Town Of Harwich, Massachusetts
SEWER USE RULES AND REGULATIONS
December, 2015

Pursuant to provisions of Massachusetts General Laws Chapter 83, Section 10, the Town of Harwich hereby establishes the following sewer use rules and regulations (Regulations) governing the use of the wastewater collection system in Harwich, County of Barnstable, Commonwealth of Massachusetts.

While these Regulations will apply to the wastewater collection system throughout the town they have been specifically developed herein for the wastewater collection system to be implemented in the Pleasant Bay Watershed area of Harwich. Wastewater collected in this area will be conveyed to the Town of Chatham wastewater treatment facility. It is anticipated that these Regulations will be modified accordingly for systems to be implemented in other watersheds.

Purpose

The purpose of these Rules and Regulations are:

a) To establish the technical and administrative procedures for making connections to the sanitary sewer system including standards of materials and design;
b) To establish requirements, restrictions, and controls on the quantities and quality of what may be discharged to the sanitary sewer system; such as discharges that may:

    1. Interfere with the operation of the sewer system, pumping station or publicly owned treatment works (POTW) in any way;
    2. Pass through the POTW, to the groundwaters, inadequately treated effluent that may cause contravention of standards for these waters or surface waters or cause violation of the POTW's Groundwater Discharge Permit (GWDP) or negatively impact the watershed into which treated effluent is discharged;
    3. Reduce the opportunity to reclaim or recycle treated wastewater and/or sludge from the system;
    4. Increase the cost or otherwise hamper or limit the disposal of sludges and other residuals;
    5. Endanger municipal employees or the public;
    6. Cause, directly or indirectly, any public nuisance condition;

c) To prevent new sources of inflow and infiltration (I/I) and eliminate private source inflow;
d) To provide for equitable distribution to all users of the POTW, all costs associated with the collection, transmission, treatment, and residuals disposal, and to provide for the collection of such costs; and
e) To provide for the orderly planning of sewer systems' and treatment systems'

components to improve the health and environmental quality of the Town of Harwich and its people and resources while discharging wastewater into the Chatham Sewer System.

The following rules and regulations are a part of the contract with every person who discharges wastewater into the Town of Chatham Sewer System from the East Harwich area, and governs the relationship between the Town of Harwich and its consumers, contractors and/or developers, and all other persons who install sewers, discharges wastewater, is connected into the sewer system or applies for a connection to the sewer system.

Modifications

Modifications, additions to or rescinding of these Rules and Regulations may take place from time to time as authorized by a Town Meeting as required by Massachusetts General Laws, Chapter 83, Section 10.

Notwithstanding anything to the contrary which may be contained therein, all amendments, changes, modifications, revisions, additions, or rescission of Articles I to XX of the Rules and Regulations shall not be valid without the approval and authorization of a majority vote of Town Meeting.
For items contained in the Appendix, modifications will be authorized by actions of the Harwich Wastewater Commissioners.

TOWN OF HARWICH
SEWER USE RULES AND REGULATIONS

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ARTICLE I
DEFINITIONS

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

Section 1. Act" or "the "Act" shall mean the Federal Water Pollution Control Act, also known as the Clean Water Act, as amended, 33 U.S.C. 1251, et seq, and the regulations promulgated thereunder, as amended from time to time.

Section 2. "Board" shall mean the Board of Wastewater Commissioners of the Town of Harwich.

Section 3. "BOD" (Biochemical Oxygen Demand) shall mean the quantity of oxygen utilized in the biochemical oxidation of organic matter under standard laboratory procedures in five (5) days at 20 degrees centigrade, expressed in milligrams per liter (mg/l).

Section 4. "Building Drain" shall mean that part of the lowest horizontal piping of a drainage system which receives the discharge from soil, waste, and other drainage pipes inside the walls of the building and conveys it to the building sewer. The building drain ends at the building sewer which begins five (5) feet or (1.5) meters outside the inner face of the building's wall.

Section 5. "Building Sewer" shall mean the extension from the building drain, five feet (5') or one and one half (1.5) meters outside the inner face of the building's wall, to the public sewer or other place of disposal.

Section 6. "Combined Sewer" shall mean a sewer receiving both surface runoff water and sanitary sewage.

Section 7. "Department of Environmental Protection", or "DEP" shall mean the Massachusetts Department of Environmental Protection, established pursuant to M.G.L. Chapter 21, Section 26 or, where appropriate, the Administrator, Director or other duly authorized official of said agency.

Section 8. "Director" (or Superintendent) shall mean the person appointed by the Town of Harwich as the Superintendent of the Wastewater (or Sewer) Department of the Town of Harwich, who is vested with the authority and responsibility for the implementation and enforcement of these rules and regulations or his authorized deputy, agent, or representative.

Section 9. "Environmental Protection Agency", or "EPA" shall mean the United States Environmental Protection Agency, or, where appropriate, the Administrator or other duly authorized official of said Agency.

Section 10. "Garbage" shall mean solid wastes from the domestic or commercial handling, storage, preparation, cooking, and dispensing or sale of produce.

Section 11. "Industrial Wastes" shall mean any water carried or liquid wastes resulting from any process or industrial manufacturing processes, trade, business, or activity listed in 310 CMR 15.004.

Section 12. "Licensed Utility Installer" or "L.U.I." shall mean a person, as defined in Section 15, who upon submitting a License and Permit Bond, Certificate of Insurance, and pays the Utility Installer's License fee, all of which are approved by the Director of the Sewer Department, is permitted to perform the installation of sanitary sewers or building sewers.

Section 13. "Natural Outlet" shall mean any outlet into a watercourse, pond, lake, or other body of surface ground water.

Section 14. "NPDES" shall mean National Pollutant Discharge Elimination System.

Section 15. "Person" shall mean any individual, partnership, co-partnership, firm, company, corporation, association, joint venture, joint stock company, trust, estate, governmental entity, or their legal representatives, agents or assigns. The masculine gender shall include the feminine, the singular shall include the plural where indicated by the context.

Section 16. "pH" shall mean the logarithm (base 10) of the reciprocal of the concentration of hydrogen ions expressed in grams per liter of solution.

Section 17. "Private Wastewater Collection, Treatment, and Disposal Facilities" shall mean any system, not owned and/or controlled by a municipal (town) sewer department, used for the collection, treatment, and disposal of wastewater from one or more properties.

Section 18. "Properly Shredded Garbage" shall mean the wastes from the preparation, cooking, and dispensing and sale of food that has been shredded to such a degree that all particles will be carried freely under the conditions normally prevailing in public sewers, with no particle greater than one-half (1/2) inch (1.27 centimeters) in any dimension.

Section 19. "Public property" shall mean land, right-of way, or easement owned or controlled by the Town, or other Town, the Commonwealth of Massachusetts, United States government, or any department, political subdivision, or governmental entity.

Section 20. "Public Sewer" shall mean a sewer in which all owners of abutting properties have equal rights and is controlled by a municipal sewer department.

Section 21. "Sanitary Sewer" shall mean a sewer which carries wastewater from residential dwellings or commercial facilities without industrial waters or waste and to which stormwaters, surface waters, and groundwaters are not intentionally admitted.

Section 22. "Sewage" shall mean a combination of the water-carrying wastes from residences, business buildings, institutions, and industrial establishments, together with such materials, surface waters, and storm waters as may be present. The preferred term is wastewater.

Section 23. "Sewage Treatment Facility" shall mean any arrangement of devices and structures used for treating wastewater. The preferred phrase is wastewater treatment facility.

Section 24. "Sewage Works" shall mean all facilities for collecting, pumping, treating, and disposing of wastewater. The preferred phrase is wastewater facilities.

Section 25. "Sewer" shall mean a pipe or conduit for carrying wastewater.

Section 26. "Sewer Department" shall mean the Town of Harwich's wastewater collection, treatment, and disposal system(s) owned and operated by the Town of Harwich.

Section 27. "Shall" is mandatory; "May" is permissive.

Section 28. "Slug" shall mean any discharge of water, sewage, or industrial waste which in concentration of any given constituent or in quantity of flow exceeds, for any period of duration, longer than fifteen (15) minutes, more than five (5) times the average twenty-four (24) hour concentration or flows during normal operation.

Section 29. "Storm Drain" (sometimes termed "Storm Sewer") shall mean a sewer which carries storm, surface, and drainage waters, but excludes wastewater and industrial wastes, other than unpolluted cooling water.

Section 30. "Suspended Solids" shall mean solids that either float on the surface of, or are in suspension in water, wastewater, or other liquids, and which are removable by laboratory filtering.

Section 31. "Town" shall mean the Town of Harwich, Massachusetts or its legal representative, agent, or assign.

Section 32. "Town Administrator" shall mean the Town of Harwich Board of Selectmen's appointed Town Administrator.

Section 33. "Watercourse" shall mean a channel in which a flow of water occurs, either continuously or intermittently.

Section 34. "Wastewater" shall mean the liquid and water-carried industrial, non-domestic or domestic wastes, including sewage, industrial wastes, other wastes, or any combination thereof,

from dwellings, commercial buildings, industrial facilities, and institutions, together with any groundwater, surface water and stormwater that may be present.

Section 34. Abbreviations:

ANSI	American National Standards Institute
ASTM	American Society for testing and Materials
AWWA	American Water Works Association
BOD	Biochemical Oxygen Demand
CFR	Code of Federal Regulations
COD	Carbonaceous Oxygen Demand
EPA	Environmental Protection Agency
TSS	Total Suspended Solids

ARTICLE II
REGULATION OF SEWER FLOW

Section 1. Existing Structures.

Any structure in existence on July 1, 2016, regardless of its flow, may maintain that flow. No person shall modify an existing structure or change its use so as to increase its wastewater flow. Design criteria contained in 310 CMR 15.203, and any Board of Health Regulation modifying such, shall be used to determine whether a proposed modification or change in use shall constitute an increase in wastewater flow. Expansion or modification of existing structures, which may result in increased flow, shall not be allowed unless the increase is in compliance with the Board of Health's Regulations in effect on July 1, 2016.

Section 2. Determination of Present Wastewater Flow.

Wastewater flow to the municipal sewer shall be determined using provisions set forth in 310 CMR 15.203: System Sewage Flow Design Criteria, and any local Board of Health Regulation modifying such in effect on July 1, 2016. The owner of any property shall, upon reasonable notice and request, allow an inspection of a property for a determination of flow by an agent of the Board of Health, except that in lieu of this inspection, the owner of the property may submit a floor plan with sufficient detail to account for all outside structure dimensions. This floor plan must bear the signature of approval of a Certified Septic System Inspector.

Section 3. Undeveloped Parcels.

For the purpose of determining wastewater flow, any existing lot, otherwise qualified, may be permitted for that wastewater flow as determined under the Board of Health's Regulations in effect on July 1, 2016, or 310 CMR 15,000 et. Seq, whichever is less.

Section 4. Rebuilding because of fire, flood, storm or other acts of nature.

A property owner may rebuild a structure destroyed by fire, flood, storm or other acts of nature as a matter of right provided that the new structure does not exceed the wastewater flow of the structure being replaced.

Section 5. Variances.

In the case of unusual and substantial hardship, not the result of acts or omissions of the landowner, the Board of Wastewater Commissioners, after a public hearing of which notice has been given by publication and posting for a minimum of two weeks, may grant a variance to this part of the regulation, provided that sufficient capacity exists and such relief may be granted without substantially derogating from the intent or purpose of this regulation or the latest version of the Town of Harwich Comprehensive Wastewater Management Plan (CWMP).

ARTICLE III
BUILDING SEWERS AND CONNECTIONS

Section 1. No unauthorized person shall uncover, make any connections with or opening into, use, alter or disturb any public sewer or appurtenance thereof without first obtaining a written permit from the Superintendent. Any person proposing a new discharge into the system or a substantial change in the volume or character of pollutants that are being discharged into the /system shall notify the Superintendent in writing, and receive the Superintendents' written approval at least ninety (90) days prior to the proposed change in discharge or sewer connection.

No person shall construct, uncover, make any connections with or opening into, use, alter or disturb any public wastewater collection, treatment, and disposal facilities or appurtenance thereof without first obtaining a written permit from the Superintendent working on behalf of the Wastewater Commission.

Section 2. There shall be two (2) classes of building sewer permits for: (a) residential and commercial service and (b) service to establishments producing industrial wastes. In either case, the owner or his agent shall make application on a special form furnished by the Town of Harwich. The permit application shall be supplemented by any plans, specifications, or other information considered pertinent in the judgment of the Superintendent and Director of the Health Department. A permit and inspection fees connection charges, and inspection fee shall be paid at the time the application is filed.

Section 3. All costs and expenses incident to the installation and connection of the building sewer to the sewer works shall be borne by the owner. The owner shall indemnify the Town from any loss or damage that may occur either directly or indirectly or occasioned by the installation or repair of the building sewer. Construction of all building sewers shall be performed only by a Licensed Utility Installer.

Section 4. A separate and independent building sewer shall be provided for every building; except where one building stands at the rear of another on an interior lot and no private or public sewer is available or can be constructed to the rear building through either: an adjoining alley,

courtyard, driveway, or easement. If these conditions exist, the building sewer from the front building may be extended to the rear building and the whole considered as one building sewer.

Section 5. Old building sewers may be used to connect new buildings only when they are found, on examination and test, to meet all requirements of these rules and regulations and are approved by the Superintendent.

Properties with building sewers that will be connected to the sewer system from a septic system, a portion of the existing pipe may be used as part of the building lateral to a public sewer or to a pumping system only if it meets the requirements in the previous paragraph.

Section 6. A property that is generating wastewater, where a common sewer is available for connection, shall be connected to the common sewer, within one year (365) days of written notification from the Board of Health, unless the Board determines a different connection schedule following a public hearing. For new construction, connection to the common sewer, where a common sewer is available for connection, shall be completed prior to the issuance of a Certificate of Occupancy.

In the case of construction of new common sewers, or extensions of existing common sewers, said Board of Health written notification shall follow notice from the Board of Water & Sewer Commissioners that said common sewer(s) are complete.

ARTICLE IV
USE OF THE PUBLIC SEWER

Section 1. No person shall discharge or cause to be discharged any stormwater, surface water, ground water, roof runoff water, subsurface drainage water, uncontaminated cooling water or unpolluted industrial waters to any sanitary sewer.

Section 2. Stormwater and all other unpolluted drainage waters shall be discharged to such systems as are specifically designated as storm sewers or to a natural outlet as approved by the Town Conservation Commission, Town Surveyor of Highways (or equivalent), and/or the Commonwealth of Massachusetts DEP or EPA. Any such discharge may be subject also to an NPDES permit. It shall be the responsibility of the originator of the discharge to obtain all required permits.

Section 3. Cleaning, maintaining, and repairing of building sewers, from the building to the property line at the street, shall be done at the expense of the owner, provided there is a manhole or cleanout at the property line. If there is no manhole or cleanout at the property line, the owner shall be responsible for the building sewer from the building to the public sewer.

Section 4. No person shall discharge or cause to be discharged any of the following described waters or wastes to any public sewer or wastewater works.

A. Any liquids, solids or gases which, by reason of their nature or quantity, are or may

be sufficient, either alone or by interaction with other substances, to cause fire or an explosion or be injurious, in any way to the sewage works, or to the operation of the sewage works, or to the safety and welfare of the workers and the public at large shall be prohibited from discharge to the wastewater works. Prohibited materials include, but are not limited to, gasoline, kerosene, naptha, benzene, toluene, xylene, ethers, alcohols, carbides, hydrides, and sulfides, and any other substance which the Director, the Town of Chatham (for Harwich wastewater collected and treated in Chatham), the State, or EPA has determined to be a fire hazard to the sewer works.

B. Any waters or wastes containing toxic or poisonous solids, liquids or gases in sufficient quantity, either singly or by interaction with other wastes, to injure or interfere with any sewage collection or treatment process, constitute a hazard to humans or animals and/or create a public hazard in the receiving waters of the sewage treatment facility.

C. Any water or wastes having a pH less than 5.5 or greater than 9.5 or having any other corrosive property capable of causing damage or hazard to structure, equipment, and/or personnel of the sewage works.

D. Solid or viscous substances in quantities or of such size capable of causing obstruction to the flow in sewers, or other interference with the proper operation of the sewage works, such as, but not limited to: fish scales, fish gurry, ashes, cinders, sand, mud, straw, shavings, metal, glass, rags, diapers, feathers, plastics, wood, unground garbage, whole blood, paunch manure, hair and fleshings, entrails, and paper dishes, towels, cups, milk containers, and etc. .

E. Due to the special nature and environmental needs of the Town and the surface and groundwaters of the Town, no person shall discharge or cause to be discharged wastewater containing nitrogen and/or phosphorus compounds in a concentration greater than 50mg/L. Any non-domestic discharges having concentration greater than 50mg/L shall require a special permit from the Director. Said permit may include sampling, flow measurement, pretreatment, and/or special fees as a condition of permit issuance.

Any non-domestic discharge having a BOD or TSS concentration greater than 300 mg/L shall require a special permit from the Director. Said permit may include sampling, flow measurement, pretreatment, and/or special fees as a condition of permit issuance.

F. Any wastewater which will cause interference or pass through.

Section 5. No person shall discharge or cause to be discharged the following described substances, materials, water, or waste if it appears likely in the opinion of the **Director** that such waste can harm the wastewater treatment process, or equipment, have an adverse effect on the receiving stream or can otherwise endanger life, limb, public or private property or cause a nuisance.

Informing his opinion as to the acceptability of these substances, the Director will give consideration to such factors as: the quantities of subject substance in relation to flows and

velocities in the sewers; material use in the construction of the wastewater collection and treatment facilities; nature of the wastewater treatment process; capacity of the wastewater collection and treatment facilities; and other factors which in his judgment are pertinent.

The limitations on wastewater strength or mass discharge contained herein may be supplemented with more stringent limitations when, in the opinion of the Director they are warranted:

(1) The limitations in this set of regulations are not sufficient to protect the POTW and the sewage works;
(2) The limitations herein are not sufficient to enable the POTW to comply with applicable water quality standards, the effluent limitations specified in the POTW's groundwater discharge permit, or effluent reuse;
(3) The POTW sludge or other residuals will be rendered unacceptable for disposal or reuse at the Town of Chatham treatment facility desires as the result of discharge of wastewaters at the above prescribed limitations;
(4) Municipal employees or the public will be endangered or otherwise affected by nuisance conditions;or
(5) Air or ground water impacts will be caused.

The restricted substances are as follows:

A. Any solid, liquid, vapor, or gas having temperature higher than 65 degrees C (150)degrees F): however, such materials shall not cause the POTW influent temperature to be greater than 40 degrees C (104 degrees F). The Director reserves the right to prohibit or limit the discharge of wastes whose maximum temperatures are lower than 65 degrees C.

B. Any water or waste containing fats, wax, grease or oils, whether emulsified or not, in excess of one hundred (100) mg/l or containing substances which may solidify or become viscous at temperatures between thirty two (32) and one hundred and four (104) degrees F (0 and 40 degrees C).

C. Any garbage that has not been properly shredded to a maximum of one half of an inch (1/2"), 1.27 centimeters, in any dimension. The installation and operation of any garbage grinder equipped with a motor of three-fourths (3/4) horsepower (0.76 hp metric) or greater shall be subject to the review and approval of the Director.

D. Any waters or wastes containing strong acid iron pickling wastes, or concentrated plating solutions whether neutralized or not.

E. Any waters or wastes containing iron chromium, copper, zinc, and similar objectionable or toxic substances; or wastes exerting an excessive chlorine requirement, to such degree that any such material received in the composite sewage at the sewage works exceeds any limits established by EPA or DEP for such material.

F. Any waters or wastes containing phenols or other taste or odor producing substances in concentration exceeding limits, established by the Director, as necessary, after treatment of the composite sewage to meet the requirements of the State, Federal, or other public agencies having jurisdiction over sewage treatment facilities' discharge to receiving waters.

G. Any radioactive wastes or isotopes of such half-life or in concentration as may exceed limits, established by the Director and not in compliance with applicable State or Federal regulations.

H. Any water or wastes having a ph in excess of 9.5.

I. Materials which exert or cause:

1. Unusual concentrations of inert suspended solids, such as, but not limited to: fullers earth, lime slurries, and lime residues or of dissolved solids, such as, but not limited to: sodium chloride and sodium sulphate.

2. Excessive discoloration (such as, but not limited to: dye wastes and vegetable-tanning solutions).

3. Unusual BOD, chemical oxygen demand, or chlorine requirements in such quantities as to constitute a significant load on the sewage works.

4. Unusual volume of flow or concentration of wastes constituting "slugs" as defined herein under Article 1, Definitions.

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

K. Concentration and/or mass-based limits-No person shall discharge, directly or indirectly, into the sewer works, wastewater containing any of the following substances in concentrations exceeding those specified below on either a daily basis or an instantaneous basis, except by permit. Limits are applicable at the point of exit from a property to the public sewer.

POLLUTANT	CONCENTRATION: PARTS PER MILLION (mg/L
Arsenic as As	0.05
Barium as Ba	5.0
Boron as B	5.0
Cyanides as Cn (amenable)	0.1
Fluroide as F	20
Chromium (total)	1.0

Chromium (Cr+6)	0.1
Magnesium as Mg	100
Manganese as Mn	5.0
Copper as Cu	1.0
Zinc as Zn	1.0
Cadmium	0.07
Lead	0.1
Tin	2.0
Silver	0.1
Mercury	0.01
Nickel	1.0

Note: All metals are to be measured as total metals.

Section 6. If any waters or wastes are discharged, or are proposed to be discharged to the public sewers, which contain the substances or posses the characteristics enumerated in Section 5 of this Article, and which in the judgment of the Director may have a deleterious effect upon the sewage works, processes, equipment, or receiving waters or which otherwise create a hazard to life or constitute a public nuisance, the Director may:

A. Reject the wastes.

B. Require pretreatment to an acceptable condition before discharge to the public sewers.

C. Require control over the quantities and rates of discharge and/or

D. Require payment to cover the added cost of handling and treating the wastes not covered by existing taxes or sewer charges.

If the Director permits the pretreatment or equalization of waste flows, the design and installation of the pretreatment facility and equipment shall be subject to the review and approval of the Director and subject to the requirements of all applicable codes, ordinances, and laws.

Section 7. Grease, oil, and sand interceptors shall be provided when, in the opinion of the Director they are necessary for the proper handling of liquid wastes containing grease in excessive amounts, or any flammable wastes, sand, or other harmful ingredients; Except such interceptors shall not be required for private living quarters or dwelling units. All interceptors shall be of the type and capacity approved by the Director, and shall be located as to be readily and easily accessible for cleaning and inspection. MDC Grease Interceptors shall be installed in the building sewer serving restaurants or hotels, boarding houses that prepare and serve food or business of a similar nature. Maintenance, operation, and repair of all installed interceptors shall be at the expense of the owner and subject to the inspection by the Director or his authorized representative.

1. Grease traps shall be inspected monthly, for the months in use, by a duly appointed representative of the Town and shall be cleaned by a licensed septage

hauler whenever the level of grease is 25% of the effective depth of the trap or at least every three months whichever is sooner. Facility owners/operators shall be responsible for notifying the Wastewater Department of extended periods of time (one [1] month or more) when the grease trap is not in use (i.e. the facility will be closed) to avoid being inspected and billed for those months.

2. Following pumping of a grease trap the grease trap shall be filled with treated water from the WPCF to a point above the discharge pipe.

Section 8. The owner of any property serviced by a building sewer carrying industrial wastes shall install a suitable control manhole together with such necessary meters and other appurtenances, as determined by the Director, in the building sewer to facilitate observation, sampling, and measurement of wastes. Such manhole shall be accessible and safely located, and shall be constructed in accordance with plans approved by the Director. The manhole shall be installed by the owner at the owner's expense and shall be maintained by owner so as to be safe and accessible at all times.

Section 9. All measurements, tests, and analyses of the characteristics of waters and wastes to which reference is made in this ordinance shall be determined in accordance with the latest edition of " Standard Methods for the Examination of Water and Wastewater", published by the American Public Health Association and 40CFR, Part 136, and shall be determined from suitable samples taken at the control manholes provided. In the event that no special manhole has been provided, the control manhole shall be determined by the Director. (Normally the control manhole will be the nearest downstream manhole in the public sewer to the point at which the building sewer is connected). Sampling shall be carried out by customarily accepted methods to reflect the effect of constituents upon the sewer works and to determine the existence of hazards to life, limb, and property. (The particular analyses involved will determine whether a twenty-four (24) hour composite of all outfalls of a premise is appropriate or whether a grab sample for samples should be taken. Normally, but not always, BOD and suspended solids analyses are obtained from 24 hour composites of all outfalls, whereas pH's are determined from periodic grab samples or continuous monitors).

Section 10. No statement contained in this Article shall be construed as preventing any special agreement or arrangement between the Town and any industrial concern whereby any waste of unusual strength or character may be accepted by the Town for treatment, subject to payment therefore, provided that such agreements do not contravene any requirements of existing federal, state, or local laws and are compatible with any user charge and industrial cost recovery system in effect.

ARTICLE V
PROTECTION FROM DAMAGE

Section 1. No person shall maliciously, willfully or negligently break damage, destroy, uncover, deface, or tamper with any structure, appurtenance or equipment which is a part of the

sewage works. Any person violating this provision shall be subject to immediate arrest under charge of disorderly conduct.

ARTICLE VI
POWER AND AUTHORITY OF INSPECTION

Section 1. The Director and other duly authorized employees of the Town of Harwich Wastewater Department, bearing proper credentials and identification, shall be permitted to enter all properties for the purpose of inspection, observation, measuring, sampling, and testing in accordance with the provisions of this ordinance. The Director, or his representatives, shall have no authority to inquire into any processes including metallurgical, chemical, oil refining, ceramic, paper, or other industries beyond that point having a direct bearing on the kind and source of discharge to the sewers or waterways or facilities for wastes treatment.

Section 2. While performing the necessary work on private properties, referred to in Article VII, Section 1., above, the Director, or duly authorized representative of the Director shall observe all safety rules applicable to the premises established by the owner or occupant person and the owner and/or occupant person shall be held harmless for injury or death to the Director's representative and the Town shall indemnify the owner and/or occupant person against loss or damage to its property by Director's representatives and against liability claims and demands for personal injury or property damage asserted against the and owner /or occupant person and growing out of the gauging and sampling operation, except as such may be caused by negligence or failure of the owner and/or occupant person to maintain safe conditions as required in Article V Section 9.

Section 3. The Director, and other duly authorized representative of the Wastewater Department, bearing proper credentials and identification shall be permitted to enter all private properties through which the Town holds a duly negotiated easement for the purpose of, but not limited to: operation, inspection, observation, measuring, sampling, repairing, and maintenance of any portion of the sewage works lying within said easement. All entry and subsequent work, if any in said easement, shall be done in full accordance with the terms of the duly negotiated easement pertaining to the private property involved.

ARTICLE VII
PENALTIES

Section 1. Any person found to be violating any provisions of these Rules and Regulations except Article IV shall be served by the Town with written notice stating the nature of violation and the offender shall permanently cease all violations. The Director may immediately halt or prevent any discharge of pollutants which reasonably appears to present an imminent endangerment to the health or welfare of persons. In the event that the Director determines that a discharge of pollutants reasonably appears to present an imminent endangerment to the health or

welfare of persons, the Director may provide informal (oral or written) notice of such determination to the discharger. The offender shall, within the period of time stated in such notice, permanently cease all violations by immediately stopping or eliminating such discharge and shall submit written proof of the elimination of the discharge to the Director within forty-eight (48) hours of receipt of notice of the Director's determination. If said person fails to voluntary halt such discharge, the Director will take such actions as deems necessary to prevent or minimize endangerment to the health or welfare of persons. Such actions may include, but are not limited to: seeking temporary injunctive relief, entry onto private property to halt such discharge, severance of the sewer connection, suspension of wastewater disposal service, suspension or revocation of a discharge permit, and/or implementation of legal action. After such discharge has been halted, the Director may take such other and further actions as may be necessary to ensure elimination of said discharge and to ensure compliance with the terms of these Rules and Regulation and any discharge permits issued hereunder.

Section 2. Any person who shall continue any violation beyond the time limit provided for in Article VIII, Section1 shall be guilty of a misdemeanor, and on conviction thereof, shall be fined an amount not exceeding five thousand dollars ($5,000) for each day for each violation of any provisions of these Rules and Regulations. Each day in which any such violation shall continue shall be deemed a separate offense. These penalties are stated in the Massachusetts General Laws, Chapter 83, as amended by Chapter 174 of the Acts of 1987. Enforcement action shall be considered to begin immediately upon discovery of the violation for the purpose of calculating penalties, etc.

Section 3. Any person violating any of the provisions of this ordinance shall become liable to the Town for any expense, loss or damage occasioned by the Town by reason of such violation.

Section 4. Neither the Town nor any of its employees shall be liable for damages arising out of a malfunction of the system including, but not limited to, backups.

ARTICLE VIII
VALIDITY

Section 1. All ordinances or parts of ordinances in conflict with these Rules and Regulations of the Sewer Department are hereby repealed.

Section 2. The invalidity of any section, clause, sentence, or provision of this ordinance shall not affect the validity determined by the Board as to which of any other part of this ordinance which can be given effect without such invalid part or parts.

ARTICLE IX
COLLECTION OF SEWER AND SERVICE CHARGES:

Sewer bills are due payable within thirty (30) days from the date of issuance. All sewer bills that are outstanding after 30 days will be mailed a demand notice which shall be due within fourteen (14) days. The demand notice shall include a demand charge and interest on the outstanding balance. Interest shall accrue at the statutory rate applicable to property taxes as stated in Massachusetts General Law Chapter 59, Section 57. If the charges are still unpaid after the due date of the demand notice, a hand delivered notice will be posted on the premises being served one week before sewer service is turned off or plugged. In order to turn off or plug a sewer service without causing a health problem the water service shall also be turned off. If the water service shall be turned off for non-payment of the sewer service charges, the water service will not be turned on until all past charges are paid in full, including all expenses associated with collection of such sewer charges and the shut off of water service. Such shut off of water charges shall be as approved by the Water Commissioners as water rates and charges of the Water Department.

ARTICLE X
GRIEVANCE AND VARIANCE PROCEDURE:

A person who seeks a variance or feels aggravated due to the interpretation of these Rules and Regulations as it affects them shall have recourse, without prejudice or retribution, to seek a response to the alleged situation, condition, problem or misunderstanding in the following manner:

Step 1. The person shall present the issue to the Director in writing using the forms available at the Wastewater Departments' office, documenting the time and/or dates of the circumstances and reasons for a variance request or said grievance. The person may expect a reply to the request for variance or grievance within thirty (30) days from the date of filing with the Director.

Step 2. Should the issue not be resolved with the response from the Director or not received within thirty (30) days, the person may take the issue to the Wastewater Commission. Such submission shall include copies of all written documentation of the variance request or said grievance, with all sequence of actions or inactions taken to date.

The Wastewater Commission will use its best effort to hold a hearing within forty-five (45) days of receipt of an application for a abatement, variance or grievance request, and shall render a decision within forty-five (45) days after holding such hearing on the application for a abatement, variance or grievance request.

Step 3. Should the issue not be resolved with the response from the Wastewater Commission or not received within forty-five (45) days after the Wastewater Commission closes the hearing on a person's application for abatement, variance or grievance request, the person may take the issue to the Board of Selectmen. Such submission shall include copies of all written documentation of the variance request or said grievance, with all sequence of actions or inactions taken to date. The Board of Selectmen will use their best effort to hold a hearing within sixty (60) days of receipt of an application for an abatement, variance or grievance request and shall render a decision within forty-five (45) days from date of the hearing.

ARTICLE XI
ORDINANCE IN FORCE

Section 1. This ordinance shall be in full force and effect from and after its passage, approval, recording, and publication as provided by law.

APPENDICES

Appendix A: Design of Sewers
Appendix B: Construction Technical Specifications

APPENDIX A
DESIGN OF SEWERS

Section 1. General

Wastewater collection systems shall be designed separately from stormwater systems. Wastewater collection systems shall not allow for the introduction of rain water, noncontract cooling water, and groundwater from foundation drains, sump pumps, surface drainage or any other source of inflow. Overflows from wastewater collection systems shall also not be permitted.

New sanitary sewers and all extensions to sanitary sewers owned and operated by the Town of Harwich shall be either gravity sewers or low pressure sewers in accordance with the Town's approved wastewater treatment facility plan, and shall be designed by a professional engineer licensed to practice in the Commonwealth of Massachusetts, in accordance with the Guides for the Design of Wastewater Treatment Works (TR-16), and in strict accordance with appropriate Massachusetts codes and the Town of Chatham Rules and Regulations of the Sewer Department. Plans and specifications shall be submitted to and approved by the Director before initiating any construction. The design shall anticipate and allow for flows from all possible future extensions or development within the immediate drainage area in conformance with Town planning documents.

Section 2. Building sewers shall be constructed of such materials and shall be a minimum four (4") inch diameter pipe for single family residential connections and six (6") inch diameter pipe for multi-family, commercial or industrial connections or as the Superintendent may determine. Sewer pipe shall be made from: ductile iron with the outside coated with extra heavy bituminous coating approved for buried utilities and the inside cement lined, minimum schedule 35 P.V.C. or acceptable substitute approved by the Superintendent. The building sewer shall be laid straight in line and grade.

Single family residential building sewers must have watertight wye cleanouts, with H-20 rated valve frame and cover box, with the word "SEWER" in raised lettering, at all locations where pipe size, slope or direction changes and at the property line. Additional cleanouts may be required for runs of 100 feet or more, or at the discretion of the Director. The cleanout shall be brought to within four (4") inches below final grade, except for paved surfaces, (bituminous concrete, concrete, paving blocks, etc.) the cover shall be flush with the finished surface. Cleanouts in pressure sewers shall be located and constructed per the manufacturer's recommendation.

For multi-family, commercial or industrial sewer connections manholes shall be used at all locations where pipe size, slope or directions changes. Commercial or industrial sewer connections shall include a sampling station, to be used for discharge sampling, located in the road layout at the property line. The sampling station shall consist of a precast manhole with approved frame & cover.

Pressure Sewer Laterals:

If building is to be connected to a low pressure sewer or requires a pump to lift sewage to a gravity sewer, the gravity portion of the installation shall meet the requirements of the previous paragraph. The pressure pipe shall be minimum 1-1/4 inch diameter if a grinder pump is used and 2-inch diameter if a grinder pump is not used or other such larger size if the sewage flow and characteristics differ from a single-family residence.

Materials

Polyethylene for 1-1/4 –inch pipe through 4 inch pressure pipe with material conforming to ASTM D3350, Type PE-4710 HDPE pressure Class PC 200, SDR-11. Fittings for use with polyethylene pipe and tubing shall be manufactured and furnished by the pipe supplier and in conformance with AWWA C901 requirements. Joints for polyethylene pipe shall be jointed by the butt fusion method in a manner recommended by the pipe manufacturer.

Polyvinyl Chloride (PVC) Pipe- ASTM D2241 PVC pressure pipe material conforming to ASTM D1784, minimum class SDR 21 for pipe 1-1/4-inch through 4-inch, push-on joint conforming to ASTM D3139 with flexible elastomeric gaskets conforming to ASTM F477.

A ball valve with curb stop and check valve shall be installed on all low pressure and force mains, as close as feasible to a property line. Ball valves for low pressure sewers shall be true union type constructed from PVC Type I cell classification with EPDM O-rings. All valve components shall be replaceable. Ball valves 2 inch and smaller shall be pressure rated to 235 psi, while valves larger than 2 inches shall be rated to 150 psi. Ball valves shall have a Safe-T-Block seal carrier to stop flow in either direction, allowing safe removal of the downstream union nut for system service or modification. Ball valves shall be true union ball valves as manufactured by Spears Manufacturing Company, or equal. Check valves for low pressure sewer laterals shall be made of stainless steel or fabric-reinforced synthetic elastomer to allow for a positive seal with minimum backpressure. Check valves shall be true union ball check valves.

Curb stop valves shall be of brass or bronze construction and two rubberized O-ring seals to provide pressure-tight seal. Curb stop valves shall be figure H-15204 as manufactured by Mueller-Oriseal, B22 as manufactured by Ford Meter Box Company, Hayes, Nueseal, or equal. Curb boxes shall be 2-1/2 inch shaft size two-piece screw type. They shall be adjustable from 48-inch to 72-inch. Curb boxes shall be constructed of cast iron and thoroughly coated with two coats of asphaltum varnish. Curb box shall be stainless steel supplied with a hole in the "U" portion for the insertion of a stainless steel pin. Pins shall be supplied and shall be made of stainless steel. Curb boxes shall be as manufactured by Ford Meter Box Company, Mueller Company, or equal.

Gravity or low pressure pipe shall have magnetic marking tape 2 inches wide with the words "SANITARY SEWER BELOW," installed not more than two (2') feet below finished grade on all mainline and service laterals.

Section 3. Whenever possible, the building sewer shall be brought to the building at an elevation below the basement floor. All buildings in which any building drain is too low to permit gravity flow to the public sewer, sanitary sewage carried by such building drain shall be lifted by an approved means and discharged to the building sewer or public sanitary sewer, as specified by the Director.

Low Pressure Grinder Pumps or Lift Pumps:

Each property serviced by a low pressure sewer shall have a dedicated pre-manufactured pump station suitable for the flow, pressure and other conditions defined by the property and the public sanitary sewer. The station shall include an in-ground self contained unit with submersible motor, level controls, sensors, alarms, and an emergency generator pulg-in connection. Properties whose sewage quantities and characteristics are equivalent to four or more families shall install a duplex pump. Refer to further requirements in Article IV-Design of Sewers, Section 11- Grinder Pump Systems.

Section 4. No person shall make connection of roof downspouts, exterior foundation drains, areaway drains, or other sources of surface runoff or ground water to a building sewer or building drain which is connected directly or indirectly to a public sanitary sewer.

Section 5. Exhaust from engines, blowoff from boilers, drainage of gasoline or any explosive liquor, liquids, or other flammable substances shall not be permitted to be discharged into any building sewer which is connected directly or indirectly to a public sanitary sewer. At the time a connection is made to the Town's sanitary sewer system, the interior plumbing shall be inspected to ensure that no connections to roof drains, yard drains, foundation drains, sump pumps, or other sources of drainage water is connected to the sanitary sewer.

Section 6. The connection of the building drain into the building sewer shall conform to the requirements of the building and plumbing code or other applicable rules and regulations of the Town.

Section 7. The Licensed Utility Installer, listed on the approved sewer connection permit, shall notify the Water and Sewer Departments, a minimum of 72 hours, before the building sewer will be ready for connection to the public sewer. The Director will schedule the time and date when he or his representative will be available to perform an inspection of the building sewer's connection to the public sewer, connection shall be made only under the supervision of the Director or his representative.

Section 8. All excavations for building sewer installation shall be adequately guarded with barricades and lights so as to protect the public from hazard. Streets, sidewalks, parkways, and other public property and/or private property disturbed in the course of the work shall be restored in a manner satisfactory to the Director.

Section 9a. Plumbers and private contractors, of established reputation and experience, who have paid the required filing fees, as stated in Section 13b, and have provided the required license and permit bonds, as stated in Section 13c, and have submitted a Certificate of Insurance with required coverage, as stated in Section 13d, may be approved by the Director as a Licensed Utility Installer (L.U.I.).

Applicants for licenses for installing sewer main and sewer services shall attend a training seminar on the installation of low pressure pumps that is conducted by the manufacturer, and the applicant shall show evidence of course completion.

Note: The installation of grinder pumps may require other permits such as, but not limited to: electrical and plumbing.

Section 9b. Applicants for licenses as sewer main and sewer service installers (Licensed Utility Installer) are required to pay a filing fee. As set by the Board (see rates and fees schedule).

Section 9c. Applicants for licenses as sanitary sewer and building sewer installers (Licensed Utility Installer) shall obtain a License and Permit Bond in the amount of Five Thousand ($5,000.00) Dollars or an amount equal to
100% of the construction cost of any proposed sewer connection located within or on public property or an amount approved by the Director, whichever is greater. Said license and permit bond shall remain in full force and effect for a period of one (1) year from date of acceptance by the Town of the L.U.I.'s last sewer connection. This bond will guarantee that the Licensed Utility Installers (L.U.I.) will comply with the statutes, regulations, or ordinances of the Town of Chatham. The license and permit bond shall be duly executed by the Principal of the L.U.I. and by a Surety Company qualified to do business under the laws of the Commonwealth of Massachusetts and satisfactory to the Director.

Section 9d. Before any Licensed Utility Installer performs any work in, on, under or around streets, sidewalks and property belonging to the Town of Chatham, it will be necessary for him to furnish, simultaneously with the submittal of the License and Permit Bond, a Certificate of Insurance showing that the contractor has the following coverage:

1.	General Liability -	$500,000 $500,000-$1,000,000	Property Damage Bodily Injury
2.	Automotive Liability-	$500,000 $500,000-$1,000,000	Property Damage Bodily Injury

3. Workmen's Compensation and Employer's Liability as required under Massachusetts General Laws.

4. Insurance shall include coverage for collapse of underground structures.

5. Insurance shall include coverage for projects completed operations.

All above insurance coverage shall remain in full force and effect for a period of at least one (1) year from the date of acceptance by the Town of the last sewer connection installed by the L.U.I. The L.U.I. shall take all responsibility for the work, and take all precaution for preventing injuries to persons and property in or about the work.

Section 9e. The L.U.I. shall pay all debts for labor and materials contracted for or by him on account of the work and shall assume the defense of and indemnify and save harmless the Town of Chatham and its Officers and Agents from all claims relating to labor and or alleged infringement of inventions, patents, or from injuries to any person or corporation caused by the acts of negligence of the L.U.I. any of his agents or employees, or any subcontractor, in doing the work or in consequence of any improper materials, implements, or labor used therein.

Section 9f. Before the L.U.I.'s License and Permit Bond or any coverage listed in the L.U.I.'s Certificate of Insurance expires, the L.U.I.'s shall send a revised License and Permit Bond or Certificate of Insurance to the Water and Sewer Department showing that the bond or insurance coverage, is still in place. The Licensed Utility Installer shall NOT perform any work in, on, under or around streets, sidewalks and property belonging to the Town of Chatham or any other public property if their License and Permit Bond or any coverage listed in their Certificate of Insurance has elapsed.

Section 9g. Approved Licensed Utility Installers will renew their Utility Installers Licenses by submitting a revised License and Permit Bond, Certificate of Insurance, and License Fee by January 1st of each year. All Utility Installers' Licenses expire at Midnight, December 31st of each year.

Section 10. All sanitary sewer extensions shall require inspection by a qualified inspector or the Director may determine that a building sewer installation or repair will require full time inspection by a qualified inspector. In either case the Director will designate a private inspector as Town Inspector who shall represent the interest of the Town of Chatham during construction of any sanitary sewer extension or building sewer installation or repair, and will monitor and inspect the ongoing progress of the work, full-time observation is required. The costs for the

services performed by said Town Inspector shall be paid by the developer or owner, through the Water and Sewer Departments. Flows will not be permitted to be discharged from any service connection until a Certificate of Compliance is submitted by the Town Inspector and the report is approved by the Director.

Section 11. After the completion of any building sewer's repairs or connection to the municipal sewer, the L.U.I. shall fill out a sewer connection tie card, on the forms provided at the Water and Sewer Departments' office, for each building sewer the L.U.I. has performed work on. The tie-card shall be completed before the inspection of the L.U.I.'s work, and before the L.U.I. backfills the building sewer and connection to the municipal sewer.

Section 12. After completion and before the final inspection of any sanitary sewer connection or building sewer connection for residential dwellings with four (4) or more dwelling units, industrial connections, commercial connections with five (5) or more water closets, commercial connection with industrial water or waste, connections of private sewer system or whenever the Director requires, the Licensed Utility Installer, developer or owner will furnish a reproducible mylar "as-built" drawing (1" = 20') to the Director. The as-built drawing(s) shall contain a plot plan(s) with building(s) and highway layouts, sewer layouts with profiles, force mains, force main gates, pump station(s), pump station(s) details, and descriptions of each building sewer showing the depth of all connections, pipes, and manholes, using buildings or other permanent markers as reference points. The as-built drawing (s) shall contain any other information deemed necessary by the Director.

Section 13. Alternative Sewer Collection Systems:

Sewer collection systems not stated in these Rules and Regulations of the Sewer Department shall only be permitted with the Director's conditional approval.

Section 14. Design Capacity and Design Flow

Design Factors:

- ☐ Peak hourly sewage flow
- ☐ Additional peak flows of industrial and commercial wastes
- ☐ Maximum groundwater infiltration
- ☐ Topography of the immediate area
- ☐ Difficulty of installation

Design Period:

Sewage collection systems shall be designed for a life span

of 50 years, and interceptor sewers shall be designed to handle the maximum capacity of uses in the drainage area as determined by the Director.

Design Flow:

Submit a detailed description of the procedures used for calculating sewer design flow to the Director.

The Massachusetts 310 CMR 15.000, the State Environmental Code, Title 5, shall be used for calculating the design flow for sewers. If the Massachusetts 310 CMR 15.000, the State Environmental Code, Title 5, does not have a flow rate for the proposed use, the following methods may be used with the approval of the Director:

Flow Related to Water Consumption;

When available, use existing sewage flow and/or consumption data as a basis for sewer design. If such data are not available, using flow data from a similar community or users;

Per Capita Flow;

Where actual flow data cannot be obtained, base residential flows from new collection systems on an average daily per capita flow of not less than 70 gallons per day (0.27 m3/day). Add an appropriate allowance for infiltration to this flow;

In all cases, add a minimum allowance of 250-500 gpd/in. diam/mile of sewer (0.24-0.48 m3/cm of pipe diam/km/day) for infiltration to the water consumption, per capita flow or any other calculation method required by the Director.

Section 15. Details of Gravity Sewer Pipe Design and Construction

Minimum Sewer Pipe Size:

No gravity sewer shall be less than 8 inches in diameter (20 cm).

Depth:

In general, sewers shall be deep enough to drain basement fixtures
and to prevent freezing. Water tight insulation shall be provided for sewers that cannot be placed deep enough to prevent freezing.
For house connections chimneys (vertical pipe) preformed block units shall be used when the sewer main is greater than or equal to 12 feet deep.

Buoyancy:

Where high groundwater conditions are anticipated, the buoyancy of sewers shall be considered, and the floatation of pipe shall be prevented with appropriate design and construction of the sewer.

Slope:

Minimum Slopes:

All sewers shall be designed and constructed to give a velocity (when flowing full) of not less than 2.0 feet per second (0.61 m/s) based on Manning's formula using an "n" value of 0.013. The Director may permit the use of other "n" values if deemed justified on the basis of research or field data. The following minimum slopes shall only be used if absolutely necessary because of grade restrictions; however, greater slopes are desirable.

Sewer Size	Minimum Slope in Feet per 100 Feet (m/100m)
8 inches (203 mm)	0.40
10 inches (254 mm)	0.28
12 inches (305 mm)	0.22
14 inches (356 mm)	0.17
15 inches (381 mm)	0.15
16 inches (406 mm)	0.14
18 inches (457 mm)	0.12
21 inches (533 mm)	0.10
24 inches (610 mm)	0.08
27 inches (686 mm)	0.067
30 inches (762 mm)	0.058
36 inches (914 mm)	0.046
42 inches (1067 mm)	0.037

The use of oversized sewers in order to justify flatter slopes is not permitted.

Slope Between Manholes:

Sewers shall be laid out with uniform slope between manholes.

High Velocity Protection:

Velocities greater than 12 feet per second (3.7 m/s) shall not be permitted under any flow conditions, unless the Director approves special provisions that will protect against pipe erosion and impact.

Steep Slope Protection:

Securely anchor sewers on 15 percent slopes, or greater, to prevent displacement.

Impervious Dams:

Impervious dams shall be installed every 300 feet to control the flow of groundwater within the pipe bedding material, when:

- ☐ The surrounding native material is considerably less impervious than the pipe bedding material;
- ☐ The pipe bedding could produce a hydraulic head of 25 feet on the pipe gaskets and joints during periods of high groundwater flow; and/or
- ☐ The sewer is constructed downstream of a waterway or wetland crossings.

Alignment:

Sewers shall be laid out in a straight line and alignment, and shall be checked with a laser beam.

Sewer Pipe Material:

Sewer pipe material shall be as specified in Article V, Construction Technical Specifications, Section 12:

Sewer Pipe Inspection and Testing:

The specifications shall include deflection and leakage testing of sewer pipes, as stated in Article V, Construction Technical Specifications, Sections 17. and 18

Section 15. Details of Sewer Manhole and Cleanout Design and Construction

Manholes and cleanouts shall be as specified in Article V, Construction, Technical Specifications, Section 13:

Manhole Inspection And Testing:

The specifications shall include a requirement for the inspection and testing of manholes for leaks or damage as specified in Article V, Construction Technical Specifications, Section 21.

Section 16. Inverted Siphons (Depressed Sewers)

Inverted siphons shall only be allowed if there is no other option and it is approved by the Director. Depressed sewers shall have no less than two barrels with a minimum pipe size of 6 inches (15 cm) and shall be provided with necessary appurtenances for convenient flushing and maintenance. Manholes shall have adequate clearances for cleaning equipment and for inspection and flushing. The design shall provide for sufficient heads and pipe sizes to secure velocities of at least 3.0 feet per second (0.92 m/s) for average flows under initial conditions. The inlet and outlet details shall be arranged so that the normal flow is diverted to one barrel and so that either barrel may be taken out of service for maintenance. A hose connection shall be provided to the siphon for flushing purposes.

Section 17. Aerial Crossings

Aerial crossings shall only be allowed if there is no other option, and it is approved by the Director. All aerial crossings shall provide appropriate support for all joints and pipes used for aerial crossing. The supports shall withstand frost heaves as well as overturning, settlement, flooding, thermal expansion, vibrations, and other loads that may act against the piping. Precautions against freezing shall be provided (e.g., insulation and increased slope). Expansion joints between above-ground and below-ground sewers shall be provided. Where buried sewers change to aerial sewers, special construction techniques to minimize damage from frost heaves shall be used. Ductile iron pipe with restrained mechanical joints are required. The bottom of the pipe shall be no lower than one (1') foot above the 100 year flood elevation level.

Section 18. Location of Sewers in Streams

Sewers shall be designed to minimize the number of stream crossings.

Cover Depth:

The top of all sewers entering or crossing a stream shall be sufficiently below the natural bottom of the stream bed to protect the sewer line. The following cover requirements shall be met:

- 1 foot (305 mm) of cover where the sewer is located in rock.
- 3 feet (914 mm) of cover in other material. In major streams, more than 3 feet (914 mm) of cover shall be required.
- In paved stream channels, the top of the sewer line shall be at least 1 foot (305 mm) below the channel pavement.

Horizontal Location:

Sewers located along streams shall be located sufficiently outside of the stream bed to allow for stream widening in the future and for the prevention of siltation during construction.

Structures:

Locate sewer manholes or other structures outside of streams whenever possible. Where structures must be located in a stream, they shall not interfere with the free discharge of flood flows or navigation in the stream. The manholes' covers shall be no lower than one (1') above the 100 year flood elevation level.

Alignment:

Sewers shall cross streams perpendicular to the flow without a change in grade.

Materials:

Sewers entering or crossing streams shall be watertight and free from changes in alignment or grade. Joints shall be restrained in order to prevent movement from stream forces. Ball-and-socket or restrained joints designed for hard service applications shall be provided.

Backfill materials shall be stone, coarse aggregate, washed gravel, or other materials that will not readily erode, cause siltation, damage pipe during backfill, or corrode the pipe and shall be approved by the Director. In large stream crossings, where required by the Director, place riprap over the sewer pipe for stability and to prevent erosion.

Siltation and Erosion:

The design engineer or L.U.I. shall include construction methods that will minimize siltation and erosion in the project specifications the construction methods for sewers in or near streams. Such methods shall control siltation and erosion by limiting unnecessary excavation, including disturbing or uprooting of trees and vegetation, dumping of soil or debris, or pumping silt-laden water into the stream. Specifications shall require cleanup, grading, planting, and restoration of all work areas to begin immediately.

Section 19. Protection of Water Supplies

Cross Connections:

No physical connection shall exist between a public or private potable water supply system and a sewer or any appurtenance that would permit the passage of wastewater or polluted water into the potable supply. No sewer shall come into contact with a water pipe and no water pipe shall pass through any part of a sewer manhole or any part of the sewer system.

Relation To Water Works Structures:

Sewers shall be located as far as possible from public water supply wells or other potable water supply sources and structures.

Engineering plans shall show all existing waterworks units, such as treatment facilities, basins, pipes, wells, or other waterworks units that are within 50 feet of the proposed sewer or to within the minimum distances required by the Director.

Water Mains' Relation:

Horizontal Separation:

Whenever possible, lay out sewers at least 10 feet (3.0 m) from any existing or proposed water main. If local conditions prevent a lateral Separation of 10 feet, the Director may make an exception on a case-by-case basis when supported by data from the design engineer. Such an exception may allow the sewer to be installed closer than 10 feet to a water main, provided that it is laid out in a separate trench with the top (crown) of the sewer at least 18 inches (46 cm) below the bottom (invert) of the water main or is encased in a water tight sleeve.

Vertical Separation:

Whenever sewers must cross water mains, lay out the sewer so that the top of the sewer is at least 18 inches (46 cm) below the bottom of the water main. The sewer joints should be equidistant and located as far away as possible from the water main joints. When the sewer cannot meet the above requirements, relocate the water main to provide for this separation or reconstruct it with mechanical-joint pipe for a distance of 10 feet (3.0 m) on each side of the sewer. One full-length (twenty feet) water main pipe shall be centered over the sewer so that both joints will be as far from the sewer as possible.

Where a water main crosses under a sewer, adequate structural support shall be provided for the sewer to maintain line and grade.

When it is impossible to achieve horizontal and/or vertical separation as stipulated above, both the water main and sewer shall be constructed of mechanical-joint cement-lined ductile iron pipe or another equivalent that is watertight and structurally sound. Both pipes shall be pressure tested to 150 psi to ensure that they are watertight, and one of the pipes shall be installed in a water tight sleeve for a horizontal perpendicular distance of 10 feet (3.0) on each side of the other pipe. Any joints in the watertight sleeve shall be as far as possible from the water main's intersection with the sewer.

Section 20. Details of Low Pressure Sewer Design and Construction

Layout: The branched configuration of a pressure sewer is required. Looped piping shall not be permitted. Pipe routing shall include long radius sweeps no less than those recommended by the pipe manufacturer.

Pressure pipes shall be designed and installed so that a minimum of five (5) feet of cover material exists over the crown of the pipe at all times. Appurtenances such as isolation valves, air release valves, and clean-outs shall be provided as required by the Director.

Pipe Size: The diameter of the pressure sewer shall be calculated so that it provides a cleansing velocity based on the average daily flow of the system. Force Mains shall have a minimum velocity of three feet per second, 3ft/sec.

Minimum low pressure sewer pipe sizes shall be as follows (unless there is a significant change in grade):

NUMBER OF HOMES OR EQUIVALENT	MINIMUM PIPE SIZE
1-3	1.5
4-9	2
10-18	2.5
19-30	3 (model recommended)
>30	Must be modeled

Isolation Valves:

Isolation valves shall be required to allow isolation of individual girder units, system expansion, and at key locations such as at the property line.

Ball valves for low pressure sewer manholes shall be true union type constructed from PVC Type I cell CLASSIFICATION WITH EPDM O-RINGS. All valve components shall be replaceable. Ball valves 2 inches and smaller shall be pressure rated to 235 psi, while valves larger than 2 inches shall be rated to 150 psi. Ball valves shall have a Safe-T-Block seal carrier to stop flow in either direction, allowing safe removal of the downstream union nut for system service or modification. Ball valve ends shall be as needed to connect to Schedule 430 PVC pipe in low pressure sewer manholes. Ball valves shall be true union ball valves as manufactured by Spears Manufacturing.

Curb Stop Valve:

Curb stop valves shall be located at the property line of the street or easement of the sewer main. Curb stop valves shall be of brass or bronze construction and two rubberized O-ring seals to provide pressure-tight seal. Curb stop valves shall be figure H-15204 as manufactured by Mueller-Oriseal, B22 as manufactured by Ford Meter Box Company, Hayes, Nuseal, or equal. Curb boxes shall be 2-1/2-inch shaft size two-piece screw type. They shall be adjustable from 48-inch to 72-inch. Curb boxes shall be constructed of cast
iron and thoroughly coated with two coats of asphaltum varnish. Curb box rods shall be stainless steel supplied with a hole in the "U" portion for the insertion of a stainless steel pin. Pins shall be supplied and shall be made of stainless steel. Curb boxes shall be as manufactured by Ford Meter Box Company, Mueller Company, or equal.

Air Release Valves:

Air and vacuum valves shall be installed on low pressure mains. The air and vacuum valves shall be designed to release air from the main when the main is being filled and/or air becomes entrapped in the main, and to admit air into the sewer main when pumps are stopped and the main is being drained by gravity. The body and cover of air and vacuum valve shall be cast iron, floats of stainless steel, protective hood of steel, seats of Buna-N, and miscellaneous internal parts of stainless steel, Manufacturer-Crispin, or equal. Air and vacuum valves shall be located in a manhole or structure with a diameter of 60 inches to allow access for repairs and maintenance.

Cleanout Connections:

Cleanouts shall be installed on the pressure mains at sags and other locations where debris can accumulate and clog the lines, and proper valving to conduct required maintenance shall be provided.

Miscellaneous.

Magnetic marking tape two (2) inches wide with the words "SANITARY SEWER BELOW," shall be installed not more than 2 feet below finished grade on all mainline and service laterals.

Section 21. Force Mains

Minimum Size:

Force mains shall have a minimum velocity of three feet per second, 3ft/sec.

Force Main Pipe Material:

Force main pipe material shall as specified in Article IV, Construction Technical Specification, Section 14:

Velocity:

At design average flow, velocity in excess of 3 feet per second (0.91m/s) shall be maintained.

When the daily average design detention time, in the force main, exceeds 20 minutes, the manhole and sewer line receiving the force main discharge or the sewage shall be treated so that corrosion of the manhole and the exiting line are prevented. The corrosion is caused by sulfuric acid biochemically produced from hydrogen sulfide anaerobically produced in the force main.

Variable Terrain:

As far as possible, the alignment and depth of a force main should provide a constant upgrade profile. All force mains shall be designed and installed so that a minimum of five (5') feet of cover material is over the crown (top) of the pipe at all times.

Air Relief Valve:

An automatic air relief valve shall be placed at all relative high points in the force main and at 400 feet intervals on level force main runs. All air relief valves shall be protected from freezing.

Drain Valves:

Drain valves at all relative low points in the force main shall be provided. These valves shall be connected to gravity sewers or provided with connections for vacuum pumper trucks. All drain valves shall be protected from freezing.

Termination:

Force mains shall enter the gravity sewer at a point not more than 2 feet (0.61 m) above the flow line of the receiving manhole.

Testing:

Leakage Testing shall be as specified in Article V, Construction Technical Specifications, Sections 17 and 18:

Section 22. Grinder Pump Systems:

Pumping equipment shall include an integral grinder capable of handling a reasonable quantity of foreign objects that may find their way into a building's sewerage system. The grinder pump shall be capable of processing foreign objects without jamming, stalling, or overloading, and without making undue noise. The grinder shall provide a positive flow of solids into the grinding zone. Grinder pump stations shall be of the wetwell type.

A list of suitable manufacturers will be available from the Director. Properties whose sewage quantities and characteristics are equivalent to four or more dwelling units shall install a duplex pump.

Design of Pump Station:

Access: Outside installation shall be designed with the service manhole constructed of the same material, and at least as thick as the tank. The manhole shall have an opening at the surface with a minimum inside diameter of 30 inches (76 cm); its cover shall be securely lockable. The size of the manhole shall allow for the performance of maintenance and repair functions.

Tank: Construct each tank of concrete or custom-molded, fiberglass reinforced polyester resin using a filament wound process, layup and spray technique, or other approved process that will ensure a smooth and resin rich interior surface that is designed for two times the maximum loading.

The basin shall be concrete, fiberglass-reinforced polyester resin, or other material meeting the minimum strength specifications herein. The basin shall be furnished with one PVC closet flange or one flexible inlet flange suitable for connection to the household gravity line. At a minimum, the basin wall and bottom shall withstand two times the anticipated maximum pressure exerted on the basin, either from soil loadings or buoyancy forces. All station components must function normally when exposed to these loadings. All seals and joints shall pass factory tests to ensure that they are water tight.

Electrical Equipment: Wiring and electrical connections shall be NEMA rated for the environment in which they are to be placed. System shall include an emergency generator plug-in connection.

Pumps:

Pump Removal: The grinder pump shall be readily removable without the need for manual disconnection of piping.

Grinder: The grinder shall be positioned immediately below the pumping elements, securely fastened to the pump motor shaft, and driven directly by the same motor. The grinder shall be a rotating type with a stationary hardened and ground stainless steel shredding ring that carries stainless steel cutter bars. This assembly shall be dynamically balanced and run without objectionable noises or vibrations over the entire range of recommended operating pressures.

Pump Opening: The grinder shall be capable of reducing all components in normal domestic sewage or the sewage to be discharged from the building drain, including a reasonable amount of foreign objects (e.g., paper, wood, plastic, glass, and rubber). Objects shall be reduced to finely divided particles that will pass through the passages of the pump and a minimum 1.25 inch (3.2 cm) diameter discharging pipe.

Intake: The grinder shall be positioned so that solids are fed into it from the bottom in an upward flow, reducing the possibility of overloading or jamming. In addition, sufficient turbulence shall be created to keep the tank bottom free of permanent deposits or sludge banks.

Check Valve:

The grinder pump shall be equipped with a check valve that is installed in a horizontal position on the discharge pipe. This valve shall provide a full- ported passageway when open.

Ventilation:

Adequate ventilation shall be provided in accordance with local and national codes.

Controls:

Sensing devices to detect wastewater levels for initiating pump operation and to detect high water levels shall be installed. Level sensing devices shall only be used and shall not be located near flows entering the well.

Section 23. Pumping Station:

Design Capacity:

A sewage pumping station shall handle the projected peak sewage flows of its tributary sewer collection system. As recommended by TR-16, Guides for the Design of Wastewater Treatment Works (Technical Report #16) and the Hydraulic Institute's Recommended Standards for Pumping Stations. This information may be included in the Comprehensive Management Plan or other engineering report and any applicable updates or amendments. Pumping stations shall accommodate future expansion, when in the opinion of the Director it is appropriate.

Site Layout:

Stations shall be readily accessible to personnel and service vehicles during all weather conditions.

Flood Protection:

Wastewater pumping stations shall be protected from physical damage by the 100-year flood elevation and shall remain fully operational and accessible during the 100-year flood. All entrances and/or unsealable openings of the station shall be a minimum of one (1') foot above the 100-year flood elevation. These flood elevations shall be determined from the Federal Emergency Management Agency, and U.S. Army Corps of Engineers, and from the local regulations and ordinances.

Environmental Considerations:

Wastewater pumping stations shall be sensitive to the environmental conditions of the site. Visual impacts, architectural style, security, noise levels, odor control, and landscaping shall be considered carefully in station design and shall be reviewed and approved by the Director.

Types of Stations:

Wastewater pumping stations fall into three categories: wetwell/drywell, submersible, or suction lift. The preferred type of station is the Suction Lift type. The Director may approve other types under certain circumstances.

Structural Design:

Earthquake Loads and Uplift Forces:

Stations shall withstand earthquake loads and uplift forces from high groundwater conditions.

Separation:

Wet and drywells, including their superstructure, shall be completely separated. Common walls shall be sealed against gas leaks.

Equipment Removal;

Provisions shall be made for removing all equipment (i.e., pumps, motors, mechanical screens, motor control centers, etc.) from the station. Access openings, hatches, and/or skylights shall be sized accordingly. Permanent hoisting devices shall be provided as necessary.

Substructure:

Station substructures shall be constructed of reinforced concrete, either cast-inplace or precast. Small, prefabricated stations may be constructed of steel plate or fiberglass with the approval of the Director.

Access:

The designer shall minimize the confined spaces and shall indicate which spaces meet the definition of confined space on the drawings. Suitable, safe, and separate means of access shall be provided for dry and wetwells. Stairways and/or steps are required for drywells and wetwells containing either bar screens or mechanical equipment that requires inspection or maintenance. A landing with railings shall be provided for stairways or ladders for every 10 vertical feet. Local, state and federal safety codes shall govern in all cases.

Pumps:

Number of Pumps:

As a minimum, two pumps shall be provided, with each pump being capable of handling peak design flows. Where three or more pumps are provided, the overall station capacity shall be capable of handling peak design flow when any one pump is out of service.

Design:

Pumps shall be designed specifically for wastewater use and shall be non-clogging and as allowed by the Director.

Incoming Wastewater and Rate Discharge:

Pumping stations shall balance the rate of incoming wastewater with the rate discharged.

Each pump shall have an individual intake valve.

Pump suction and discharge openings shall be a minimum of 4 inches in diameter.

Centrifugal Pumps:

Centrifugal pumps shall be used in the drywell/wetwell pumping stations. The pump casing and suction elbow shall be provided with a clean-out access port. Impellers shall be enclosed or semi-open. To ensure primed pump conditions, the wetwell level shall not drop below the centerline of the pump impeller under normal operating conditions.

Submersible Pumps:

Submersible pumping stations may be used when, in the opinion of the Director, circumstances warrant. It shall be possible to remove and replace the submersible pumps without dewatering the wetwell or disconnecting the piping. Pumps shall be of the pull-up design, using a lifting cable and guides for pump removal. The pump shall be connected to the fixed discharge piping with a self-locking coupling. Shaft seal failure or potential seal failure detection alarms shall be provided. Submersible pumps may also be used in a wetwell/drywell configuration, with the Director's approval.

Suction Lift Pumps:

Suction pumps shall be self- or vacuum-priming.

Location: The pump equipment compartment shall be above grade or offset, and shall be isolated from the wetwell to prevent humid and corrosive sewer atmospheres form entering the equipment compartment. Access to the wetwell shall not be located in the equipment compartment. Valves shall not be located in the wetwell.

Self-priming Pumps: Self –priming pumps shall be capable of rapid priming at the lead pump-on elevation. Such self-priming and repriming shall be accomplished automatically under design operating conditions. Suction piping shall not exceed the size of the pump suction and shall not exceed 25 feet (7.6 meters) in total length. Priming lift at the lead pump on elevation shall include a safety factor of at least 4 feet (1.2 meters) from the maximum allowable priming lift for the specific equipment at design operating conditions. The combined total of dynamic suction lift at the pump-off elevation and

required net positive suction head at design operating conditions shall not exceed 22 feet (6.7meters).

Vacuum-priming Pumps: Vacuum-priming pump stations shall be equipped with dual vacuum pumps capable of automatically removing all air from the suction lift pump. The vacuum pumps shall be adequately protected from sewage damage. The combined total of dynamic suction lift at the pump-off elevation and required net positive suction head at design operating conditions shall not exceed 22 feet (6.7 meters).

Wetwells:

Divided Wells:

The wetwell shall be divided into two sections that are properly interconnected and gated to facilitate repair and cleaning.

Storage Capacity:

The effective storage capacity of the wetwell shall be based upon the recommended number of pump starts per hour and the design filling time. The effective volume of the wetwell shall be based on a filling time of 30 minutes under design average-daily-flow rates. To determine the frequency of starts used for design, refer to the pump manufacturer's warranty.

Where tributary wastewater flows are anticipated to be significantly less than the design average flow, provisions should be made so that the filling time under initial conditions does not exceed 30 minutes
(i.e., providing a divided wetwell or shortening the wetwell operation range) and the duration of storage in the pump station and force main does not result in septic conditions in the system or the release of objectionable odors to the environment.

Pump Protection:

Pumps shall be protected from large solids by readily accessible mechanically cleaned bar racks (screen) or combination device located at the wetwell influent. Bar racks should have clear opening not exceeding 1.25 inches (3.1 cm) unless pneumatic ejectors are used or special devices are installed to protect the pumps from clogging or damage.

Floor Slope:

The wetwell 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 is needed for proper installation and function of the wetwell inlet.

Vortexes:

The wetwell and suction inlets of dry-pit pumps shall eliminate the possibility of vortexes. The required submergence of the intake valves shall be determined for the day-pit pump's location. Intake valves should be flared, with the inlet opening facing down. Every effort shall be made to minimize flow rotation in the wetwell.

Sewage Channels:

Sewage channels located in wetwells shall be covered with nonskid, corrosion-resistant grating. They shall be installed flush with a floor, and capable of supporting anticipated loads. All channels shall be drained when not in use. Where the side meets the floor of the channel, fillets shall be provided.

Inlet Sewers:

Sewer piping entering the wetwell shall not have air in the pump suction line.

Drywells:

Automatic heating and dehumidification equipment shall be provided in all drywells. The electrical requirements shall meet those outlined in subsequent paragraphs of this section.

A sump pump shall be provided in the drywell to remove extraneous water. The discharge pipe of the sump pump shall be equipped with dual check valves and shall be pumped from the drywell into the wetwell above the high water level. Water ejectors connected to a potable water supply shall not be permitted. All floor and walkway surfaces shall slope to a point of drainage. Pump seal leakage shall be piped or channeled directly to the sump.

Valves:

Suitable shutoff valves shall be placed on the suction lines and on the discharge lines of each pump (except on submersible and vacuum-primed pumps). A suitable check valve shall be placed on a horizontal section of each discharge line between the shutoff valve and the pump.

Unless adequate space is available in a dry pit pump room, valves on the discharge piping (including flow meters, if required) shall be in a separate underground precast concrete vault.;

Every pump station shall include appropriate valves and quick disconnects to allow the Town to bypass the existing pumping equipment and valves. The piping shall allow the Town to install temporary piping into the wet well, and discharge to a location downstream of the check and shutoff valves.

Valves shall not be located in wetwells.

Section 24. Controls:

All pump stations, grinder pump stations, vacuum sewer stations, and other sewer handling facilities required by the Director shall be connected to the Water and Sewer Departments' Supervisory Control and Data Acquisition (SCADA) System.

All sensing, alarm, and SCADA system devices shall be of the same type, configuration, and function as that used by the Water and Sewer Departments. Each pumping station shall have its own screen display, processor logic controller (PLC), and communications equipment for the SCADA system and shall also display the required monitoring controls and alarm on the all SCADA system screens of the water and/or sewer systems.

Level Sensing Devices:

Level sensing devices shall not be affected by flows entering the wetwell or by the suction of the pumps. All wall penetrations between the wet and drywells shall withstand gas leaks and be located as high as possible to prevent overflow from the wetwell to the drywell. The pumps shall be automatically alternated. Running-time meters shall be installed at all pumping stations for each pump.

Alarm Systems:

Alarm systems shall be provided for all pumping stations. At a minimum, the alarm system shall be activated in any one of the following cases:

* High water in the wetwell;
* Low water in the wetwell;
* Loss of one or more phases of power supply;
* High water level in the pump room sump;
* Loss of the alarm transmission or communications;
* Loss of air pressure in the bubbler tube system/level sensing trouble or failure;
* Standby power failure or malfunction of the pump;
* Flooding of building or drywell;

* Smoke/fire alarms;
* Low temperature;
* Surge suppressor failure;
* PLC processor failed;
* PLC low battery;
* Intrusion; and
* Three spare connections

Section 25. Pump Station Ventilation

General:

Adequate ventilation shall be provided for all pumping stations. Where the pump pit is below the ground surface, mechanical ventilation is required, especially when screens or mechanical equipment requiring maintenance or inspection are located in the wetwell. The wet and dry well ventilation systems shall not be connected. In pits more than 15 feet (4.6 m) deep, multiple inlets and outlets shall be installed. Switches for the operation of ventilation equipment shall be marked and located conveniently. If odors are a problem, an odor control system shall be installed.

Wetwells:

Ventilation may be either continuous or intermittent. For continuous ventilation, at least 12 air changes per hour shall be provided. For intermittent ventilation, at least 30 air changed per hour shall be provided. Heating shall be installed where needed.

Drywells:

Ventilation shall be continuous. Heating and dehumidification is required. At least 6 complete air changes per hour shall be provided.

Section 26. Flow Measurement:

Suitable devices, as approved by the director, for measuring wastewater flow and power consumption shall be installed in all pump stations.

Section 27. Pump Station Water Supply:

Water under pressure shall be provided for cleanup at the pumping station. If a public water supply is used, a Reduced Pressure Zone (RPZ) backflow preventer or other approved device shall be installed on the water service entering the station. No other potable water supply and other piping systems or fixtures shall be connected to the systems supplied by the public water supply.

Section 28. Electrical:

Electric Equipment

Electrical systems shall be designed and installed in strict conformance with the latest edition of the National Electrical Code. Electrical equipment in enclosed places where gas may accumulate shall be noncorrosive and in compliance with the National Electrical Code requirements for Class I Group D, Division I locations.

Submersible Pump Motors

Electrical supply and control circuits shall allow disconnection at a junction box located at or accessible from outside the wetwell. Terminals and connectors shall have watertight seals located outside of the wetwell and shall be protected by separate strain relief.

The motor control center shall be located outside of the wetwell and protected by a conduit seal or other appropriate sealing method meeting the requirements of the National Electrical Code for Class 1. Division 2 locations.

The pump motor shall meet the requirements or the National Electrical Code for Class 1. Division 2 locations.

Submersible pump motors that are totally submerged during the pumping cycle are not required to protect against explosions.

Power cords for pump motor shall be flexible and serviceable under conditions of extra hard use. Ground fault interruption protection shall deenergize the circuit in the event of any failure in the electrical integrity of the cable.

Power cord terminal fittings shall be provided with strain relief appurtenances, and shall facilitate field connecting.

Section 29. Emergency Operations:

When the Director deems it is necessary, an independent natural gas or propane engine-generator type source of electric power shall be provided for electrically driven pumps. This source shall be automatically activated when or if any phase of the power supply fails or upon any fluctuation in voltage. Installation shall comply with all applicable requirements of the National Electrical Code.

Small Pumping Stations: When the Director agrees that a small pump station does not require a permanent alternative power supply, electrical connections for portable standby generator or pneumatic connection for portable air compressor shall be installed as approved by the Director.

Controls:

Provisions shall be made for automatic and manual startup and cut-in. The controls shall be such that upon automatic startup under emergency conditions, shutdown can be accomplished only manually, except in conditions that would damage the generator or engine.

Size:

Unit size shall be sufficient to start up and run all pumps needed to handle peak flows as well as lighting, ventilation, pump controls, and the sump pump.

Exerciser:

The engine controls shall be equipped with an automatic exerciser that may be set on any selected schedule to start the generator, to run it under no-load conditions, and to shut it off without activating the alarm system.

Noise Attenuation:

Noise attenuation components must be incorporated in the design to produce no more than 60 decibles (db) of noise at the property line.

Section 30. Safety

Adequate provisions shall be made to protect the operator and visitors from hazards. The design and construction of pumping stations shall meet all prescribed local, state, and federal safety laws and codes. Safety provisions shall include the following:

- Handrails at openings, stairways, and other hazardous areas;
- Guards around the belt drives, gears, rotating shafts, and moving equipment;
- Warning signs as appropriate;
- Provisions for power lockout controls at all pumps and equipment;
- Eye wash stations where chemicals are used;
- Adequate lighting in all areas of the pumping station;

- Provisions for confined space entry in accordance with OSHA and regulatory agency requirements;
- First aid equipment; and
- Fire extinguisher.

Section 31. Overflows and Bypasses

Overflows and bypasses shall not be allowed on pumping stations serving sanitary sewage collection systems.

Section 32. Site Protection and Aesthetics:

The Director will review the design and location of the pump stations and may determine that fencing, aesthetics vegetation plantings, intrusion alarms, and aesthetics superstructures style or any other site conditions may warrant site protection and/or aesthetics.

Section 33. Odor Control:

Odor control equipment may be required by the Director, depending on the sitting of the pumping station and force main discharge point.

Appendix B
CONSTRUCTION TECHNICAL SPECIFICATIONS

The owner of the property, the developer, and/or Licensed Utility Installer, shall construct and install all sanitary sewers and all building sewers in accordance with the following rules and regulations:

Section 1. The owner, developer, or LUI shall submit to the Director (for his approval) plans and profiles of the proposed public sewer extensions and/or building sewer connections.

Section 2. The owner, developer or L.U.I. of a subdivision shall submit to the Director, a subdivision plan approved by the Chatham Planning Board along with the plans and profiles of the proposed public sewer extension.

Section 3. The Contractor doing all the work shall be approved by the Director as a Licensed Utility Installer (L.U.I.) as described in Article II-Building Sewers and Connections, Sections 13a through 13g.

Section 4. All materials, including pipe and manhole structures, shall be of the same make and quality used by the Chatham Sewer Department and approved by the Director.

Section 5. Public sewers and building sewers shall be laid using a transit or laser level. All sewer pipes shall be laid on a bed of crushed stone of at least six inches (6") in depth under the pipe and crushed stone shall extend at least halfway up the side of the pipe. Approved gravel, with no stones larger than two inches (2") in any dimension, shall be used to cover pipe to one foot above pipe. The rest of the backfill material must be approved by the Director, Massachusetts Highway Department or Town of Chatham Surveyor of Highways. The approved backfill material shall be placed in mechanically compacted lifts of no more than six inches (6") deep or as specified by the Chatham Surveyor of Highways, Massachusetts Highway Department, or other specifications more stringent than the above. The approved backfill material above the gravel shall contain no stones greater than 6 inches in any dimension.

Section 6. Impervious dams shall be considered every 300 feet to control the flow of groundwater within the pipe bedding material when:

- The surrounding native material is considerably less impervious than the pipe bedding material;
- The pipe bedding could produce a hydraulic head of 25 feet on the pipe gaskets and joints during periods of high groundwater flow; and/or
- The sewer being constructed is downstream of any waterway and wetland crossings.

Section 7. Sewers may be deep enough to drain basement fixtures, and shall be deep enough to prevent freezing. Watertight insulation shall be provided for sewers that cannot be placed deep enough to prevent freezing.

House connections chimneys (vertical pipe) preformed block shall be used when the sewer main is greater than or equal to 12 feet deep.

Section 8. Where high groundwater conditions are anticipated, the buoyancy of sewers shall be considered, and the floatation pipe of pipe shall be prevented with appropriate design and construction of the sewer.

Section 9. No mud, gravel or debris shall be allowed to enter the sewer pipes at any time. All pipes shall be capped at end of day's laying and water shall be pumped out of excavation prior to removing the cap.

Section 10. Building sewer connection to the public sewer shall have a wye branch fitting, as approved by the Director, made of the same type of materials as the sewer main being tapped.

Section 11. Minimum size of gravity public sewer pipe diameter shall be eight (8") inches and building sewer pipes shall not be less than four (4") inches in diameter. Minimum sizes of low pressure sewer mains shall be in accordance with Article IV-Design of Sewers, Section 9. Details of Low Pressure Sewer Design and Construction.

Section 12. Sewer pipe and building sewer pipe material shall be:

(a) Reinforced Concrete Pipe shall meet the following specification:

Portland cement shall conform to ASTM C-150 Type II;
The pipe and its appurtenances shall conform to ASTM Specification C-76;
The reinforcing wire cage shall conform to ASTM Specification A 15, A 82, or A 185, as appropriate;
Entrained air shall be 5.0% to 9.0% by ASTM C-890;
Water absorption and three-edge bearing tests shall conform to ASTM Specification C-497; and
Gaskets shall conform to Sections 3.3 and 3.4 of AWWA Specification C-302.

Note: non-reinforced concrete pipe shall not be used.

(b) Extra Heavy Cast Iron Pipe shall meet the following specifications:

Pipe, fittings, and appurtenances shall conform to the requirements of ASTM Specification A-74 or ANSI A-21.11 and gaskets shall conform to ASTM Specification C-564.

(c) Heavy Wall Polyvinyl Chloride (PVC) Pipe shall meet the following specifications:

Pipe shall be made from Class 12454-B materials or better in accordance with ANSI/ASTM Specification D-1784, and shall ultraviolet light (UV) protected.

The pipe and accessories shall conform to the requirements of the following, with a minimum pipe stiffness of 46 PSI at a maximum deflection of five percent (5%):

ANSI/ASTM	**D 3034**	**(4" – 15")**
ASTM	**F 679 Type I**	**(18" – 27").**

(d) Ductile Iron Pipe shall meet the following specifications:

Pipe, fittings, and appurtenances shall be manufactured in accordance with ASTM Specification A-746;
Pipe shall have a minimum thickness of Class 50;
Fittings shall conform to ANSI Specification A-21.11 and have a minimum pressure class rating of 150 PSI;

All pipe and fittings shall be cement mortar lined in accordance with ANSI Specification A-21.4 at twice the specified thickness, and have an internal and

external bituminous seal coating and closure pieces shall be jointed by means of a mechanical coupling of the cast sleeve type.

(e) Extra Strength Vitrified Clay Pipe shall meet the following specifications:

Pipe shall conform to the current requirements of NCPI Specification ER 3300 – 67 and meet the requirements of ASTM Specification C 700.

Note: standard strength vitrified clay pipe shall not be used).

(f) Acrylonitrile – Butadiene – Styrnee (ABS) Pipe shall meet the following specifications:

Pipe and fittings shall conform to the requirements of ASTM Specification D 2661.

(g) Plastic Pipe, sizes 4 inches through 12 inches, shall be ANSI/ASTM D3034, SDR-35 Type PSM Poly (Vinyl Chloride) (PVC) material; minimum pipe stiffness (F/^Y) is 46 psi; bell and spigot style and rubber gasket conforming to ASTM F477.

(h) Low Pressure Mains and Services for 1-1/4-inch pipe through 4-inch pressure pipe shall be polyethylene pipe with material conforming to ASTM D3350, Type PE-3408 pressure Class PC 160, SDR-11. Fittings for use with polyethylene pipe and tubing shall be manufactured and furnished by the pipe supplier and in conformance with AWWA C901 requirements. Joints for polyethylene pipe shall be jointed by the butt fusion method in a manner recommended by the pipe manufacturer.

Pipe sizes 1-1/4 inches through 4 inches shall be Polyvinyl Chloride (PVC) pipe ASTM D2241 PVC pressure pipe material conforming to ASTM D1784, minimum class SDR 21 for pipe 1-1/4-inch, push-on joint conforming to ASTM D3139 with flexible elastomeric gaskets conforming to ASTM F477.

Fittings for use on PVC pressure pipe of 4-inch nominal inside diameter or greater shall be ductile iron with mechanical joints as described in ANSI 21.10/AWWAC110. The coatings and linings of the fittings shall be as specified for ductile iron pipe.

(i) Other pipe materials:

Other pipe materials shall requires prior written approval of the Director before being installed.

Materials for sewer construction shall be appropriate for local conditions, including the character of industrial wastes, septicity, soil characteristics, external loadings, and problems such as abrasion and corrosion.
All sewers shall be able to withstand damage from superimposed loads. Proper allowances for soil and potential groundwater conditions, as well as the width and depth of the trench shall be used. Where necessary, special bedding, haunching and initial backfill, concrete cradles, or other special construction elements shall be used.

The minimum internal pipe diameter shall be eight (8) inches for gravity sewers.

Joints for the selected pipe shall be designed and manufactured such that "O" ring gaskets of the "snap-on" type are used.

Gaskets shall be continuous, solid, natural or synthetic rubber, and shall provide a positive compression seal in the assembled joint.

Joint preparation and assembly shall be in accordance with the manufacturer's recommendations.

Wye branch fittings, as approved by the Director, shall be installed for connection of laterals.

Bedding, Haunching, and Initial Backfill:

Based on the bedding support of the type of soil and potential groundwater conditions, use the following for the anticipated loads:

- ☐ Bedding classes A, B, and C, or crushed stone as described in the American Society of Testing Materials standard ASTM C 12, should be used for all rigid pipe, or

- ☐ Materials for bedding, haunching, and initial backfill, or classes I, II, or III as described in ASTM D 2321, should be used for all flexible pipe.

Safety and Load Factors:

Selection of pipe class shall be predicated on the following criteria:

Safety factor	-	1.5
Load factor	-	1.7
Weight of soil	-	120 lbs/cu.ft.
Wheel loading	-	H-20

Section 13. Manholes and Cleanouts:

Manhole and Cleanout Size:

Cleanouts. Cleanouts shall be constructed of the same material as the building sewer. The size of the cleanout shall be the same size as the building sewer up to six (6") inches in diameter, for building sewers larger than six (6") inches in diameter manholes shall be used. Cleanouts shall be sealed with removable, re-useable threaded screw-in plug or screw-on cap.

Manholes. Manholes shall be minimum of four (4') feet in diameter with a minimum access diameter of 30 inches (76 cm). Larger diameter manholes may be required by the Director. A minimum drop of 0.10 foot shall be used between entrance and exit inverts.

Location:

Manholes and cleanouts shall be installed at the end of each line; at all changes in grade, size, or alignment; and at all intersections. Distances shall not be greater than 300 feet for sewers measuring 15 inches (38 cm) or less in diameter, or 400 feet for sewers 18-30 inches (46-76 cm) in diameter. Greater distances may be permitted for larger sewers or for those carrying a settled effluent, but only with prior approval of the Director. The top of the manhole cover shall be no lower than one (1') foot above the 100 year flood elevation level. Junction manholes on low pressure sewers shall be installed at all intersections

Drop Type:

A drop pipe for a sewer pipe with an invert entering a manhole of more than 24 inches (61 cm) above the manhole invert shall be provided. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches (61 cm), the invert shall be filleted to prevent solids deposition.

Drop manholes shall be constructed with an outside drop connection. Outside drop connections shall be encased in concrete, and shall provide access for cleaning as the sewer enters the manhole at the top of the drop connection.

Inside drop connections may be used provided the manhole has the area to facilitate safe access into the manhole with the inside drop in place, and shall be approved by the Director. The inside drop connection shall be secured to the interior wall of the manhole, and shall provide access for cleaning as it enters the manhole at the top. Internal drop pipes and fittings shall be PVC plastic sewer pipe in compliance with ASTM D2241. Corrosion resistant anchors shall be used to attach the drop pipe to the inside surface of the manhole barrel.

Structural Base:

Manhole bases shall be constructed or placed on a minimum of twelve (12) inches of crusher run with a maximum stone diameter in all directions of one half ½ inch and free of organic materials.

Diameter:

The manhole's minimum diameter shall be 48 inches (122 cm) for standard manholes and 60 inches (153 cm) for inside drop manholes. A minimum access diameter of 30 inches (76 cm) shall be provided. Larger openings shall be provided for manholes that house equipment, as specified by the Director.

Materials:

Manholes shall be precast concrete with barrel sections, cones, and bases, manufactured in compliance with ASTM C 478, and shall have an O-ring or bituminous-based gasketed joints. "Precast concrete walls shall be made up using straight, circular barrel sections and eccentric cone sections if manhole steps are required, and concentric cone sections where no steps are require. Manholes can also be poured-in-place concrete. Other types are allowed subject to the approval of the Director.

All tongue-and-grove (or male and female joints in the precast wall, including the joint at the top of the base, shall be made up using the "Snap-On" type O-ring gasket, and shall conform to ASTM C443; except that joint taper shall not exceed 3-1/2 degrees. The precast sections shall be provided with a special groove (cast into the male end) to receive and hold the gasket in position during joint assembly. After joint assembly, the gap between sections shall be packed on the inside and outside with Anti-Hydro "Azpandcretes," Masterflow 713 by Master Builders; or Five Star Grout by U.S. Grout Corp., and shall be troweled smooth so that no projections remain on the inside.

Manhole bases shall be constructed of 4,000 psi (28 day) concrete 8 inches thick, or shall be precast bases properly bedded in the excavation. Field constructed bases shall be monolithic, properly reinforced, and extend at least 6 inches beyond the outside walls of lower manhole sections. Precast manhole bases shall extend at least 6 inches beyond the outside walls of lower manhole sections.

Manholes shall be constructed using minimum 4 foot diameter, precast concrete manhole barrel sections, and an eccentric top section, conforming to ASTM Specification C-478, with the following exceptions on wall thickness:

Manhole Diameter Feet	Wall Thickness Inches
4	5
5	6
6	7
6-1/2	7-1/2
7.	8
8.	9

All Sections shall be cast solid, without lifting holes. Flat top slabs shall be a minimum of 8 inches thick and shall be capable of supporting a H-20 wheel loading.

All joints between sections shall be sealed with "O" ring rubber gasket, meeting the same specifications as pipe joint gaskets, or butyl joint sealant completely filling the joint.

All joints shall be sealed against infiltration. All metal parts shall be thickly coated with bitumastic or elastomeric compound to prevent corrosion.

No holes shall be cut into the manhole sections closer than 6 inches from joint surfaces.

Manholes which extend above grade shall not have an eccentric top section. The top plate shall be large enough to accommodate the cover lifting device and the cover.

Manhole Covers:

The elevation of the top section shall be such that the cover frame top elevation is one (1) foot above the 100-year flood elevation (in a field), 0.5 foot above a lawn elevation, or at finished road or sidewalk grade.

When located in a traveled area (road or sidewalk), the manhole frame and cover shall be heavy duty cast iron. When located in a lawn or in a field, the manhole frame and cover may be light duty cast iron. The cover shall provide a minimum access diameter of 30 inches (76 cm). The mating surfaces shall be machined, and painted with tar pitch varnish. The cover shall not rock in the frame. Infiltration between the cover and frame shall be prevented by proper design and construction. Covers shall have "Sewer" cast into them. Covers shall be designed so that infiltration is prevented.

Manhole frames, installed at grade, shall be set in a full bed of mortar with no less than two nor more than four courses of brick underneath to allow for later elevation adjustment. In lieu of brick, grade rings may be used for elevation adjustment. Grade rings shall not exceed 6 inches in depth. The total number of grade rings shall not exceed 12 inches in height, however, in no event shall more than 3 grade rings be used.

Manholes which extend above grade, shall have the frames cast into the manhole top plate. The top plate shall be securely anchored to the manhole barrel, by a minimum of six, ½ inch diameter, corrosion resistant anchor bolts, to prevent overturning when the cover is removed. The anchor bolts shall be electrically isolated from the manhole frame and cover.

Ladders:

Manhole steps are to be provided in manholes. Steps are to be cast in or grouted solid into the precast units at intervals of 12 inches. Steps shall be in conformance with OSHA requirements having drop front or equivalent. Bolted-on type is not acceptable. Manhole steps to be M.A. Industries, Inc. copylymer polypropylene reinforced with ½-inch steel rod or equal.

Flow Channel or Invert:

The flow channel through the manholes shall conform in shape and slope to that of the sewers entering and leaving the manholes. Construct the top of the flow channel so that the flow will remain in the channel under peak conditions. Form or shape the channel walls to the full height of the crown of the outlet sewer and so as not to obstruct maintenance, inspection, or flow in the sewers. When curved flow channels are required, including branch inlets, increase minimum slopes to maintain acceptable velocities. Provide a minimum 0.1-foot drop through the manhole.

Bench or Shelf:

Provide a bench on each side of every manhole channel. The bench should have a slope of no less than 0.1 inch per foot or no greater than 0.5 inch per foot. No lateral sewer, service connection, or drop manhole pipe should discharge onto the surface of the bench.

Manhole Inverts:

Manhole inverts shall be constructed by laying sewer bricks on their long side with their water structured face up, in straight line or sweeping arch to from the bottom of the invert, from pipe to pipe. Additional sewer bricks will fan out with their water structure facing towards the center of the invert from the invert brick. The invert's width will be the same diameter of the effluent pipe of the manhole. The minimum height of the shelf shall be equal to the crown of the manhole's effluent pipe and it shall be constructed from sewer brick with their water structured face up.

Buoyancy:

Where high groundwater conditions are anticipated, the manholes shall be designed and constructed to prevent floatation.

Watertightness:

Solid or watertight manhole covers shall be used in areas subject to flooding. All manhole lift holes and grade adjustment rings shall be sealed with a nonshrinking mortar or other material approved by the Director. A bituminous coating shall also be used on the exterior. Inlet and outlet pipes shall be joined to the manhole with a gasketed, flexible watertight connection or with another watertight connection arrangement that allows for differential settlement of the pipe and the manhole.

The Contractor shall furnish manholes waterproofed over the entire exterior surface that will be below finished grade. The water proofing shall not mar or interfere with the specified exterior finish for these structures. Waterproofing shall be accomplished prior to structure installation for precast sections, and shall be applied to dry surfaces under proper weather conditions.

Waterproofing shall consist of a two-coat application of coal tar compound as manufactured by Koppers Bitumastic Super Service Black; Tnemec Heavy Duty Black 46-449; Preco Nitroproof

600; or equal, and shall be applied according to manufacturer's specification. Total thickness of the two-coat application shall no be less than 16 mils.

Pipe Connections:

Pipes being connected to new manholes shall be connected to the manhole with cast-in-place rubber boot with clamp around gasket. Pipes being connected to existing manholes shall be core drill opening and seal with link seal water stop between pipe and manhole wall.

Section 14. Force main pipe shall be either:

(a) Ductile Iron Pipe:

Pipe shall conform to ANSI A21.51;
The minimum wall thickness shall be Class 52 (ANSI A21.50);
The pipe shall be clearly marked with either "D" or "DUCTILE";
Fittings shall conform to ANSI A21.10;
Pipe shall be furnished with push-on joints and fittings shall be furnished with mechanical joints. Both conforming to ANSI A21.11; and
Pipe and fittings shall be cement mortar lined and have an internal and external bituminous seal coating.

(b) Polyvinyl Chloride (PVC) Plastic Pipe:

Pipe shall conform to ASTM D2241;
Materials used in the manufacturer of PVC pipe shall meet ASTM C1784; and be ultraviolet light (UV) protected;
The minimum wall thickness shall be SDR-21;
Fittings shall conform to ASTM D2241; and
Joints and gaskets shall conform to ASTM D2241, D1869, and F477.

(c) Other pipe materials:

Other pipe materials shall require prior written approval of the Director before being installed.

Trenching, bedding, and backfilling shall be as approved by the authority having jurisdiction over the property, such as but not limited to: the Massachusetts Highway Department, Town of Chatham Surveyor of Highways or Harwich Wastewater Superintendent.

Joint preparation and assembly shall be in accordance with the manufacturer's written instructions.

Anchorages, concrete blocking, and/or mechanical restraint shall be provided when there is a change of direction of 7-1/2 degrees or greater.

When the daily average design detention time, in the force main, exceeds 20 minutes, the manhole and sewer line receiving the force main discharge or the sewage shall be treated so that corrosion of the manhole and the exiting line are prevented. The corrosion is caused by sulfuric acid biochemically produced from hydrogen sulfide anaerobically produced in the force main.

The force main shall terminate, in the receiving manhole, at a PVC plastic sewer pipe "T". The vertical arms of the "T" shall be twice the diameter of the force main. The upper arm shall be at least 4 feet long; the lower arm shall terminate in a PVC plastic sewer pipe 90 degree elbow in a flow channel directed to the manhole exit pipe. The "T" and its arms shall be securely fastened to the inside surface of the manhole wall using corrosion resistant anchors.

Force mains shall have a minimum velocity of three feet per second, 3ft/Sec.

Section 15. No sanitary sewer pipe shall be left open into an unfinished house or cellar hole. All pipes must be capped to prevent the flow of surface water or debris from entering the sanitary sewer.

Section 16. All sewer works located in the flood plain district area, established under the zoning by-law, shall require that new and replacement sewer works be designed and constructed to minimize or eliminate infiltration of flood waters into the system or discharge sewerage from the system into the floodwater.

Section 17. Sewer Pipe Testing:

A. General

The L.U.I. shall test the first section of pipeline as soon as it is installed to demonstrate that the work conforms to these specifications. The initial section shall not be less than five hundred (500) feet and not more than one thousand (1000) feet of pipeline. Testing of pipe shall closely follow pipe laying.

For all sewer pipe tests, the L.U.I. shall furnish an air or water test pump, an air or water meter, and suitable pressure gauge. The L.U.I. shall also furnish all labor and materials required to install suitable temporary testing plugs or caps for the pipeline and perform the test. The meter and gauge shall be installed by the L.U.I. in such a manner that all air or water entering the section under the test will be measured and the pressure in the section indicated and they shall be kept in use throughout all tests.

The scheduling of deflection and pressure and leakage tests shall be as approved and attended by the Town of Chatham's Sewer Department or Town Inspector.

Before accepting any sewer segment, the L.U.I. shall provide a television tape of the entire sewer including point of connection an existing sewer or pumping station. Television inspection shall be performed by a firm specializing in this work and shall produce the following information:

2. A continuous videotape recording of the entire length of pipe being inspected. The tape shall include location of each section, direction of camera travel, a commentary of the pipe's condition, and various irregularities found and lateral connections.

3. The section of pipe being televised shall be identified at least once every 50 ft.

4. Documentation on television logs and voice recorded on tape shall consist of the following information:

    a. Distance from the numbered manhole point of beginning on each sewer section to the location of the specific condition being inspected.
    b. Angular orientation of all above conditions inside pipe (i.e., leak at 10:00, service connection at 3:00).
    c. Sewer size, material, and joint spacing.

B. Deflection

Deflection tests shall be performed on all flexible pipes. The tests shall be conducted after the final backfill has been in place at least 30 days to permit stabilization of the pipe system.

No pipe shall exceed a deflection of 5 percent. If deflection exceeds 5 percent , the pipe shall be replaced.

The rigid ball or mandrel used for the deflection test shall have a diameter of not less than 95 percent of the base inside diameter or the average inside diameter of the pipe as specified by ASTM D 2122 Standard Test Method of Determining Dimensions of Thermoplastic Pipe and Fittings. The tests shall be performed without mechanical pulling devices.

C. Air Testing:

The Town requires air testing in lieu of the exfiltration or infiltration tests. The L.U.I. shall submit his proposed method of air testing to the Director for approval. All air testing shall be performed in accordance with the procedures described in ASTM C828-86 for Clay Pipe or ASTM C924 for or Concrete Pipe or those procedures approved by the Director, and shall be specifically designed and manufactured for testing pipelines with low-pressure air and shall be provided with an air regulator valve or air safety valve set to prevent the air pressure in the pipeline from exceeding ten (10) psi. If the results of the air test are unsatisfactory, the L.U.I. shall repair the sewer pipe and perform the air tests until the sewer pipe passes the air test. If site conditions are not conducive to air test, as determined by the Director, the L.U.I. will be required to perform an exfiltration and/or an infiltration test as outlined below.

Low pressure air tests shall conform to ASTM Specification C 828. All sections to be tested shall be cleaned and flushed, and shall have been backfilled, prior to testing.

Air shall be added until the internal pressure of the test section is raised to approximately 4.0 PSIG. The air pressure test shall be based on the time, measured in seconds, for the air pressure to drop from 3.5 PSIG. Acceptance is based on limits tabulated in the "Specification Time Required for a 1.0 PSIG Pressure Drop" in the Uni-Bell PVC Pipe Association "Recommended Practice For Low-Pressure Air Testing of Installed Sewer Pipe".

Before pressure is applied to the line all connections shall be firmly plugged. Before the test period starts, the air shall be given sufficient time to cool to ambient temperature in the test section.

If the test section is below groundwater, the test pressure shall be increased by an amount sufficient to compensate for groundwater hydrostatic pressure, however, the test pressure shall not exceed 10 PSI.

The pressure test gauge shall have been recently calibrated, and a copy of the calibration results shall be made available to the Director prior to testing.

Exfiltration Test:

If for any reason, approved by the Director, air testing cannot be performed, the Director shall require exfiltration testing. Leakage tests by exfiltration shall be made before or after backfilling at the discretion and under the supervision of the Town Inspector. The length of pipe to be tested shall not exceed 1,000 feet and be such that the head over the crown at the upstream pipe is not less than two (2) feet and the head over the downstream pipe crown is not more than six (6) feet. The pipe shall be plugged, by pneumatic bags or mechanical plugs, in such a manner that the air can be released from the pipe while it is being filled with water. Before any measurements are made, the pipe shall be kept full of water long enough to allow absorption of water and the escape of any trapped air. Following this, a test period of at least two hours shall begin. Provisions shall be made for measuring the amount of water required to maintain the water at a constant level during the minimum two (2) hours test period. If any joint shows an appreciable amount of leakage, the joining material shall be removed and replaced. If the water required to maintain a constant level in the pipe does not exceed twenty-five (25) gallons per nominal diameter, in inches, per 24 hours per mile of pipe and if all leakage is not confined to a few joints, workmanship shall be considered satisfactory. If the amount of leakage indicates defective joints or broken pipes, they shall be corrected or replaced.

Infiltration Test:

If for any reason, approved by the Director, air testing and exfiltration testing cannot be performed, the Director shall require infiltration testing be performed. Pipe shall be tested for infiltration after backfill has been placed and the ground water allowed to return to normal elevation. Infiltration tests shall be made only under the supervision of the Town Inspector, and the length of line to be tested shall be not less

than the length between adjacent manholes and not more than the total length or each size pipe and shall not exceed 1000 feet. The allowable infiltration shall be twenty-five (25) gallons per nominal diameter, in inches, per 24 hours per mile of pipe in each section tested as determined by means of V-Notch weirs, pipe spigots, or by plugs in the end of the pipe to be furnished and installed by the L.U.I., in an approved manner, and at such times and locations as may be directed by the Town Inspector.

There shall be no gushing or spurting leaks. If an inspection of the completed sewer or any part thereof shows pipes or joints which allow noticeable infiltration of water, the defective work or material shall be replaced or repaired.

Section 18. Sewer Force Main Testing:

The sewer force main pipe shall be given pressure and leakage tests in sections of approved length as approved by the Director. For these tests, the L.U.I. shall furnish a water test pump, water meter, and a pressure gauge. The L.U.I. shall also furnish all labor and equipment to install suitable temporary testing plugs or caps for the pipeline and to perform the tests. The meter and gauge shall be installed by the L.U.I. in such a manner that all water entering the section under the test will be measured and the pressure in the section indicated and they shall be kept in use throughout all tests.

The scheduling of pressure and leakage tests shall be as approved and attended by the Town Inspector.

The section of pipe to be tested shall be filled with water by pumping water into it and opening the air release valves and expelling all air from the pipe. If air release assemblies are not available at high points for releasing air, the L.U.I. shall perform: all excavation(s); make the necessary tap(s) at such highpoint(s); plug said holes of the tapping saddles after completion of the test with brass or bronze plug(s); and backfill the excavation(s).

The L.U.I. shall make a leakage test by metering the flow of water into the pipe while maintaining (in the section being tested) a pressure equal to 1.5 times the highest pressure to which the pipe will be subjected under normal conditions of service or 150 psi, whichever is greater. This shall be done by placing the section under pressure by pumping.

The lengths of joint to be used in determining the allowable leakage shall be based on the nominal diameter of the pipe. The allowable leakage shall be less than 11.65 gallons per inch diameter per day per mile of force main tested, maintaining a pressure within 5 psi for a minimum of two (2) hours duration. If the section shall fail to pass the pressure test, the L.U.I. shall locate and repair or replace the defective pipe, fitting, or joint, at the L.U.i.'s own expense.

If, in the judgment of the Director, it is impracticable to follow the foregoing procedure exactly, modifications in the procedures may be made if approved by the Director, but in any event the L.U.I. shall be responsible for the ultimate tightness of the line within the above leakage requirements with no allowances for leakage from valves.

Section 19. Low Pressure Sewer Testing:

The sewer low pressure pipe shall be given pressure and leakage tests in sections of approved length as approved by the Director. For these tests, the L.U.I. shall furnish a water test pump, water meter, and suitable pressure gage. The L.U.I. shall also furnish all labor and equipment required to install suitable temporary testing plugs or caps for the pipeline and perform the test. The meter and gage shall be installed by the L.U.I. in such a manner that all water entering the section under the test will be measured and the pressure in the section indicated and they shall be kept in use throughout all tests.

The scheduling of pressure and leakage tests shall be as approved and attended by the Town Inspector.

The section of pipe to be tested shall be filled with water by pumping water into it and opening the air release valves and expelling all air from the pipe. If air release assemblies are not available at high points for releasing air, the L.U.I. shall perform: all excavation(s); make necessary tap(s) at such highpoint(s); plug said holes of the tapping saddles after completion of the test with brass or bronze plug(s); and backfill the excavation(s).

The L.U.I. shall make a leakage test by metering the flow of water into the pipe while maintaining (in the section being tested) a pressure equal to 1.5 times the highest pressure to which the pipe will be subjected under normal conditions of service or 150 psi whichever is greater. This shall be done by placing the section under pressure by pumping.

The lengths of joint to be used in determining the allowable leakage shall be based on the nominal diameter or the pipe. The allowable leakage shall be less than 11.65 gallons per inch diameter per day per mile of pipe tested, maintaining a pressure within 5 psi for a minimum of two (2) hours duration. If the section shall fail to pass the pressure test, the L.U.I. shall locate and repair or replace the defective pipe, fitting, or joint at the L.U.I.'s own expense.

If, in the judgment of the Director, it is impracticable to follow the foregoing procedure exactly, modifications in the procedures may be made if approved by the Director, but in any event the L.U.I. shall be responsible for the ultimate tightness of the line within the above leakage requirements with no allowances for leakage from valves.

Section 20. Cleaning Sewer Lines:

At the conclusion of the work, the L.U.I. shall thoroughly clean all pipelines by washing with water or other means to remove all dirt, stones, pieces of wood, or other material which may have entered the pipes during the construction period. Debris cleaned from the lines shall be removed from the low end of the pipeline by installing a screening device that will prevent any debris from entering the public sewer system or a section of the sewer works already approved. If after this cleaning, obstructions remain, they shall be removed. After the pipelines are cleaned and if the groundwater level is above the pipe or following a heavy rain, the Town Inspector will examine the pipes for leaks. If any defective pipes or joints are discovered, they shall be repaired or replaced as directed by the Town Inspector.

Section 21. Sewer Manhole Leakage Tests:

Leakage tests shall be made and observed by the Town Inspector on each manhole. The test shall be the exfiltration test or vacuum test as described below:

For these tests, the L.U.I. shall furnish an air or water test pump, an air or water meter, and suitable pressure gage. The L.U.I. shall also furnish all labor and materials required to install suitable temporary testing plugs or caps for the pipeline, and perform the test. The meter and gage shall be installed by the L.U.I. in such a manner that all air or water entering the manhole under the test will be measured and the pressure in the manhole indicated and they shall be kept in use throughout all tests.

After the manhole has been assembled in place, all lifting holes and exterior joints surface shall be filled and pointed with an approved non-shrinking mortar. The test shall be made prior to placing the shelf and invert and before filling and pointing the interior horizontal joints. If the groundwater table has been allowed to rise above the bottom of the manhole, it shall be lowered for the duration of the test. All pipes and other openings into the manhole shall be suitable plugged and the plugs braced to prevent blow out.

Exfiltration Testing:

The manhole shall then be filled with water to the top of the cone section. If the excavation has not been backfilled and observation indicates no visible leakage that is, no water visible moving down the outside surface of the manhole, the manhole may be considered to be satisfactory water-tight. If the test, as described is unsatisfactory, as determined by the Town Inspector or if the manhole excavation has been backfilled, the test shall be continued. A period of time may be permitted, if the Contractor so wishes, to allow for absorption. At the end of this period the manhole shall be refilled to the top of the cone and the measuring time of at least two (2) hours shall begin. This amount shall be extrapolated to a 24 hour rate and the leakage determined on the basis of depth. The leakage for each manhole shall not exceed one (1) gallon per vertical foot per day, a twenty-four (24) hour period shall equal one day. If the manhole fails this requirement, but the leakage does not exceed three (3) gallons per vertical foot per day, repairs by approved methods may be directed by the Town Inspector to bring the leakage within the allowable rate of one (1) gallon per foot per day. Leakage due to a defective section or joint or exceeding the three (3) gallon vertical foot per day, shall be the cause for the rejection of the manhole. It shall be the L.U.I.'s responsibility to uncover the manhole, as necessary, and to disassemble, reconstruct, or replace it as directed by the Town Inspector. The manhole shall then be retested and, if satisfactory, interior joints shall be filled and pointed and the invert constructed.

No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorptions, etc., it will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete. Furthermore, the L.U.I. shall take any steps necessary to assure the Town Inspector that the water table is below the bottom of the manhole throughout the test.

If the groundwater table is above the highest joint in the manhole, and there is no leakage into the manhole, as determined by the Town Inspector, such a test can be used to evaluate the water-tightness of the manhole. However, if the Town Inspector is not satisfied, the Contractor shall lower the water table and carry out the test as described hereinbefore.

Vacuum Testing:

The vacuum test shall be based on the time, measured in seconds, for the vacuum to decrease from 10 inches of mercury to 9 inches of mercury for manholes.

Acceptance of manholes is based on the following:

Manhole	Manhole Diameter	Time to Drop 1" Hg (10" to 9")
10 ft or less	4 ft	120 seconds
10 ft to 15 ft	4 ft	150 seconds
15 ft to 25 ft	4 ft	180 seconds

NOTE: For 5 ft diameter manholes, add 30 seconds to the times above.
For 6ft diameter manholes, add 60 seconds to the times above.

The vacuum test gauge shall have been recently calibrated, and a copy of the calibration results shall be made available to the Director prior to testing.

If the test on the manhole fails (the allowable gallons or the time is less than that tabulated above), necessary repairs shall be made and the vacuum test repeated, until the manhole passes the test.

Section 22. Manhole Cleaning

All new manholes shall be thoroughly cleaned of all silt, debris and foreign matter of any kind, prior to final inspection.