SECTION 7--CONSTRUCTION OF MAIN AND LATERAL SEWERS

GENERAL

The construction of new public sewers, private sewers, and extensions of existing sewers within the Sanitary Authority limits or outside the limits of the Sanitary Authority but to connect to the Sanitary Authority's facilities shall fully conform to this Ordinance, the Sanitary Authority's Construction Standards, and the requirements of the Oregon State Board of Health and Department of Environmental Quality. In the event of conflict, the highest applicable standard shall govern. Copies of the construction standards are available at the Sanitary Authority's office. No connection shall be made to the Sanitary Authority's wastewater facilities without the prior approval of the Sanitary Authority.

5-STEP PROCEDURE

Construction of mains and laterals shall as a minimum follow the 5-step administrative procedure below:

Step 1. Feasibility Review

Step 2. Application for sewer extension

Step 3. Submission of construction plans and specifications

Step 4. Preconstruction Conference and submittals

Step 5. Post construction submittals

Feasibility Review. The person or local government agency proposing an extension or extensions of the Sanitary Authority's sewers shall request a meeting with the Manager to discuss the scope of the proposed extension, conformance with the Sanitary Authority's master sewer plan, procedures, standards, and requirements for Sanitary Authority sewer extensions and feasibility of the proposed extension.

Application for Sewer Extension. Applications for sewer extension shall be made in writing to the manager on the form prescribed by the Sanitary Authority for all proposed construction of wastewater facilities within the area of the Sanitary Authority or outside the Sanitary Authority area, but to be connected to the Sanitary Authority's Wastewater facilities.

The application shall be accompanied by a plat showing the sizes and locations of lots, existing and proposed buildings,

legal description of the property to be served, existing and proposed streets and roads, and other information as requested by the Manager.

Construction Drawings and Specifications. Five sets of detailed construction drawings and specifications (construction documents) for the proposed public and private sewer extensions shall be submitted to the Sanitary Authority. Two sets of the construction documents will be forwarded by the Sanitary Authority to the State Department of Environmental Quality (DEQ) for review and approval. The construction documents shall be prepared by a professional engineer registered in the State of Oregon.

Drawings shall be submitted on the Sanitary Authority's mylars to the Sanitary Authority's scale, and shall contain the information as required by the DEQ as a minimum. Elevations shall be on the Sanitary Authority's datum plane. Mylars can be obtained at the Sanitary Authority's office.

The Sanitary Authority shall return one reviewed set of the construction documents to the local government agency or person with approval or required changes indicated. If said construction documents are disapproved, the required changes shall be made by the local government agency or person, and all required revisions of the construction documents resubmitted in the same manner as provided for the initial submittal. Construction documents shall be approved by both the DEQ and the Sanitary Authority before the Sanitary Authority will issue a permit to construct the sewer extension.

Preconstruction Conference and Submittals. Upon approval of the construction documents, the Sanitary Authority will notify the person or local government agency thereof and request a preconstruction conference. The attendees at the preconstruction conference shall be at least the person or authorized representative of the local government agency proposing the sewer extension, the design engineer, an authorized representative of the construction contractor, and authorized Sanitary Authority personnel.

The following shall be submitted to the Sanitary Authority before issuance of a permit for construction.

(1) A performance and payment bond. The performance and payment bond shall be in favor of the Sanitary Authority for 100 percent of the construction cost or other guarantee that the system is functional and meets the Sanitary Authority standards. The Bond or guarantee shall be for a period of one year after the date of full acceptance by the Sanitary Authority (the date

established by the Sanitary Authority for start of the warranty period).

(2) Signed agreement with the Sanitary Authority for inspection services, payment of permit, and inspection fees and connection charges, and other provisions not otherwise prescribed by this Ordinance.

(3) Evidence of notifying utilities through the one call system.

(4) Evidence of adequate insurance. The Sanitary Authority its officers, agents, and employee shall be named as additional insureds.

(5) Evidence that all other permits have been obtained, including, but not limited to, building and county road permits.

Post Construction Submittals. Upon completion of the sewer extension, the design engineer shall submit to the Sanitary Authority a written statement that the sewer extension is complete, that it was constructed in accordance with the approved construction documents, and request a final construction inspection and acceptance by the Sanitary Authority. The Sanitary Authority will notify the person or local government agency in writing of their final inspection and acceptance of the sewer extension and establish the date for the start of the one-year warranty. The design engineer shall submit record drawings of the sewer extension as it is actually constructed within 10 days after completion of construction. Record drawings drawn to the Sanitary Authority's scale and on the Sanitary Authority's datum plane shall be submitted on Sanitary Authority mylars which can be purchased at the Sanitary Authority's office. All easements shall be submitted to the Sanitary Authority prior to the Sanitary Authority's acceptance of the sewer extensions.

MODIFICATION TO APPROVED DRAWINGS AND SPECIFICATIONS

Revised drawings and specifications shall be submitted to the Sanitary Authority for any changes to the approved documents. Minor changes may be indicated by an addendum. For changes in alignment and scope of the sewer extension, the 5-step procedure shall be followed. Written approval of the Sanitary Authority shall be obtained prior to constructing any sewer extension affected by the revisions.

LOCATION OF SEWERS

All sewer mains and laterals shall be located if practical in dedicated streets or utility rights-of-way to avoid easements across private property. Approval must be granted by

the Manager to locate the sewer on easements. Easement shall be obtained by the persons or local government agency on the form and to the permanent easement widths approved by the Sanitary Authority and turned over to the Sanitary Authority upon the Sanitary Authority's acceptance of the sewer extension.

SEWER CONNECTIONS TO SANITARY AUTHORITY SYSTEM

Sewers shall be planned so as to require the minimum number of points of connection to the Sanitary Authority system.

TYPE OF SEWERAGE SYSTEM

New public sewers, private sewers, and extensions of existing sewers shall be designed as separate sanitary sewers or storm sewers. Construction of combined sewers will not be permitted.

FLOW ALLOWANCES

The design criteria for new public sewers, private sewers, and extensions of existing sewers shall be such that the total daily flow allowance for stormwater shall be 1,500 gallons per acre per day.

INSPECTION

The Sanitary Authority will provide an inspector or inspectors on all new sanitary sewer construction within the Sanitary Authority to insure compliance with this Ordinance and the specifications under which they are to be constructed. The inspector(s) will make diligent efforts to guard the Sanitary Authority against defects and deficiencies in the work of the contractor(s) and to help determine if the provisions of this Ordinance are being fulfilled. Day-to-day inspection will not, however, cause the Sanitary Authority to be responsible for those duties and responsibilities which belong to the construction contractor and/or the design engineer and which include, but are not limited to, full responsibility for the techniques and sequences of construction and the safety precautions, incidental thereto, meeting all Sanitary Authority, local, state, and/or Federal requirements and for performing the construction work in accordance with this Ordinance.

The Sanitary Authority will notify the local government agency or person responsible for the construction when, in the opinion of the Sanitary Authority, the construction work does not comply with this Ordinance. Upon receipt of notification from the Sanitary Authority that any sewer construction work is not being performed in compliance with this Ordinance, the local government agency or person shall immediately take such action as may be necessary to insure compliance.

Each local government agency or person shall inform the Sanitary Authority a minimum of five (5), but not more than ten (10) days in advance of the start of any sewer construction.

The Sanitary Authority shall be reimbursed by the local government agency or person installing new sanitary sewers for the cost of providing inspection services. The cost for inspection services shall be on a per diem basis determined by the Manager at the time the permit is issued to perform the work.

The construction of the sewers shall be under the supervision of an engineer currently registered in the State of Oregon, or his representative.

AGREEMENT FOR SEWER EXTENSION

The person or local government agency proposing a sewer extension shall enter into an agreement with the Sanitary Authority that provides for inspection services by the Sanitary Authority and payment of fees therefore and other provisions for the sewer extension not otherwise prescribed by this Ordinance.

In all those areas where sewer extension is done by private persons under supervision of the Sanitary Authority as hereinabove provided for in this section, the Sanitary Authority and the persons doing the work shall agree as to the time within which said sewer extension work shall be done and upon completion of said work and acceptance thereof by the Sanitary Authority, said sewer mains, laterals, and connections shall be turned over to the Sanitary Authority free and clear of any and all expenses for the construction and installation thereof. The person, persons, or company doing the work before turning over the sewers, mains, and laterals to the Sanitary Authority shall prepare the lots, part of lots, or parcels of ground actually hooked up to said sewer.

In the event a future expansion of the Sanitary Authority sewerage system is made by the Sanitary Authority, the construction cost and connection fee shall be established by the Sanitary Authority and agreed to by the person or local government agency desiring the sewer extension prior to construction.

OREGON ADMINISTRATIVE RULES
REVIEW OF PLANS AND SPECIFICATIONS
CHAPTER 340 DIVISION 52

Statutory Authority: 468.742, 468.035, and 468.700 thru 468.725

Purpose

340-52-005

The purpose of these rules is to prescribe requirements and procedures to obtain approval of plans and specifications as required by ORS 468.742 for the construction, installation or modification of disposal systems, treatment works and sewerage systems.

Definitions

340-52-010

As used in these rules unless otherwise required by context:

(1) "Common Sewer" is a collecting sewer, and a part of the sewerage system which either initially or ultimately will serve two or more tax lots, parcels, or ownerships which may or may not be owned or controlled by a municipality either initially or ultimately. Exception: It does not include for purposes of these rules common sewers within a Unit Ownership (Condominium) Development described in ORS 91.500 to 91.671 and 91.990.

(2) "Department" means the Department of Environmental Quality.

(3) "Disposal system" means a system for disposing of wastes, either by surface or underground methods, and includes municipal sewerage systems, domestic sewerage systems, industrial and agricultural waste systems, treatment works, disposal wells and other systems. ORS 468.700(1)

(4) "Industrial Waste" means any liquid, gaseous, radioactive, or solid waste substance or a combination thereof resulting from any process of industry, manufacturing, trade or business, or from the development or recovery of any natural resources. ORS 468.700(2).

(5) "Municipality" means any county, city, special service district or other governmental entity having authority to dispose of or treat or collect sewage, industrial wastes or other wastes, or any combination of two or more of the foregoing acting jointly. ORS 454.010(3).

(6) "Permit" means a National Pollutant Discharge Elimination System (NPDES) permit or a Water Pollution Control Facilities (WPCF) permit as defined in OAR 340-45-010.

(7) "Person" means the United States and any agencies thereof, any individual, public or private corporation, political subdivision, governmental agency, municipality, copartnership, association, firm, trust, estate, or any other legal entity whatever.

(8) "Pretreatment system" means a system for giving partial treatment to industrial wastes prior to being discharged to a domestic sewerage system for further treatment and ultimate disposal.

(9) "Sewage" means the water-carried human or animal waste from residences, buildings, industrial establishments, or other places together with such groundwater infiltration and surface water as may be present. The admixture with sewage of wastes or industrial wastes shall also be considered "sewage". ORS 468.700(4).

(10) "Sewerage System" means pipelines or conduits, pumping stations, and force mains, and all other structures, devices, appurtenances and facilities used for collecting or conducting wastes to an ultimate point for treatment or disposal. ORS 468.700(5). Generally limited to "common sewers."

(11) "Treatment Works" means any plant or other works used for the purpose of treating, stabilizing or holding wastes, including pretreatment systems.

(12) "Wastes" means sewage, industrial wastes, and all other liquid, gaseous, solid, radioactive, or other substances which will or may cause pollution or tend to cause pollution of any waters of the state. ORS 468.700(7).

SUBMITTAL OF PLANS

340-52-015

Except where exempted under OAR 340-52-040 of these rules, all plans and specifications along with other data submitted for a proposed construction, installation, or modification project involving disposal systems, treatment works, sewerage systems or common sewers shall first be submitted to the Department for review. No construction, installation or modification shall be commenced until the plans and specifications submitted to the Department are approved.

Plans and other information to be submitted shall constitute a complete descriptive proposal, including, but not limited to, the following:

(1) For all projects -

(a) The name of person or firm submitting the project;

(b) Project location by county and nearest city;

(c) The name of the project and/or project developer; or a written description of the project for industrial/ commercial facilities;

(d) The name of the person who will own, operate and maintain the completed project;

(e) The name of the person who will provide construction engineering/inspection services and certify construction inspection under OAR 340-52-035 for (domestic) sewage projects if other than the design engineer;

(f) At least two sets of plans and specifications. (Three sets of final bid documents shall be submitted for a project to receive EPA grant assistance.)

Plans and specifications shall be complete to the extent that a contractor qualified in the type of work could be reasonably expected to construct it with minimal direction by the engineer. In accordance with ORS 672 plans and specifications shall be prepared under the supervision of and signed by a registered professional engineer unless exempted under ORS 672.060 (i.e., company engineer designing certain industrial facilities).

(g) An affirmative written statement from the appropriate jurisdiction that the proposed project for new or expanded facilities is compatible with the L.C.D.C. acknowledged local comprehensive plan, ordinances and zoning requirements or L.C.D.C. statewide planning goals under ORS 197.

(A) Where the jurisdiction submitting a proposed project to the Department for approval under these rules is the sole jurisdiction that is responsible for the affirmative statement of compatibility, the Department will not require the written statement. In such case, submittal of construction plans to the Department shall be deemed evidence that the jurisdiction is in compliance with its own requirements or L.C.D.C. goals.

(B) Where more than one local jurisdiction has planning authority over the specific project, statements of compatibility from each of these jurisdictions (e.g., city, county, and regional planning jurisdictions) shall be submitted to the Department.

(C) Where special districts are proposing projects, the appropriate county and/or city would prepare such statements.

(D) Statements of compatibility for master sewerage plans or portions there of may be submitted in advance covering areawide sewering in lieu of statements on a project-by-project basis.

(2) In addition to the submittal requirements of 340-52-015(1), the following shall be submitted with plans for treatment works, disposal systems and pretreatment systems to the extent that these pertain to the particular treatment or disposal system which is being instaled or modified:

(a) The design flows, design population, and design effluent parameters;

(b) A hydraulic profile;

(c) Unit detention times, volumes, sizes, hydraulic loadings, organic loadings, solids loadings, chemical loadings, expected removal efficiencies, as appropriate;

(d) A schematic of the complete treatment works;

(e) An estimate of the personnel requirements to operate and maintain the completed treatment works;

(f) A written statement that an operation and maintenance manual for the added facilities acceptable to the owner and the Department will be prepared, the name of the person to prepare such manual and that the manual will be completed prior to start up of facilities;

(g) A detailed program for the satisfactory disposal and/or beneficial use of all collected grit, screenings, and sludges.

(3) In addition to the submittal requirements of 340-52-015(1), and excepting sewerage systems wholly designed for industrial wastes the following shall be submitted with plans for sewerage systems:

(a) Drawings for sewers shall provide complete plan and profile views which adequately describe the service conditions for the completed work.

(b) For sewers larger than eight (8) inches in diameter, appropriate design flow shall be indicated in the plans or separately submitted. Population to be served, gallons of sewage per person per day, infiltration allowance and unavoidable inflow allowance shall be submitted to support the design flow when requested by the Department.

(c) Plans for a common sewer or a sewerage system submitted by a person other than the owner or joint owner of the treatment works must be accompanied by a statement from the treatment works owner that he agrees to provide sewer service and has sewerage system and treatment capacity to do so.

(d) For a project with a lift station, a written statement that a lift station operation and maintenance manual acceptable to the owner and the Department will be prepared, the name of the person to prepare such manual and that the manual will be completed prior to start up of each lift station.

(4) Any new owner or operator of a common domestic sewerage system, sewage treatment works or sewage disposal facility which serves or will serve a residential area shall have a realistic, long-term, management and financial plan for continuous maintenance, operation and replacement of such common facilities. Final construction plan approval cannot be given until the management and financial plan has been approved.

Performance Requirements and Guidelines for Technical Review

340-52-020

(1) The Department may use as guidelines any and all available and pertinent technical sources in reviewing plans including, but not limited to, published journals of such organizations as the Water Pollution Control Federation (W.P.C.F.), and the American Society of Civil Engineers (A.S.C.E.), technical reports, like type plant performance data, pilot plant performance data, textbooks on waste water treatment and other recommended standards as they are published.

(2) The Department shall evaluate the degree of reliability and flexibility the system may have to operate as designed, considering component breakdown likelihood, waste water quantity and strength variations, alternate modes of operation, permit requirements, water quality needs and minimum design criteria for treatment and control of wastes in the statewide Water Quality Management Plan. (OAR 340 Division 41).

(3) Sewerage systems except those wholly designed for industrial wastes shall be technically evaluated in conformance with minimum Requirements and Guidelines of the Appendices. The Requirements are mandatory. The Guidelines side of these appendices contain minimum design recommendations and are intended to supplement and implement the mandatory Requirements.

(4) Designs should conform to rules of the Department including but not limited to water, air, noise and solid waste.

APPROVAL OF PLANS

340-52-021

(1) Approval of plans shall be in writing.

(2) Final review of plans will commence upon receipt of all appropriate and required submittal data and shall be completed within a reasonable period of time commensureat with the nature and complexity of the project.

(3) Approval may be provisional.

(4) Approval of plans may be deferred pending satisfaction of other requirements including but not limited to, (a) issuance of either a WPCF or a NPDES permit, (b) obtaining a surety bond or substitute as may be required by ORS 454.425.

Meaning of Approval

340-52-025

Approval of plans means that the Department has reviewed favorably the estimates, assumptions and the design presented in the specific project plans for reasonableness and practicality consistent with process technology and for the likelihood that the project may, if operated and maintained as proposed, achieve or maintain the desired result. Plan approval by the Department does not warrant that the facility will meet expectations. Plan approval does not negate the responsibility of the owner to provide additional facilities should the completed work fail to achieve design effluent parameters, unforeseen water quality violations occur, other operational problems

develop, or treatment standards or requirements change. Review of nonprocess related aspects of the plans will be cursory, if reviewed at all, and not meant to assure adequacy of nonprocess related aspects of the design.

REJECTION OF PLANS

340-52-030

The Department may reject plans for any one of the following causes:

(1) Submittal data is incomplete;

(2) Performance Requirements and Guidelines of OAR 340-52-020 are not reasonably adhered to;

(3) The plans fail to provide for such flexibility and reliability as to:

(a) preclude violation of either a permit or water quality standards, or

(b) provide reasonable assurance that the system can be operated and maintained on a continuous basis;

(4) The project includes a planned discharge of raw or inadequately treated waste which reasonably can be prevented;

(5) Roof, surface, foundation, footing or other groundwater drains are to be connected to the municipal sewerage system;

(6) The plans are determined to be inadequate to reliably and consistently achieve permit effluent limitations or to correct water, air, noise, solid waste, or public health problems;

(7) The financing plan for sewerage facilities treatment works, or disposal systems does not provide reasonable assurance of adequate funding for continuing maintenance, operation, and replacement; and

(8) Affirmative statement of land use compatibility determination is not made in accordance with OAR 340-52-0]5(])(g). The Department will notify the plan submitter in writing of reasons for the rejection or deferral of final review of plans.

Responsibility of Treatment Works Owners, Designs Engineers and Developers After Approval of Plans For (Domestic) Sewage Projects

340-52-035

(1) Construction of all projects must be in accordance with the project plans and specifications approved by the Department. No substantial change in or deviation from such plans and specifications shall be made without the prior written approval of the Department, which shall make the final determination whether or not a change or deviation is in fact substantial.

(2) The owner of the sewerage system (generally a municipality) as recipient of any construction work on its system has a vested responsibility to review and approve project plans prior to the start of construction. Department approval of plans under these rules does not preclude the right and responsibility of review and approval by the owner. The owner may adopt more stringent construction standards and impose special conditions for sewer use, service connection, and related activities. Department approval of plans in such cases is contingent upon similar approval by the owner. Submittal of plans to the Department through the owner and prior approval of plans by the owner is encouraged.

(3) Inspection and certification of proper construction shall be governed by the following provisions:

(a) The construction of all sewerage projects shall be under the supervision of and shall be thoroughly inspected by the design engineer or his authorized representative, unless relieved under OAR 340-52-035(3)(b). At the completion of the project he shall certify in writing to the owner and the Department that such construction was inspected by him and found to be in accordance with the plans and specifications, including any changes therein approved by the Department. Nothing in the foregoing exempts an owner from monitoring the project for conformance to requirements and performing supplementary inspections or prevents an owner's qualified staff from assuming responsibility for inspection and certification.

(b) If the design engineer is to have no further involvement or have limited involvement with the project after obtaining Department approval of plans, he must so notify the Department, the owner, and the developer upon submittal of plans or immediately upon being disassociated or limited in control over materials or workmanship within the project. (Nothing precludes either the owner or the developer from giving such notice if this is more appropriate.) Thereupon, if the project is to continue on to construction, the owner shall assume necessary responsibility for satisfactory construction of the project

in accordance with the approved plans. He shall employ or apply such construction engineering/inspection services as appropriate for the project. The owner shall thereupon certify in accordance with OAR 340-52-035(3)(a). No project shall proceed to construction without adequate and capable construction engineering/inspection services. (This assumption of construction engineering/inspection services responsibility by the owner does not necessarily relieve the design engineer of design responsibility.)

(c) Sewerage system integrity and water-tightness is the system owner's ultimate responsibility. He shall monitor all private sewer construction and control all common sewer construction in the sewerage system to the extent necessary to this end.

(4) An appropriate final operation and maintenance manual, approved by the Department shall be prepared and submitted to the owner by the design engineer for all treatment works, disposal systems, and lift stations prior to start up of such facilities.

Exemption from Plan Submittal to the Department

340-52-040

(1) The Department may exempt in writing gravity sewer projects from submittal to the Department on an owner-by-owner basis subject to provisions it may find necessary including, but not limited to, all of the following:

(a) The owner requests such exemption;

(b) The owner is a municipality;

(c) The owner has adequate responsible, professional staff including a registered professional engineer with review authority binding upon the design engineer.

(d) The owner submits a copy of all specifications and standards by which sewerage system construction will comply and agrees to submit all subsequent changes thereto;

(e) The owner submits a current master plan for sewer service;

(f) The owner agrees in writing to approve and construct sewerage systems in conformance with rules of the Department, the owner's published standards, and terms of their permit; and,

(g) The owner will submit to the Department any plans for projects proposed to be funded by EPA construction grants.

(2) The Department may exempt submittal of plans for industrial waste pretreatment systems where the municipality receiving the industrial waste has competent review staff and is making those plan reviews.

(3) The Department may exempt other facilities where it has been determined that adequate review is conducted by another state agency and the Department's review would be redundant.

(4) The Department may exempt from submittal of plans minor modifications to existing facilities where the change will not significantly affect the operation of the treatment or disposal system. Notification to the Department of each such minor modification is required, however, in order to qualify for such exemption. (Where an industry intends to apply for tax credit for a facility, a "Notice of Intent to Construct" (DEQ form) must be filed with the Department which requires attachment of plans and specifications.)

(5) The Department may cancel in writing an exemption for cause or changes in circumstances.

Treatment Works and Sewerage Systems Utilizing New or Unproven Technology

340-52-045

The Department encourages the development of new technology and will approve plans of such provided adequate documentation is submitted. The burden of proof for demonstrating new processes, treatment systems, and technologies lies with the design engineer. Documented case histories where any such new application has been successfully and similarly demonstrated or operated on a full scale basis shall be submitted. Demonstrations shall be at other than bench scale and shall be at field conditions such that the prototype information can be validly scaled up to a working facility. Experimental data need not be acquired solely from actual permanent operating facilities. For all such proposals, contingency plans shall be presented which will assure that in event of failure, public health and water quality would be protected.

APPENDIX A

SEWER PIPELINES

(1) MINIMUM REQUIREMENTS FOR SEWER - PIPELINES

(a) Capacity :

Sewers shall be of such diameter as to pass without overflow, bypass, or back flow onto damageable property of a user the design peak flow including sewage and infiltration. All unavoidable inflow from roof, surface, footing, foundation, or other groundwater or surface water sources shall be excluded from capacity allowance.

(b) Velocity :

Sewers shall be designed to have a velocity to "self clean" or transport consituent solids to the treatment facility or the owner shall periodically service sewers to flush, transport, or remove solids from sewers with minimal velocity.

(2) GUIDELINES FOR SEWER PIPELINES

(a) Capacity :

(A) Collection sewers should be designed for the ultimate development of the tributary areas as determined by master sewerage and land use plans of the owner.

(B) The design of sewers should be based upon initial and ultimate flows. Flows should be broken down into domestic, industrial, and infiltration/inflow fractions. A peaking factor should be applied to domestic and industrial fractions.

(C) Domestic flows should be between 50 and 100 gallons per capita per day (gpcd). Peaking factors should be between 1.8 and 4.0. Infiltration allowance should be normally less than 2,000 gallons per acre per day: any greater allowance should be justified. Any significant inflow allowance should be justified.

(D) The minimum diameter of sewers should be 8 inches for maintenance purposes. Short nonextendable 6 inch sections of up to 250 feet are permissable.

(E) Replacement sewers should be designed commensurate with flow conditions.

(b) Velocity :

(A) Sewers should be laid on a gradient which will produce a mean velocity, when flowing full or half full, of at least (2) two feet per second, based upon the Manning formula with "n", the coefficient of roughness, valued at 0.013.

(B) Sewers with minimal flow such as upper reaches of laterals or those sewers serving few dwellings should be steepened and/or reduced in diameter to approach a (2) two feet per second selfcleaning velocity. Actual flows during initial years of use should be carefully evaluated in this regard.

(C) Force mains and inverted siphons should be designed for (3) three feet per second at average flows.

(D) The minimum gradient for 8 inch sewers should be no less than 0.4 percent regardless of pipe material.

(E) The minimum gradient for 6 inch sewers should be no less than 0.6 percent, preferably 0.75 percent.

(F) The flow channel(s) through manhole bases should be smooth and conform to the shape and slope of the inlet sewer(s).

(G) Intersecting sewers, sewer connections, etc., should be made without causing backup into the smaller sewer. For intersecting unequal sized sewers in manholes , the elevation at 0.8 of full depth of flow in each sewer should match.

(c) Watertightness :

Completed sewer construction shall result in limited infiltration/ exfiltration through pipe walls, joints, fittings, and connection fittings, etc., and no inflow. The limit shall be consistent with the pipe and manhole materials and with what is obtainable at the time by the construction industry on representative jobs for the same type of construction using high quality materials and state-of-the-art methods of workmanship. All completed sewer lines in new work shall be tested for watertightness using either recognized air or water testing requirements and procedures.

(c) Watertightness :

(A) Watertightness begins with good material and finally depends upon sound field practices. Good inspection and tests should be supplemented with an initial television inspection after trench backfilling is complete. Since many defects do not appear initially, an eleventh month final inspection should be performed where that capability is available and determined necessary to obtain acceptable in-place work. If only one television inspection is considered, the eleventh month inspection is recommended.

(B) Exfiltration testing or the low pressure air test for sanitary sewers should be a pressure at least 6 feet greater than the groundwater conditions which the sewer is subject to at test time.

(C) Pipe materials, joints, fitings, and appurtenances should be selected for their watertight capabilities.

(D) Acceptance or performance standards should not necessarily be uniform for all pipe materials since average testing results with good workmanship for work will vary depending upon pipe materials. The range of allowable exfiltration/infiltration for work acceptance should be between 50 and 200 gallons per day per inch-of-diameter per mile (gpdidm). Nonporous (non-airpermeable) pipe should sustain pressure for twice the computed time for the same one pound per square inch (psi) air pressure drop required by the air test. Test sections should be from manhole-to-manhole or about 700 feet maximum.

(E) The watertightness of all building sewers should conform to the State Plumbing Code and be tested without exception.

(F) Manholes should be water tested for exfiltration during construction and/or visually inspected during first wet weather season after construction for infiltration. Leaks should be promptly repaired.

(G) Curved sewers should be as watertight as other sewers and be tested. While not recommended, horizontal/vertical curves at times may be allowed but should be limited in use. When used, the minimum radius of curvature should be not less than 200 feet and the maximum computed joint opening no more than 3/8 inch. Complete and accurate records should be kept of the exact location of such curved sewers for future reference. Reasonable field control should be exercised to not compound joint deflections and compromise watertightness.

D. Structural Strength :

The completed installation including the excavated trench, the pipe, the bedding, and the pipe zone materials shall resist imposed loads from backfill, impact, and live loads (construction and design) without pipe failure through crushing, loss of watertightness, settlement, or significant capacity loss.

(d) Structural Strength :

(A) Bedding material should be placed full trench width from at least 4 inches under to spring line of all pipe for a leveling course and proper pipe support. Hand shaping of the native trench bottom for rigid pipe is not recommended but may be allowed, if appropriate, and uniform pipe support can be obtained and grade/alignment can be maintained.

(B) Cantilevering of nonreinforced rigid pipe at manholes should be limited to the least distance practicable to make a flexible connection. A flexible joint should be within 12 inches of manhole for smaller pipe sizes. A second flexible joint should be provided within 4 feet of the manhole.

(C) Where cover from top of pipe to finished grade is less than 36 inches, special design and/or construction requirements should be considered including, but not limited to, raising finish grade, increasing class of pipe and/or pipe bedding, use of ductile iron, concrete encasement and restriction of construction equipment from travel over partially backfilled trench.

(e) Ability to Pass Solids :

Sewer systems shall be free of depressions, sharp edges, roughness, side sewer projections, obstructions, restrictions, displaced "O" rings, etc., which can cause solids to accumulate or deposit.

(e) Ability to Pass Solids :

(A) New sewers should be thoroughly flushed and visually inspected for accumulated debris prior to use.

(B) Building sewer connections should be made with fittings which prevent any projection into the main sewer. The main sewer should not be cracked, crushed, or otherwise damaged in making taps. All taps should be watertight.

(C) A tolerance for vertical deviation from true grade line should be plus or minus 0.02 feet. Depressions for solids deposition should be avoided. Similarly, the horizontal tolerance for deviation from line should be plus or minus 3/8 inch.

(D) Drop manhole piping should be easily maintained, self cleaning or able to "overflow" into the manhole. Pressure sewer piping connections, flow measuring devices, etc., in manholes should be designed to not obstruct flow.

(E) Flow channels in manholes should slope at least 0.1 feet from inlet to outlet.

(f) Durability :

(A) The materials and details of construction shall provide an in-place sewerage system which will resist corrosion of the pipe and manhole materials caused by any source or condition. Any corrosive effect shall be consistent with the design life of the sewer.

(B) Resistance to erosion of surfaces by grit, high velocity flow, etc., shall be addressed if appropriate.

(C) Temperature effect upon thermoplastic materials shall be addressed if appropriate.

(g) Stability :

(A) Line and Grade: Horizontal alignment and vertical grade of in-place sewers upon construction completion and construction acceptance shall be relatively stable.

(f) Durability :

(A) Sewers should be constructed of materials resistant to or protected from biological degradation, acid and alkaline solutions, normal sewer temperature variations, abrasion and industrial wastes (where applicable), or other harmful service conditions which may exist in the sewerage system.

The owner should have a user ordinance which restricts discharge of harmful substances into the sewerage system.

(B) Velocities over 15 feet per second in sewers should have special consideration for erosion control.

(g) Stability :

(A) Appropriate foundation stabilization or soils should be employed in unstable soils. Back fill should be in small lifts and compacted uniformly to specified density along and around the pipe.

Design considerations, construction specifications, inspections, etc., shall preclude pipe settlement, shifting, or flotation such that capacity, watertightness structural integrity, ability to pass solids, maintainability etc., are not compromised either at construction or any later time.

(B) Diameter : Rigid, flexible and semiflexible pipes tend to lose minimum inside diameter if not designed and/or installed properly. Design considerations, construction specifications, field inspections, etc., shall preclude diameter loss such that capacity, watertightness, structural integrity, ability to pass solids, maintainability, etc., are not compromised either at construction or any later time.

(B) The Soil Class and density for bedding and pipe zone materials should be carefully selected and then compacted in the field to the required in-place density.

PVC and ABS composite sewer pipe should be deflection tested upon construction completion prior to acceptance with an approved nine blade go-no-go gauge. Initial deflection at construction completion should be no more than the following:

(i) PVC (ASTM D-3034) sewer pipe should deflect no more than 4 to 5 percent based upon inside base diameters of 7.76, 9.7],]].56 and]4.]4 inches for 8,]0,]2, and]5 inch nominal pipe respectively.

(ii) ABS (ASTM D-2680) composite sewer pipe should deflect no more than 2 to 3 percent based upon inside average diameters of 7.75, 9.75,]].75 and]4.75 inches for 8,]0,]2, and]5 inch nominal pipe respectively.

(C) Sewers on slopes over 25 percent should be evaluated for slippage or pipe bedding depending upon soil type, groundwater presence, construction conditions. etc. Appropriate anchors should be provided if necessary.

(h) Operation, Maintenance and Safety:

Sewer systems require periodic and unscheduled maintenance for sustained operation. Designs shall conform to requirements of the sewage works owner for manhole construction, spacing, size, details and easements. All parts of the sewerage system shall be readily accessible. The minimum inside bottom diameter of manholes shall be 42 inches.

(h) Operation, Maintenance, and Safety:

(A) Access to the sewer by the sewer owner is essential to perform maintenance tasks. Easements should be granted along the sewer line to the system owner for any sewer for emergency repairs. Manholes and clean-outs are necessary for routine access. Structures should not be located over sewers.

(B) Owners should review own procedures, equipment, construction standards, etc., for sewer maintenance. Requirements of the owner should be obtained by designers upon start of sewer design since the owner must assume all future maintenance. Stricter standards of the owner should prevail if in conflict with these guidelines.

(C) General Manhole/Cleanout Standards for Sewers

(i) The minimum inside bottom diameter should be no less than 48 inches. The least inside dimension may be reduced 38 inches where an integral inside drop is acceptable to the owner. No more than one inside drop should be installed in a manhole.

(ii) Minimum cover opening diameter should be 22 inches.

(iii) Manholes should be located at:

(I) Every change in grade or alignment of sewer.

(II) Every point of change in size or elevation of sewer.

(III) Each intersection or junction of sewers.

(IV) Upper end of a lateral sewer.

(V) At intervals of 500 feet or less except for 24 inch and larger sewers.

(iv) Cleanouts should not be substituted for manholes except at the upper end of lateral sewers 250 feet or less in length.

(v) Channel width and depth should be equal to sewer pipe diameter. Manhole base ledges should be sloped to drain at least] in]2.

(vi) Access to manholes may be by portable ladder. Manhole rungs and in-place ladders which are subject to considerable corrosion and sliming are not recommended.

(vii) Where free fall of sewage into a manhole exceeds 24 inches from inlet pipe invert to manhole invert, an approved drop manhole should be used.

(D) Inverted Siphons .

Inverted siphons should include at least two pipe lines of such size and hydraulic gradient as to maintain a velocity of at least 3 feet per second in one pipe under conditions of average dry weather flow. Control manholes must be provided at both ends of the inverted siphon line. The inlet and outlet details shall be so arranged that the normal flow is diverted to either barrel so that the other barrel may be removed from service for maintenance.

(i) Separation of Water and Sewer Lines .

Protection of the water supply, be it distribution system, production facilities or source is not only prudent but mandatory and absolutely necessary.

Sanitary sewers and appurtenances thereto shall not physically connect to a public or private

(i) Separation of Water and Sewer Lines.

(A) Parallel Water and Sewer Lines

(i) Sewer lines should conform to Figure A-1.

(ii) Common trench construction for water and sewer should be avoided where practical. Where used, the minimum pipe separations of Figure A-1 should be maintained.

potable water supply system so as to permit the passage of any sewage or polluted water into the potable supply.

Sewer construction shall not disturb, degrade, or decrease the watertightness of any existing water supply line.

(B) Vertical Separation at Crossings of Water and Sewer Lines :

No special precautions should be necessary where top of sewer line is at least 1.5 feet below bottom of waterline and adequate structural protection for each line is provided.

(C) Exceptions; Use of Pressure Pipe Materials for Sewer Line:

(i) Where the above horizontal or vertical separations cannot be maintained, the following pressure pipe materials should be used in addition to whatever waterline improvements or reconstruction that may be advisable or required for protection of water. The use of these pressure pipe materials from manhole-to-manhole is encouraged to avoid discontinuity of materials.

(I) Ductile iron pipe, class 50, ANSI Standard A21.51 (AWWA C-151) with either Push-on or mechanical rubber gasket joints in accordance with ANSI Standard A21.11 (AWWA-C111).

(II) PVC pressure pipe, ASTM D-2241, SDR 32.5, (125 psi) with rubber-gasket joint in accordance with UNI-Bell Plastic Pipe Association recommended Standard Specification UNI-B-1 for a pressure-joint assembly.

(III) Asbestos-Cement pressure pipe, class 100, ASTMC-296 (AWWA C-400) with rubber-ring gaskets in accordance with ASTM D-1869.

(IV) High density polyethylene pipe (Driscopipe 1000) PE 3406, minimum SDR 32.5, with butt fused joints.

(V) Other materials approved by the State Health Division.

(ii) At crossings requiring pressure pipe materials the following should apply with one standard length of special pressure pipe centered over the waterline in all cases:

Pipe Material	Standard Pipe Length	Minimum Laying Length Length Each Side of Waterline Crossing
Ductile Iron	18 feet	18 feet
PVC	20 feet	20 feet
Asbestos-Cement	13 feet	19 feet
High-Density Polyethylene	38 feet	19 feet

(D) Soil Restoration at Crossings

Soil removed in sewer line trench construction at waterline crossings where sewer crosses over water should be replaced in all areas to as near natural densities as possible through mechanical compaction to restore any natural resistance to groundwater movement which did exist prior to construction. Soil should include no rock fragments over 1 1/2 inch in the pipe zone.

(E) Well Protection

No sewer pipe should be laid less than 50 feet from any well without specific Health Division approval. Pressure pipe materials should be used to protect wells where minimum setbacks are not obtainable or where additional protection is required as determined by the State Health Division.

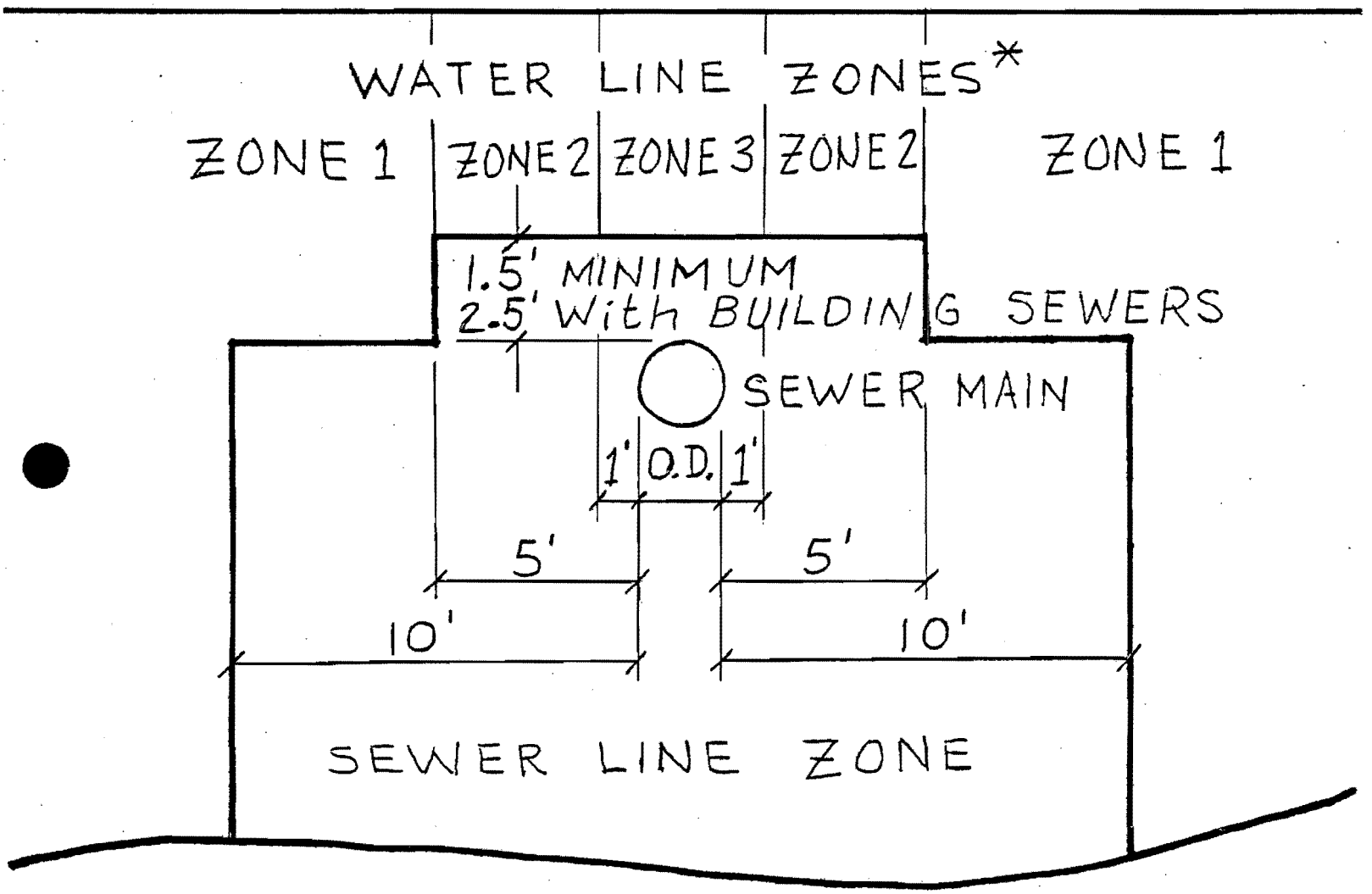
(F) Pipe Testing

Whenever a pressure pipe material is used for any of the above purposes of water/sewer separation, an appropriate pressure test should be conducted on the pressure pipe to confirm watertightness. Test pressures should be no less than 15 psig where use will be for a gravity sewer and higher where use will be for a pressure sewer (force main).

(G) Other Exceptions should be resolved jointly with the water purveyor and the State Health Division.

WATER LINE

ZONE 1 - Crossing Restrictions Apply Only
ZONE 2 - CASE-BY-CASE DETERMINATIONS
ZONE 3 - PARALLEL WATER LINE PROHIBITED



* A PARALLEL WATER LINE SHOULD BE LOCATED ON UNDISTURBED EARTH IN ALL CASES.

FIGURE A-1

SEPARATION OF PARALLEL WATER-SEWER LINES

APPENDIX B

RAW SEWAGE LIFT STATIONS

(1) MINIMUM REQUIREMENTS FOR RAW SEWAGE LIFT STATIONS

(a) Capacity:

Stations shall pass peak hourly flow including domestic, industrial and infiltration/inflow allowance.

(b) Solids Handling

Pumping equipment shall pass at least 2 1/2 inch spheres. Valves, fittings etc. shall be capable of passing at least 3 inch spheres. Minimum force main size shall be 3 inches.

(c) Reliability

(A) Mechanical reliability shall be achieved by redundant lift units such that the peak hourly flow can be passed with the largest unit out of service. Redundancy shall include check and gate valves and other 'common mode' failure sensitive items such as vacuum pumps or compressors on control systems.

(2) GUIDELINES FOR RAW SEWAGE LIFT STATIONS

(a) Capacity:

Lift stations should be sized for the immediate flow requirement and expandable to the long-range (ultimate) requirement. Alternatively interim lift stations may be proposed if the date o expansion is unknowable or beyond the useful life of the lift station.

(b) Solids Handling

All equipment should be sized to handle at least a 3-inch sphere. Force mains should be at least 4 inches in diameter.

(c) Reliability

(B) (i) Power outages shall result in no raw sewage discharges or bypasses to waters of the state based upon a predictable maximum period of power outage which will occur from year-to-year. Where such reliability does not exist, facilities and/or procedures shall be provided to prevent the discharge or bypass.

(ii) A discharge or bypass in a sensitive area shall be prevented at all times. Example: Raw Sewage discharge across residential property.

(C) Failure of prudent Operation and maintenance shall not be considered a valid reason for a station failure and resultant discharge or bypass.

(A) Where no specific records exist, a four (4) hour minimum electrical power outage should be assumed.

(B) Events which should be excluded from design considerations are those which are rare, unusual, and catacyclysmic in nature.

Means to prevent discharge or bypass include, but are not limited to, the following:

(i) Electric generator
—Stationary or portable
—Automatically or manually started.

(ii) Auxiliary fuel fired pump.
—Stationary or portable.

(iii) Storage
—Sewer lines and manholes
—Wet well
—External basin

(iv) Water supply reduction.

(C) (Future)

(D) (i) Alarms shall be provided to all stations to announce at least high wet well conditions. conditions.

(ii) Telemetering to location with a 24-hour attendant shall be required in sensitive areas.

(D) (i) Alarm signals should be relayed to the sewer system owner in an effective manner.

(ii) Alarm should be actuated independently of the station control system. Example: Pumps are controlled by pneumatic system and separate float actuated alarm is provided.

(iii) Alarm power should have a battery powered backup electrical source.

(d) Operation and Maintenance

(A) Lift equipment shall be easily removable. Screwed fittings shall not be used for equipment removal. Lifting eyes or hoists shall be provided for equipment removal as appropriate.

(B) (i) A means to wash down wet wells shall be provided for all stations.

(ii) Potable water piped into wells or dry wells shall be equipped with a reduced pressure backflow prevention device.

(C) Wet wells shall have 'hopper bottoms' at a slope of no flatter than one to one (1:1), and flat bottom area shall be minimized to prevent deposition of solids.

(d) Operation and Maintenance

(A) Flanged or bolted compression fittings should be used for pump removal.

(B) Frequent wet well washdown should be assumed for all stations. A source of high volume wash water thru a nozzle should be provided for this purpose at or on finish grade.

(e) Safety

(A) Wet and dry wells of all lift stations shall be considered manholes which will be entered by the owner's personnel.

(B) Each dry well shall have permanently installed ladder, lights, and forced fresh (outside) air supply to the bottom of the well. Air supply shall be activated with light switch and intermittently operated with a timer.

(C) Wet wells including single well lift stations, shall have either installed or portable equipment for access, lighting, ventilation, etc., to be used when entered.

(e) Safety

(A) No amount of safety equipment should replace basic safety procedures, knowledge, training, and precautions.

(B) (i) Designers should follow appropriate safety codes.

(ii) Air supply should be sized for at least 30 air changes per hour where installed.

(C) (i) Frequently entered wet wells should have permanently installed equipment for access, lighting and ventilation, etc.

(ii) Infrequently entered wet wells may be served with portable equipment.