in quantities or concentrations that will:
- (1) Create a fire or explosion hazard including, but not limited to, gasoline, benzene, naphtha, fuel, oil, or other flammable or explosive liquid, solid, or gas;
 - (2) Cause corrosive damage or hazard to structures, equipment, or personnel of the wastewater facilities, and in no case will discharges be allowed with pH lower than 5.0.
- G. FEDERAL CATEGORICAL PRETREATMENT STANDARDS - No person shall discharge or cause to be discharged to any wastewater facilities, wastewaters containing substances in excess of the quantity prescribed by the applicable Federal Categorical Pretreatment Standard promulgated by EPA, except as otherwise provided in this section. Compliance with applicable pretreatment standards shall be made within three years of the date the standard is promulgated for existing systems; however compliance with a categorical pretreatment standard for new sources shall be required upon connection to the POTW.

Upon application by an Industrial User, the manager shall revise any limitations on substances specified in the applicable pretreatment standards to reflect removal of the substances by the wastewater treatment facility. The revised discharge limit for specified substances shall be derived in accordance with federal law.

Upon application by Industrial User, the manager shall adjust any limitation on substances specified in the applicable pretreatment standards to consider factors considered by EPA during the development of the pretreatment standard. Requests for and determinations of fundamentally different adjustments shall be in accordance with federal law.

The manager shall notify Industrial User affected by the provisions of this section and establish an enforceable compliance schedule for each.

H. SPECIAL AGREEMENTS - Nothing in this subchapter shall be construed as preventing any special agreement or arrangement between the district and any user of the wastewater facilities, whereby wastewater of unusual strength or character is accepted into the system and specially treated subject to any applicable payments or user charges.

I. CONNECTIONS - No unauthorized person shall uncover, make any connection with or opening into, use, alter or disturb any wastewater sewer without first obtaining a written permit from the manager. The owner shall be application for connection to the district's sanitary sewer system at the office of the Grant County Sanitary Sewer District. A connection fee as established in the published rate will apply.

J. CONNECTION AND INSTALLATION COSTS - The costs and expenses incidental to the building sewer installation and connection to the district's wastewater facilities shall be borne by the owner. The owner shall indemnify the district from any loss or damage that directly or indirectly may result from the installation of the building sewer.

K. SEPARATE CONNECTIONS - A separate and independent building sewer lateral shall be provided for every building. The district assumes no obligation or responsibility for damage caused by or resulting from any single building sewer that serves two buildings.

L. USES OF EXISTING BUILDING SEWERS - Existing building sewers may be used for connection of new buildings only when they are found, after examination and test by the manager, to meet the requirements of the Grant County Sanitary Sewer District.

M. BUILDING SEWER DESIGN - The size, slope, alignment, construction materials, trench excavation and backfill methods, pipe placement, jointing, and testing methods used in the construction and installation of a building sewer shall conform to the Building and Plumbing Code or other applicable requirements of the district. In the absence of code provisions or in amplification thereof, the materials are procedures set forth in appropriate specifications of the ASTM and WPCF shall apply.

N. SURFACE RUNOFF AND GROUNDWATER DRAINAGE - Building sewers shall not allow surface runoff to enter the sanitary sewer system and shall not allow groundwater drains to discharge into the sanitary sewer system.

SECTION FOUR: SANITARY SEWERS

A. PURPOSE – The purpose of this chapter is to outline requirements for the proper design, construction, and final acceptance of gravity sanitary sewers and appurtenances.

B. DESIGN REQUIREMENTS – All sanitary sewers and appurtenances shall be designed in accordance with requirements and regulations of the Public Service, the Department for Natural Resources and Environmental Protection, Division of Water, Facilities Construction and in accordance with "Recommended Standards for Wastewater Facilities" (10 state standards).

(1) Plans for sanitary sewer shall show plan view and profile view with size of sewer line and slope of sewer line.

(2) Minimum size – minimum size for sanitary sewer lines shall be 8 inches.

(3) Buoyancy – buoyancy of sewers shall be considered and floatation of the pipe shall be prevented with appropriate construction where high groundwater conditions are anticipated.

(4) Slope – All sewers shall be designed and constructed to give mean velocities, when flowing full, of not less than 2.0 feet per second, based on Manning's formula using an "n" value of 0.013. The minimum slope for 8 inch sewer lines shall be 0.40 feet per 100 feet.

(5) Slope Between Manholes – Sewers shall be laid with uniform slope between manholes.

(6) High Velocity Protection – Where velocities greater than 15 feet per second are attained, special provision shall be made to protect against displacement by erosion and impact.

(7) Steep Slope Protection – Sewers on 20 percent slopes or greater shall be anchored securely with concrete anchors spaced as follows:

(a) Not over 36 feet center to center on grades 20 percent and up to 35 percent;

(b) Not over 24 feet center to center on grades 35 percent and up to 50 percent; and

(c) Not over 16 feet center to center on grades 50 percent and over.

(8) Alignment – Sewers shall be laid with straight alignment between manholes, straight alignment shall be checked by using a laser.

(9) Service Connections – Service connections to the sewer main shall be water tight and not protrude into the sewer. If a saddle type connection is used, it shall be a device designed to join with the types of pipe which are to be connected. All materials used to make service connections shall be compatible with each other and with the pipe materials to be jointed and shall be corrosion proof.

(10) Manholes

(a) Location - Manholes shall be installed: at the end of each line; at all changes in grade, size, or alignment; at all intersections; and at distances not greater than 400 feet. Cleanouts may be used only for special conditions and shall be not substituted for manholes nor installed at the end of laterals greater than 150 feet in length.

(b) Drop Type - A drop pipe shall be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole invert. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches, the invert shall be filleted to prevent solids deposition.

Drop manholes should be constructed with an outside drop connection. The entire outside drop connection shall be encased in concrete.

(c) Diameter - The minimum diameter of manholes shall be 48 inches. A minimum access diameter of 22 inches shall be provided.

(d) Flow Channel - The flow channel straight through a manhole should be made to conform as closely as possible in shape, and slope to that of the connecting sewers. The channel walls should be formed or shaped to the full height of the crown of the outset sewer in such a manner to not obstruct maintenance, inspection or flow in the sewers.

(e) Watertightness - Manholes shall be of the pre-cast concrete. Manholes lift holes and grade adjustment rings shall be sealed with non-shrinking mortar or other material approved by the district.

Inlet and outlet pipes shall be joined to the manhole with a gasketed flexible watertight connection that allows differential settlement of the pipe and manhole wall to take place.

Watertight manhole covers are to be used wherever the manhole tops may be flooded by street runoff, high water or in a 100 year flood plain.

(11) Cross Connections Prohibited - There shall be no physical connections between a public or private potable water supply system and a sewer, or appurtenances thereto which would permit the passage of any wastewater or polluted water into the potable supply. No water pipe shall pass through or come into contact with any part of a sewer manhole.

(12) Separation of Water Lines and Sewers - Water main shall be laid at least ten feet horizontally from any existing or proposed sewer. The distance shall be measured edge to edge. In cases where it is not practical to maintain a 10 foot separation, the sewer line shall be 2.5 feet from and 2.5 feet below the water line.

(13) Water Line Crossings - Water lines shall be a minimum of 18 inches above and sewer line. Sewer joints will be equidistant and as far as possible from the water main joint.

C. MATERIALS

(1) General - All pipe, joint, and fittings for sanitary sewer shall be constructed of polyvinyl chloride (P.V.C.) or ductile iron (DI) (when shown on plans), unless otherwise approved by Engineer.

(2) Polyvinyl Chloride Pipe and Fittings (PVC) - PVC pipe shall be extruded from Type I, Grade 1, polyvinyl chloride material designated as PVC 1120, meeting ASTM Specifications D3034, Type PSM, and have a standard dimension ratio of SDR 35.

Pipe shall be homogeneous throughout and free from cracks, holes, foreign inclusions or other defects. Pipe shall be as uniform as commercially practical in color.

Workmanship, pipe dimensions and tolerances, outside diameters, wall thickness, eccentricity, sustained pressures, burst pressures, flattening, extrusion quality, marking and all other requirements of Commercial Standards CS 256-63 shall be complied with in all respects.

Pipe shall be furnished in 13 foot lengths. Pipe shall have a bell on one end. Male ends of pipe must be beveled on the outside. Pipe shall have a ring painted around male end or ends in such a manner as to allow field checking of setting depth of pipe in the socket. This requirement is made to assist construction superintendents and inspectors in visual inspection of pipe installation.

Pipe must be delivered to job site by means which will adequately support it and not subject it to undue stresses. In particular, the load shall be so supported that the bottom rows of pipe are not damaged by crushing. Pipe shall be unloaded carefully and strung or stored as close to final point of placement as is practical. Pipe must not be exposed to direct rays of sun for an extended period of time. If pipe is not to be installed shortly after delivery to job site, it must be stored in shaded location and strung as needed.

All pipe and fittings shall be clearly marked on the outside indicating name of manufacturer, nominal diameter, and specification classification.

(3) Ductile Iron Pipe - Mechanical and Rubber Slip Joint Type - Ductile iron pipe shall be designed for a minimum 200 psi operating pressure plus 100 psi water hammer allowance.

The net weight, class or nominal thickness, and casting period shall be shown on each pipe. The manufacturer's mark, the year in which the pipe was produced and the letters "DI" or "DUCTILE" SHALL BE CAST OR STAMPED ON THE PIPE.

The spigot end of the pipe shall be free of blemishes and defects which might be responsible for a poor fit with the rubber ring gasket and result in leakage.

All ductile iron pipe for sewer service shall have manufacturer's standard outside bituminous or asphaltic base coating and a cement lining and bituminous seal coat on the inside. Cement mortar lining and bituminous seal coat inside shall conform to ANSI/AWWA C104/A21.4-90.

Ductile iron compact fittings, meeting the requirements of ANSI/AWWA C153/A21.53-88, will be accepted through 16 inch diameter.

Fittings shall be 350 psi pressure rating for all sizes through 30 inch.

All fittings shall be lined and coated the same as adjacent pipe.

Pipe joints shall be mechanical joint or rubber ring slip joint.

All items used for jointing pipe shall be furnished with the pipe. The joints shall be made with tools and lubricant in strict conformity with the manufacturer's instructions. Copies of the instructions shall be delivered to the DISTRICT at start of construction in sufficient numbers that will permit the DISTRICT to retain 3 copies.

Mechanical joints are to be furnished according to ANSI/AWWA C111/A21.11-90. All pipe joints must be furnished complete with all accessories. Mechanical joint bolts and nuts shall be of alloy cast iron or alloy steel (Corten type such as U.S. Alloy) or equal. Rubber gaskets shall be made of plain first grade rubber, free of imperfections and porosity. Hardness shall be 75 ± 5 durometer.

(4) Steel Encasement Pipe - Steel encasement pipe shall be steel, plain end uncoated and unwrapped, have a minimum yield point strength of 35,000 psi and conform to ASTM A252 Grade 2 or ASTM A139 Grade B without hydrostatic tests. Steel pipe shall have continuous welded joints and be in at least 18-foot lengths. Used pipe can be used if the minimum wall thickness is met.

Wall thickness of pipe shall be a minimum of 0.250 inches. Diameter of pipe shall conform to requirements of Kentucky Transportation Cabinet, Bureau of Highways for highway crossings and the American Railway Engineering Association.

Spacers shall be used at every 8 feet. Manufactured end sections shall be used at the end of the steel encasement.

(5) Manholes

(a) Precast Concrete Rings - Precast concrete rings for manholes shall conform to ASTM C 76, Table II, Wall B, with minimum concrete strength of 4,000 psi, except that rings for manholes over 12 feet deep shall be in accordance with Table III. O-ring gaskets shall be installed between connected ring sections.

(b) Precast concrete eccentric cones shall be of size and shape indicated on Drawings and shall conform to ASTM C 76 for reinforced concrete sewer pipe.

(c) Manhole bases shall be formed as indicated on Drawings. Watertight seals, such as "Dura-Seal" shall be factory installed in the bases.

(d) Manhole Steps - shall be made of steel reinforced polypropylene plastic as the PS1 manhole step manufactured by M.A. Ind., Inc., Peachtree City, Georgia, or any steel reinforced plastic step which produces equal or better performance.

(e) Manhole castings shall consist of cast iron frames and 22-3/4 inch diameter covers, dimensioned as indicated on Drawings. Manhole covers shall set neatly in rings, with contact edges machined for even bearing and tops flush with ring edge. They shall have sufficient corrugations to prevent slipperiness and be marked in large letters, "SANITARY SEWER". Covers shall have two pick holes about 1-1/4" inches wide and sanitary sewer manholes shall not be perforated. Standard manhole frames (for medium traffic) shall be 7 inches thick and weigh 350 pounds, heavy duty manhole frames shall be 9 inches thick and weigh 450 pounds. Four (4) inch frames are not permitted.

(f) Drops into standard manholes shall be built as a part of standard manhole of Class "B" concrete. Stack pipe shall be laid in manhole as indicated on Drawings and encased with concrete. Pipe which is laid on drop portion of manhole shall be supported with Class "B" concrete extending from drop stack to reinforced base of manhole.

D. TRENCH EXCAVATION - Trenches in which pipes are to be laid shall be excavated in open cut to depths indicated on Drawings. Minimum allowable trench width shall not be less than outside diameter of pipe plus twelve inches. Where rock is encountered, it shall be removed to a minimum depth of six inches below the pipe.

Unless specifically authorized by District, trenches shall in no case be excavated or permitted to become wider than 2 feet 6 inches plus nominal diameter of pipe at level or below top of pipe. If trench does become wider than 2 feet 6 inches at level of or below top of pipe, special precautions may be necessary, such as providing compacted granular fill up to top of pipe or providing pipe with additional crushing strength determined by District after taking into account actual trench loads that may result and strength of pipe being used. Contractor shall bear cost of such special precautions as necessary.

All excavated materials shall be placed a minimum of 2 feet from edge of trench.

Where conditions exist that may be conducive to slides or cave-ins, proper and adequate sheeting, shoring and bracing shall be installed to provide safe working conditions and to prevent damage to work.

Trenches shall be kept free of water during laying of pipe and until pipeline has been backfilled.

All trenching operations shall be in compliance with OSHA regulations and state requirements.

When excavated material is placed on paved roads, the contractor shall clean road with power broom at the end of each days work or as directed by the Engineer.

When excavated material is placed on gravel or dirt roads, the contractor shall place crushed stone to the same thickness of the road prior to construction as determined by the District.

Where unstable material is encountered or where depth of excavation in earth exceeds six feet, sides of trench or excavation shall be supported by substantial sheeting, bracing and shoring, or side sloped to angle of repose. Sloping sides of ditch to angle of repose will not be permitted in streets, roads, narrow rights-of-way or other constricted areas unless otherwise specified. Design and installation of all sheeting, sheet piling, bracing and shoring shall be based on computations of pressure exerted by materials to be retained under construction conditions. Adequate and proper shoring of all excavations shall be the entire responsibility of Contractor.

E. BLASTING - Shall be conducted in accordance with municipal ordinances, state laws, and Section 9 of the Manual of Accident Prevention in Construction published by the Associated General Contractors of America, Inc. All explosives shall be stored in conformity with said ordinances, laws and safety regulations. No blasting shall be done within five feet of any water mains, except with light charges of explosives. Any damage done by blasting is the responsibility of the Contractor and shall be promptly and satisfactorily repaired by him.

All shots shall be covered with heavy timber or steel blasting mats to prevent flying material. Unless otherwise specified or directed, delay caps shall be used to reduce earth vibrations and noise.

All blasting operations shall be covered by public liability insurance, or if said public liability insurance does not cover blasting, then the Contractor shall have separate public liability insurance to cover his blasting operations.

All blasting operations shall be supervised and performed by qualified licensed personnel.

F. PIPE BEDDING - In all cases foundation for pipes shall be prepared so that entire load of backfill on top of pipe will be carried on barrel of pipe and where bell and spigot pipe are involved, none of load will be carried on bells.

For bell and spigot pipe, bell holes shall be cut in granular bedding to prevent bells from being supported on undisturbed earth or granular material.

Supporting of pipe shall be as set out hereinafter, and in no case shall the supporting of pipe on blocks be permitted.

Foundations for pipes laid in trenches shall be prepared so that entire load of backfill on top of pipe will be carried uniformly on barrel of pipe. Pipe bells shall not carry any load of backfill. Excavation shall be undercut to a minimum depth of six inches below bottom of pipe. Pipe shall be laid on a bed of granular material to provide continuous support for the lower section of pipe. Granular bedding shall be Dense Graded Aggregate (DGA) or #9 stone.

If trench bottom is in rock, excavation shall be undercut to a minimum depth of six inches below bottom of pipe. Pipe shall be laid on a bed of granular material to provide continuous support for the lower section of pipe. Granular bedding shall be Dense Graded Aggregate (DGA) or #9 stone.

In wet, yielding mucky locations where pipe is in danger of sinking below grade or floating out of line or grade, or where backfill materials are of such a fluid nature that such movements of pipe might take place during placing of backfill, pipe must be weighted or secured permanently in place by such means as will prove effective. When directed by District, yielding and mucky material in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for pipe.

G. PIPE LAYING – Crushed stone or other such granular material shall be used as backfill.

Laying of sewer pipe in finished trenches shall commence at lowest point so that spigot or tongue ends point in the direction of flow.

Contractor shall use a laser instrument to set grades on sewer lines. In using such an instrument, Contractor shall be responsible for maintaining grades and elevations as called for on drawing profiles, and any variances found shall be corrected by Contractor.

All pipe lengths shall be laid with ends abutting and true to line and grade as shown on the plans. They shall be fitted and matched so that when laid they will form a sewer with a smooth and uniform invert. Foundation of pipe shall be as set out hereinbefore under "Pipe Bedding" and in no case shall supporting of pipe on blocks be permitted.

Branches and fittings for sewer lines shall be provided and laid as and where directed by District or indicated on Drawings.

Before each piece of pipe is lowered into trench, it shall be thoroughly cleaned and inspected. Each piece of pipe shall be lowered separately. No piece of pipe or fitting which is known to be defective shall be laid or placed in trenches. If defective pipe or fitting shall be discovered after pipe is laid, it shall be removed and replaced with a satisfactory pipe or fitting. In case a length of pipe is cut to fit in a line, it shall be so cut as to leave a smooth end at right angles to longitudinal axis of pipe.

When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a suitable plug fitted into pipe bell, so as to exclude earth or other material, and precautions taken to prevent floatation of pipe by runoff into trench.

All joints and connections shall be as established hereinbefore. Assembly of pipe and fitting joints shall be in accordance with manufacturer's recommendations.

H. BACKFILLING - All backfilling shall be accomplished in accordance with detail drawings and the requirements of this section. Any variances must be approved in writing by District.

When directed by District, Contractor shall add water to backfill material or dry out material when needed to attain a condition near optimum moisture content for a maximum density of material when it is tamped. Contractor shall obtain a compaction of the backfill of at least 95 percent of a standard (ASTM D698) Proctor density where mechanical tamping of backfill is required.

Before final acceptance, Contractor will be required to level off all trenches or to bring trench up to level of surrounding terrain. Contractor shall also remove from roadways, rights-of-way and/or private property all excess earth or other materials resulting from construction.

In the event that pavement is not placed immediately following trench backfilling in streets and highways, Contractor shall be responsible for maintaining trench surface in a level condition at proper pavement grade at all times. Pavement shall be replaced within 30 calendar days unless asphalt plant is closed.

In all cases walking or working on completed pipelines except as may be necessary in tamping or backfilling will not be permitted until trench has been backfilled to a point one foot above top of pipe. Filling of the trench and tamping of backfill shall be carried on simultaneously on both sides of the pipe in such a manner that completed pipeline will not be disturbed and injurious side pressures do not occur.

The method of backfilling shall be as follows:

Method "A" Backfilling in Open Terrain (AREAS NOT SUBJECT TO VEHICULAR TRAFFIC)

Lower portion of trench, from pipe bedding to a level plane 12 inches above top of pipe shall be backfilled with DGA or #9 stone.

Upper portion of trench above crushed stone portion shall be backfilled with material which is free from large rock. Incorporation of rock having a volume exceeding one-half cubic foot is prohibited. Backfilling this portion of trench may be accomplished by any means approved by District. The trench backfill shall be leveled.

**Method "B" Backfilling Under Paved Streets and Roads
(Open Cut Method)**

Backfilling of pipeline trenches under sidewalks, streets, proposed streets, and parking lots shall be backfilled with DGA or flowable fill. Backfill shall be placed full depth in trench.

The Contractor shall be responsible for any trench settlement which occurs within one year from time of final acceptance of all work in the project. If paving shall require replacement because of trench settlement, within this time, it shall be replaced by Contractor. Repair of settlement damage shall meet approval of appropriate governing body.

Concrete cradle, anchors or encasement of sewer lines and/or fittings shall be placed where indicated on Drawings or directed by District. Concrete shall be Class "B" and shall be mixed sufficiently wet to permit it to flow under pipe to form a continuous bed. In tamping concrete, care shall be taken not to disturb grade or line of pipe or injure joints.

I. STREAM CROSSINGS - All construction related to stream crossings shall be done to minimize soil erosion and siltation. Hay bales on silt fences shall be installed.

On stream crossings care shall be taken to limit the disturbed areas during construction. No excavating of unnecessary areas, disturbing or uprooting of trees and vegetation, dumping of soil or debris or pumping of silt-laden water into stream will be allowed.

On stream crossings, clean-up, grading, seeding and restoration shall begin immediately. All unexposed areas shall not remain unprotected for more than seven days.

J. MANHOLES - Manholes shall be installed where and as indicated on Drawings.

Standard manholes shall be over five feet in depth, measured from base of cover frame to top of concrete footing and shall be of cone-type top construction as indicated on Drawings.

Shallow manholes shall be five feet or less in depth, measured from base of cover frame to top of concrete footing and shall be of flat top construction as indicated on drawings.

Manhole excavation shall be kept free of water while manhole is being constructed and the manhole shall not be backfilled until inspected by the District.

Prior to installation, manhole shall be inspected for damage.

K. HIGHWAY AND RAILROAD CROSSINGS - Steel encasement pipe for road and railroad crossings shall be bored and/or jacked in place to the elevations shown on the plans. All joints between lengths shall be solidly welded with a smooth non-obstructing joint inside. The encasement pipe shall be installed without bends. The sewer line pipe shall be installed after the encasement pipe is in place. Casing spacers and end caps shall be installed on the pipe in the encasement.

L. CONCRETE ENCASEMENT - Concrete encasement shall be placed where shown on drawings, or as directed by District. Concrete shall be Class 3500 psi and shall be mixed sufficiently wet to permit it to flow under pipe to form a continuous bed. In tamping concrete, care shall be taken not to disturb grade or line of pipe or injure joints.

M. CONNECTION TO EXISTING SYSTEM

All connections to existing manholes shall be core drilled and installed with a neophrene boot. The invert of the manhole will be reconstructed to provide a channel for the new sewer line.

N. LATERALS - Sanitary Y's will be set on all sanitary sewer mains to serve the lots as shown on plans. The 4 inch laterals will be constructed to the property line or road right-of-way line as shown on plans. Contractor shall coordinate lateral location with the District.

All house connections, unless otherwise specified or directed, shall be 4-inch standard PVC pipe as specified hereinbefore and as indicated on Drawings. Trenching, pipe laying, joints and backfilling shall conform to requirements set out herein. All open ends shall be sealed with standard plugs to satisfaction of Engineer. To protect sealed end from trenching equipment, a #4 reinforcing bar shall be installed as shown in the Plans.

For shallow sewers (10 feet or less in depth) in rock or earth trenches, tees shall be encased entirely with crushed stone (Kentucky Highway Department Size No. 78) and fully compacted.

House connection pipe shall be of same type as used in collector lines. Pipe shall be laid on a uniform grade from tee branch to meet building sewer grade to building so that no bends will be needed for final connection. Contractor shall coordinate lateral location with the District.

House connection pipe shall contain a 45° fitting which will put end of pipe to ground level. The end of pipe shall be at the property line, right-of-way line or easement line.

For deep sewers (greater than 10 feet in depth) in rock, the tees shall be encased entirely with Class "B" Concrete. House connections in this case shall be a combination of cast iron pipe, cast iron bends, and standard adapter and sewer pipe of same material used for collector lines, extended from tee to property line. Cast iron pipe shall be laid vertically from main to a point to meet the probable building sewer grade. From this point appropriate pipe (same type as used in collector lines) shall be laid on a uniform slope to match probable grade of building sewer.

The laterals shall be installed so the grade will be able to tie into the house connection.

Under normal conditions, where elevations are not critical, house connection pipe shall be laid on a slope of not less than one foot per 100 feet (approximately 1/8 inch per foot).

Tapping house connections into manholes on newly constructed sewers will not be permitted, except where approved by District. Where it is necessary to do so, invert of house connection shall not be higher than a point three inches below top of bench to prevent accumulation of solids on bench. If necessary, a standard drop connection shall be provided for a house connection that is tapped into a manhole.

O. TESTING GRAVITY SEWERS

(1) General - After collection and/or outfall lines have been brought to completion, and prior to final inspection, Contractor shall rod out entire system by pushing through each individual line in system, from manhole to manhole, appropriate tools for removal from the lines of any and all dirt, debris and trash.

All lines or sections of lines that are found to be laid improperly with respect to line or grade, that are found to contain broken or leaking sections of pipe, or are obstructed in such a manner that they cannot be satisfactorily corrected otherwise, shall be removed and replaced.

(2) Low Pressure Air Test - All sanitary sewers will receive a low-pressure air test for leakage. Air test will be made after all laterals have been installed to property lines and backfilling has been completed and compacted.

All ties and end of sewer services shall be plugged with flexible joints plugs or end caps securely fastened to withstand internal test pressures. Such plugs or caps shall be readily removable, and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension.

Prior to testing, pipe shall be checked to see that it is clean. If not, it shall be cleaned by passing a full gauge squeegee through the pipe. It shall be Contractor's responsibility to clean the pipe.

Immediately following this check or cleaning, pipe installation shall be tested with low-pressure air. Air shall be slowly supplied to plugged pipe installation until internal air pressure reaches 4.0 pounds per square inch greater than average back pressure of any ground water that may be in the pipe. At least two minutes shall be allowed for temperature stabilization.

Requirements of air test shall be considered satisfied provided that the time required, in seconds for pressure to decrease from 3.5 to 3.0 pounds per square inch greater than the average back pressure of any ground water that may submerge the pipe is not less than that shown in the "Allowable Time Table" listed below, which is for 400 foot sections of pipe. For testing of shorter sections of pipe the District shall determine duration of test.

ALLOWABLE TIME TABLE

PIPE SIZE	<u>TIME</u>		PIPE SIZE	<u>TIME</u>	
	MIN.	SEC.		MIN.	SEC.
6"	2	55	18"	8	30
8"	3	57	21"	9	50
10"	4	43	24"	11	20
12"	5	40	27"	12	45
15"	7	05	30"	14	10

Contractor shall furnish all labor and equipment necessary to conduct low pressure air test. Records of test results shall be kept for each section of sewer tested.

District must witness each satisfactory air test before it will be accepted as fulfilling requirements of these specifications.

(3) Infiltration Test - Contractor shall lay sewer lines, including house connections, so that ground water infiltration shall not average more than 1500 gallons per 24 hours per mile of sewer without regard to diameter of sewer. Only length of main sewers shall be used in making the foregoing computation even though house connections (from the main sewer to property line) should be in place and included as a part of system when infiltration is measured. This requirement may be applied to a portion of contract work, such as sewers in a separate drainage area or to a single section of line between two manholes.

In order to test for infiltration, the District may also require exfiltration tests on each section of pipe between manholes after it has been laid but prior to backfilling of joints. Exfiltration tests shall be conducted by plugging lower end of section of sewer to be tested and filling sewer with water to a point approximately five feet above invert at lower end observing for leakage at all joints and measuring the amount of leakage for a given interval of time. Exfiltration shall not exceed 110 percent of infiltration limits set out hereinbefore. All observed leaks shall be corrected even if exfiltration is within allowable limits. Exfiltration tests will normally be required for flat sections of sewer that are expected to be below wet season ground water table.

To test for infiltration, Engineer may also require that Contractor plug open ends of all lines at manhole so that measurements may be made in each section of sewer line. This infiltration test will not be made until sewer line is completed, and Contractor will be required to correct all conditions that are conducive to excessive infiltration and may be required to relay such sections of line that may not be corrected otherwise. All observed leaks shall be corrected even if infiltration is within allowable limits.

(4) Deflection Test - Deflection tests shall be performed on all sewers after they have been constructed a minimum of 30 days. If the deflection test is to be run using a rigid ball or mandrel, it shall have a diameter equal to 95 percent of the inside diameter of the pipe. The test shall be performed without mechanical pulling devices. Pipe deflection shall be measured and recorded by the CONTRACTOR in the presence of the District using appropriate methods approved by the pipe manufacturer and acceptable to the District. Equipment required for the test shall be provided by the Contractor.

Any sewer line exceeding 5% of deflection shall be replaced.

(5) Each manhole shall be tested for water tightness.

SECTION FIVE: SEWAGE FORCE MAIN

A. PURPOSE – The purpose of this chapter is to outline requirements for the proper design, construction and final acceptance of sewage force mains and appurtenances.

B. DESIGN REQUIREMENTS – All sewage force mains and appurtenances shall be designed in accordance with requirements and regulations and the Public Service Commission and the Department for Natural Resources and Environmental Protection, Division of Water, Facilities Construction Branch.

(1) Velocity and Diameter – At design pumping rates, a cleansing velocity of at least 2 feet per second should be maintained. The minimum force main diameter for raw wastewater shall not be less than 4 inches. Smaller force mains can be used with grinder sewage pumps.

(2) Air and Vacuum Relief Valve – An air relief valve shall be placed at high points in the force main to prevent air locking. Vacuum relief valves may be necessary to relieve negative pressures on force mains. The force main configuration and head conditions should be evaluated as to the need for and placement of vacuum relief valves.

(3) Termination – Force mains should enter the gravity sewer system at a point not more than 2 feet above the flow line of the receiving manhole.

(4) Pipe and Design Pressure – Pipe and joints shall be equal to water main strength materials suitable for design conditions. The force main, reaction, reaction blocking, and station piping shall be designed to withstand water hammer pressures and associated cyclic reversal of stresses that are expected with the cycling of wastewater lift stations.

(5) Design Friction Losses – Friction losses through force mains shall be based on the Hazen and Williams formula or other acceptable methods. When the Hazen and Williams formula is used a "C" value of 120 shall be used for design. The design shall also check force main design with a "C" value of 140.

(6) Identification – Where force mains are constructed of material which might cause the force main to be confused with potable water mains, the force main shall be appropriately identified.

(7) Depth of Cover – All force mains shall have a minimum cover of thirty six inches of backfill, measured from the top of the pipe.

(8) Separation of Water Lines and Sewers – Force main shall be laid at least ten feet horizontally from any existing or proposed water line. The distance shall be measured edge to edge.

C. MATERIALS

(1) Polyvinyl Chloride Pipe (PVC) - PVC pressure pipe shall conform as a minimum, to ASTM Specifications D-2241, and shall be pressure Class 200. Pipe furnished under ASTM A-2241 shall have a standard dimension ratio not to exceed SDR 21, and shall be rated to a working pressure of at least 200 psi at 73.4°F.

Fittings shall be cast iron Mechanical Joint Class 250 conforming to AWWA Specifications C110 for short body cast iron fittings. Fittings shall be tar-coated outside, and shall receive standard cement lining with bituminous seal coat on inside.

Joints shall be of push-on type conforming to ASTM D3139 and F477 requirements for elastomeric-gasket joints. All jointing material and lubricants shall be non-toxic.

(2) Sewage Combinations Air Valve - The Sewage Combination Air Valve shall consist of a single body with double orifice to allow large volumes of air to escape and enter thru the larger diameter air and vacuum orifice when filling or draining a pipe line.

The Float shall be heavily constructed stainless steel hermetically sealed; and having a Concave bottom impact area to provide immediate resistance to flow and instant upwards movement to shut off the larger orifice "WITHOUT SPILLING".

The Buna-N seat must be fastened to the valve cover, without distortion for drop tight shut-off.

The Sewage Combination Air Valve shall be fitted with (1) inlet 2" Bronze Gate Valve from the force main, (1) Blow-off Valve and (1) Flush Valve and minimum 5' Rubber Hose with quick disconnect couplings for back flushing.

Valve to be APCO Series 440WA Sewage Combination Air Valve with attachments, as manufactured by Valve & Primer Corporation or approved equal.

(3) Check Valve - Check valve shall be a lever a spring type and conform to the latest revision of AWWA Specification C-500. Valves shall have a rated working pressure of 175 psi with standard mechanical joint.

Check valve shall be installed in a 36" diameter PVC box.

Metal lid for boxes shall be VWM-24-2 by Vestal Manufacturing or approved equal and marked "Sewer".

(4) Gate Valves and Boxes - All gate valves shall be double disc, parallel seat type or resilient seated type, iron body, non-rising stem, fully bronze mounted with O-ring seals. Valves shall be of standard manufacture and of highest quality both as to materials and workmanship and shall conform to latest revisions of AWWA Specification C-500. Valves shall have a rated working pressure of 200 psi, with standard mechanical joint, A-2380-23 as manufactured by Mueller Co., Darling, Smith, Kennedy, or approved equal.

Gate valves for buried service shall be furnished with mechanical joint end connections, unless otherwise indicated on Drawings. End connections shall be suitable to receive PVC.

All gate valves shall have name or monogram of manufacturer, year valve casting was made, size of valve, and working pressure cast on the body of valve.

Gate valves set with valve boxes shall be provided with a 2 inch square operating nut and shall be opened by turning to left (counterclockwise); gate valves set in vaults or pits shall be furnished with hand wheels.

Gate valves shall be installed in a vertical position with cast iron valve box. Valve boxes shall be cast iron, screw type with drop over marked "SEWER". They shall be set vertically and properly adjusted so that cover will be in the same plane as finished surface of ground, street, or sidewalk.

Valve boxes shall be accurately centered over valve operating nut, and backfill thoroughly tamped about them. Valve box bases shall not rest on valves but shall be supported on crushed stone fill. They shall be set vertically and properly cut and/or adjusted so that tops of boxes will be at grade in any paving, walk or road surface, and two to three inches above ground in grass plots, fields, woods or other open terrain. Valve boxes shall be as manufactured by Mueller, M & H Valve Company, Darling, Russell Pipe and Foundry, or approved equal.

A two feet diameter by four inch thick concrete pad shall be furnished around valve boxes. All concrete shall be poured on site with no prefab pads allowed.

D. TRENCHING, BEDDING, PIPE LAYING, BACKFILLING AND HIGHWAY CROSSING - Trenching, bedding, pipe laying, backfilling and highway crossing for force main shall be as indicated on the drawings.

E. TESTING OF SEWAGE FORCE MAINS - Finished work shall comply with provisions listed below:

- (1) Leakage in pipelines, when tested under pressure of 50# in excess of normal operating pressure, shall not exceed 5 psi differential during duration of test.
- (2) Where practicable, pipelines shall be tested between line valves or plugs in lengths of not more than 1500 feet.
- (3) Pipelines shall be tested before backfilling at joints except where otherwise required by necessity, local ordinance, or public convenience.
- (4) Duration of test shall be not less than two hours.
- (5) Where leaks are visible at exposed joints and/or evident on surface where joints are covered, joints shall be repaired or relaid, and leakage minimized, regardless of total leakage as shown by test.
- (6) All pipe, fittings and other materials found to be defective under test shall be removed and replaced at Contractor's expense.
- (7) Lines which fail to meet tests shall be repaired and retested as necessary until requirements are complied with.
- (8) All tools, equipment, labor, materials, and water necessary for pressure testing of force main shall be provided by Contractor at no additional cost to Owner.

(6) All pipe, fittings and other materials found to be defective under test shall be removed and replaced at Contractor's expense.

(7) Lines which fail to meet tests shall be repaired and retested as necessary until requirements are complied with.

(8) All tools, equipment, labor, materials, and water necessary for pressure testing of force main shall be provided by Contractor at no additional cost to Owner.

SECTION SIX: SUBMERSIBLE SEWAGE PUMP STATION

A **PURPOSE** – The purpose of this chapter is to outline requirements for the proper design, construction and final acceptance of submersible sewage pump station.

B. **DESIGN REQUIREMENTS** – All pump stations and appurtenances shall be designed in accordance with the requirements and regulations of the Public Service Commission and the Department for Natural Resources and Environmental Protection, Division of Water, Facilities Construction Branch and in accordance with "Recommended Standards for Wastewater Facilities" (Ten State Standards).

(1) **Flooding** – Wastewater pumping station structures and electrical and mechanical equipment shall be protected from physical damage by the 100 year flood. Regulations of state, provincial and federal agencies regarding flood plain obstructions shall be considered.

(2) **Accessibility and Security** – The pump station shall be readily accessible by maintenance vehicles during all weather conditions. The facility should be located off the traffic way of streets and alleys. It is recommended that security fencing and access hatches with locks be provided.

(3) **Construction** – Submersible pumps and motors shall be designed specifically for raw wastewater use, including totally submerged operation during a portion of each pumping cycle and shall meet the requirements of the National Electrical Code for such units. An effective method to detect shaft seal failure or potential seal failure shall be provided.

(4) **Pump Removal** – Submersible pumps shall be readily removable and replaceable without dewatering the wet well or disconnecting any piping in the wet well.

(5) **Wet Wells** – The design fill time and minimum pump cycle time shall be considered in sizing the wet well. The effective volume of the wet well shall be based on design average flow and a filling time not to exceed 30 minutes unless the facility is designed to provide flow equalization. The pump manufacturer's duty cycle recommendations shall be utilized in selecting the minimum cycle time. When the anticipated initial flow tributary to the pumping station is less than the design average flow, provisions should be made so that the fill time indicated is not exceeded for initial flows. When the wet well is designed for flow equalization as part of a treatment plant, provisions should be made to prevent septicity.

The wet well shall be designed to have two (2) hours of storage of average flow above the alarm setting.

The wet well floor shall have a minimum slope of 1 to 1 to the hopper bottom. The horizontal area of the hopper bottom shall be no greater than necessary for proper installation and function of the inlet.

Covered wet wells shall have provisions for air displacement to the atmosphere, such as exhaust pipe or other means.

(6) Buoyancy – Where high groundwater conditions are anticipated, buoyancy of the wastewater pumping station structures shall be considered and, if necessary, adequate provisions shall be made for protection.

(7) Pump Openings – Pump handling raw wastewater shall be capable of passing spheres of at least 3 inches in diameter. Pump suction and discharge openings shall be at least 4 inches in diameter unless grinder pumps are used.

(8) Valves – Suitable shutoff and check valves shall be placed on the discharge line of each pump. The check valve shall be located between the shutoff valve and the pump. Check valves shall be suitable for the material being handled and shall be placed on the horizontal portion of discharge piping except for ball checks, which may be placed on the vertical run. Valves shall be capable of withstanding normal pressure and water hammer.

All shutoff and check valves shall be operable from the floor level and accessible for maintenance.

Valves shall be located in a separate valve pit. Provisions shall be made to remove or drain accumulated water from the valve pit. The valve pit may be dewatered to the wet well through a drain line. Check valves that are integral to the pump need not be located in a separate valve pit provided that the valve can be removed from the wet well.

(9) Electrical Equipment – Electrical supply, control, and alarm circuits shall be designed to provide strain relief and to allow disconnection from outside the wet well. Terminals and connectors shall be protected from corrosion by location outside the wet well or through use of watertight seals.

The motor control center shall be located outside the wet well, be readily accessible, and be protected by a conduit seal or other appropriate measures meeting the requirements of the National Electrical Code, to prevent the atmosphere of the wet well from gaining access to the control center. The seal shall be so located that the motor may be removed and electrically disconnected without disturbing the seal. When such equipment is exposed to weather, it shall meet the requirements of weatherproof equipment NEMA 3R or 4.

Pump motor power cords shall be designed for flexibility and serviceability under conditions of extra hard usage and shall meet the requirements of the National Electrical Code standards for flexible cords in the wastewater pump stations. Ground fault interruption protection shall be used to de-energize the circuit in the event of any failure in the electrical integrity of the cable. Power cord terminal fittings shall be corrosion-resistant and constructed in a manner to prevent the entry of moisture into the cable, shall be provided with strain relief appurtenances, and shall be designed to facilitate field connecting.

(10) Alarm System - An audio-visual alarm system with a self-contained power supply shall be provided for pumping stations. The alarm shall be activated in cases of power failure, pump failure, or any cause of pump station malfunction.

C. MATERIALS

(1) Pumps - At each station, furnish two (2) heavy-duty non-clog submersible sewage chopper pumps, upper guide bar jacket, 40 feet of stainless steel lifting chain and 40 feet of pypalonjacketed type SPC cable P-MSHA approved and sized according to N.E.C. and ICEA standards.

Pumps shall be capable of handling unscreened sewage at pumping rate adequate for total dynamic head and flow rate required for proper operation of system in which it exists. Design shall be such that pump unit will be automatically and firmly connected to discharge piping when lowered into place on its mating discharge connection, permanently installed in a wet well. Pump shall be easily removable for inspections or service, requiring no bolts, nuts or other fastenings to be disconnected. For this purpose, there shall be no need for personnel to enter wet well. Each pump shall be fitted with a stainless steel chain of adequate length and strength to permit raising and lowering pump for inspection and removal. Pump, with appurtenances and cable, shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet.

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

Pumps shall be capable of continuous dry pumping in a totally dry condition without damage to motor or seals.

(2) Grinder Pump - At each grinder pump station, furnish two (2) heavy-duty non-clog submersible sewage grinder pumps, upper guide bar jacket, 40 feet of stainless steel lifting chain and 40 feet of pypalon-jacketed type SPC cable P-MSHA approved and sized according to N.E.C. and ICEA standards.

Pumps shall be capable of handling unscreened sewage at pumping rate adequate for total dynamic head and flow rate required for proper operation of system in which it exists. Design shall be such that pump unit will be automatically and firmly connected to discharge piping when lowered into place on its mating discharge connection, permanently installed in wet well. Pump shall be easily removable for inspections or service, requiring no bolts, nuts or other fastenings to be disconnected. For this purpose, there shall be no need for personnel to enter wet well. Each pump shall be fitted with a stainless steel chain of adequate length and strength to permit raising and lowering pump for inspection and removal.

Pump shall be of the centrifugal type with an integrally built in grinder unit and submersible type motor. The grinder unit shall be capable of macerating all material in normal domestic and commercial sewage including reasonable amounts of foreign objects such as small wood, sticks, plastic, thin rubber, sanitary napkins, disposable diapers and the like to a fine slurry that will pass freely through the pump and 1-1/4" discharge pipe. Discharge shall be 1-1/4" NPT.

Pumps shall be capable of continuous dry pumping in a totally dry condition without damage to motor or seals.

Grinder assembly shall consist of grinder impeller and shredding ring and shall be mounted directly below the volute passage. Grinder impeller to be threaded onto stainless shaft and shall be locked with screw and washer. The shredding ring shall be pressed into iron holding flange for easy removal. Flange shall be provided with tapped back-off holes so that screws can be used to push the shredding ring from housing. All grinding of solids shall be from action of the impeller against the shredding ring. Both grinder impellers and shredding ring shall be of 440C stainless steel hardened to 58-60 Rockwell C.

(3) Pump Motors - Submersible electric motor shall be rated at the H.P. shaft output as shown in the design, have a service factor of 1.15, and be connected for available electricity at site meeting NEMA standards for electric motors.

Motor shall be designed for continuous duty, capable of sustaining ten (10) starts per hour.

Pump motors shall be housed in watertight casing and shall have Class B insulation system with Class "F" materials. Motor shall be equipped with tandem mechanical seals in oil bath and dual moisture sensing probes. Motor shall include two normally closed automatic resetting thermostats connected in series and imbedded in adjoining phases. Motor frame shall be cast iron, and all hardware and shaft shall be stainless steel.

Cable entry water seal design shall be such that precludes specific torque requirements to insure a watertight and submersible seal. Epoxies, silicones or other secondary sealing systems shall be used. Cable entry junction box and motor shall be separated by stator lead sealing gland or terminal board which shall isolate motor interior from foreign materials gaining access through pump top.

Pump motor cable installed shall be suitable for submersible pump applications and this shall be indicated by a code or legend permanently embossed on cable. Cable sizing shall conform to NEC specifications for pump motors and shall be of adequate size to allow motor voltage conversion without replacing cable.

(4) Level Controls - Liquid level controls shall include mercury switch level sensors in corrosion and shock resistant plastic casing with flexible cord and weight. Level control system shall include support brackets for suspending a minimum of five sensors at proper levels in wet well, and NEMA 4 watertight junction box as indicated on Drawings: one for pump turn-on; one for pump turn-off; one for both pumps ON; one for alarm and one for flooding of pump. Controls for automatically alternating the pumps shall also be installed.

(5) Pump and Valve Pits - Pump and valve pits shall be constructed of prefabricated reinforced concrete pipe conforming to requirements of AASHTO M-207. Concrete slab cover for pump pit shall be adequately reinforced to support a live load of 100 pounds per square foot.

(6) Rail Assembly - The lift-out rail system assembly shall permit easy removal and installation of the pump without the necessity of personnel entering the wet well. Structural guide brackets with guide yokes of sufficient bearing strength to prevent binding shall bolt to the pump. A brace, easily removable from the top of the wet well, shall be provided to lock the parts together and to prevent line surges from breaking the seal and allowing leakage.

The discharge case shall be securely bolted to the floor of the wet well so that slight detection caused by the discharge pipe will not cause the quick-connect pump flange to leak. The discharge case shall be made of cast iron pipe.

All guides, brackets and hold-downs shall be of non-sparking, corrosion resistant material.

(7) Sewage Pump, Fittings and Valves – All inside piping shall be Class 52 Ductile Iron Pipe, flanged ANSI Class 125 inside and terminating in mechanical joints bells outside. Outside piping shall conform to requirements listed elsewhere in these Specifications.

Gate valves shall be solid wedge, bronze fitted. Check valves shall be weight loaded, external lever type, bronze fitted. Gate valves shall be provided on discharge lines and a check valve on discharged line between pump and gate valve as indicated on Drawings.

A pressure gauge shall be installed downstream of the check valve. Coupling adapters shall be Type 912 cast iron as manufactured by Smith-Blair, or approved equal.

D. FACTORY TESTING - Pump manufacturer shall perform the following inspections and tests on each pump before shipment to insure proper operation of pump and compliance to customer's purchase order.

- (1) Impeller, motor rating and electrical connections shall first be checked for compliance to the customer's purchase order.
- (2) A motor and cable insulation test for moisture content or insulation defects shall be made.
- (3) Prior to submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.
- (4) The pump shall be run submerged in water to a minimum of six (6) feet.
- (5) After operational test No. 4, the insulation test (No. 2) is to be performed again.

A written report stating the foregoing steps have been done shall be supplied with each pump at the time of shipment.

E. FIELD TEST - After installation, pumping station shall be given a running test of all equipment by factory representative. During test all piping and seals shall be checked to insure no leaks occur and controls shall be carefully checked and balanced for proper operation. A written report shall be delivered to the District on the results of the test.

Contractor shall furnish all necessary tools, materials, equipment and supervision of tests. Owner will furnish electrical energy.

Any defects in equipment or failure to meet guaranteed requirements of these specifications shall be promptly corrected by Contractor by replacement.

F. TOOLS, SPARE PARTS AND MANUALS - One complete set of tools required for routine maintenance, together with any special tools required for such purpose, shall be furnished. Tools shall be supplied in a substantial steel tool box.

A complete replacement pump shaft seal assembly for each pump provided, complete with installation instructions and spare volute gasket shall be furnished.

Two copies of the Operation and Maintenance Manual shall be supplied to the District before final acceptance of pump station.

G. WARRANTY

Complete pump station shall have an unconditional one (1) year warranty on all parts and labor. Sewage pumps shall have a five (5) year prorated manufacturer's warranty.

SECTION FOUR: SEEDING

A. **PURPOSE** - The purpose of this section is to outline the requirements for proper seeding in areas of construction.

B. **MATERIALS** - Mulch shall be a high quality small-grain straw or a hydraulically applied wood-cellulose fiber mulch approved by District.

Commercial fertilizer shall be a complete fertilizer, uniform in composition, dry and free flowing. Fertilizer which becomes caked or otherwise damaged making it unsuitable for use will not be accepted.

Lime shall be agricultural limestone containing not less than 85% of total carbonates and shall be ground to a fineness that 50% will pass through a 100-mesh sieve and 80% will pass through a 20-mesh sieve. Coarser material will be acceptable provided that specified rates of application are increased proportionally on basis of quantities passing 100-mesh sieve.

Lawn Seed shall be guaranteed by dealer and distributed as follows:

(1) **Farm or pasture**

80% Kentucky 31 Tall Fescue
20% Annual Ryegrass

(2) **Residential Yards**

40% Kentucky Bluegrass
40% Fine Leaf Fescue
20% Annual Ryegrass

Seed mixture shall be sown at rate of 5 pounds per 1000 square feet.

C. **SOIL IMPROVEMENTS**

Fertilizer shall be applied to all seeded areas as follows:

(1) Agricultural limestone - 75 pounds per 1000 square feet. Limestone shall be thoroughly mixed into topsoil as far ahead of seeding as will not interfere with other grading operations.

(2) Fertilizer - 20 pounds, 10-10-10 fertilizer per 1,000 square feet. Fertilizer shall be applied to areas being prepared for seeding and shall be mixed lightly in top few inches of topsoil.

D. **SEEDING AND MULCHING** - Immediately before seed is sown, loosen soil to a depth of 3 inches by rotary tools, discs, harrows, or other approved methods. Engineer may reduce depth to which soil is loosened on steep slopes or places inaccessible to mechanical equipment.

Remove all large or unsightly clods or stones, and other foreign material brought to surface and repair all gullies, washes, or disturbed areas before seed is applied.

Seed shall be broadcast either by hand or by approved sowing equipment at rate specified.

Do not perform seeding during high winds that would prevent uniform distribution of seed.

E. PLANTING SEASON - Spring seeding season shall be between February 15 and April 15. Fall seeding season shall be between August 1 and October 20. Seeding seasons may be extended only at direction of District.

F. CLEAN-UP - Soil, peat or similar material which has been brought onto paved areas within or outside construction limit by hauling operations or otherwise shall be removed promptly, keeping these areas clean at all times. Upon completion of seeding, all excess soil, stones and debris which have not previously been cleaned up shall be removed from site. All lawn areas shall be prepared for final inspection.

G. GUARANTEE - Seeding shall be guaranteed for a period of one year. Developer shall perform all corrective work as soon as favorable working conditions occur after being advised of corrective action.