

Design Standards of the City of Bremen

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Section I: Purpose

An ordinance of the City of Bremen, Georgia, establishing rules and regulations governing the subdivision of land into streets, blocks, and lots; requiring the preparation and presentation for Subdivision Plans and Plats; establishing minimum subdivision design standards; requiring street improvements and the installation of utilities as a condition of plat approval, defining terms, establishing procedures; providing penalties for violation; repealing conflicting resolutions; and for other related purposes.

A: Preamble and Enactment Clause

Pursuant to the mayor and Council of the City of Bremen do hereby resolve to enact this Ordinance for the following purposes:

- 1) To encourage the development of an economically sound and stable city;
- 2) To assure the provision of required streets, utilities, fire protection and other facilities and services in the new land development;
- 3) To assure the adequate provision of safe and convenient traffic access and circulation, both vehicular and pedestrian, in new developments;
- 4) To assure, in general the wise development plans of new areas in harmony with the development plans of the City of Bremen.

B: Short Title

This resolution shall be known and may be cited as "Design Standards of the City of Bremen, Georgia."

Section II: Definitions

A: Customary Dictionary Definitions

Except as specifically defined herein, all words in this resolution have their customary dictionary definitions as used in 2006.

B: General Definitions

- 1) Words in the present tense include the future tense. Words in the singular include the plural, and words in the plural include the singular.
- 2) The word "shall" is always mandatory and never discretionary.
- 3) The word "person" includes individuals, firms, partnerships, corporations, associations, governmental bodies and all other legal entities.
- 4) The word "street" includes streets, avenues, boulevards, roads highways, expressways, lanes, alleys and other vehicular ways.

C: Specific Definitions

- 1) "City Engineer". The term "City Engineer" as used herein includes the Office of the City Engineer and Public works as such, may include other designated city representative. The city engineer primary responsibilities are to ensure that the minimum design standards and specifications of the City of Bremen are followed by all developments; and that the proposed developments are in compliance with all State and Federal mandated regulations.
- 2) "City Planner". The term "City Planner as used herein includes the Office of the city planner, and as such, may include Building Inspectors and code enforcement or other designated city representatives. The city planner primary responsibilities are to ensure that the zoning ordinance, subdivision regulations, and other pertinent ordinances are followed by developers, and property owners. The City Planner coordinates with other city departments and is responsible for issuing all permits within the City of Bremen, unless other city representatives are authorized.
- 3) "Common Walk" or "Sidewalk". A right-of-way, dedicated to common use, with paved sidewalks, providing pedestrian access between dwelling units and such common use facilities as schools, parking lots, shopping centers, recreation areas and other community facilities.
- 4) "Land Subdivision". All divisions of a tract or parcel of land into two (2) or more lots, building sites or other divisions for the purpose of development, whether immediate or future; including all divisions of land involving a new street to which the public has access or a change in a existing street, including any resubdividing and where appropriate to the context, relates to the process of subdividing or to the land or area subdivided; provided, however, that the following are not included within this definition: The combination or recombination of portions of previously platted lots where the total number of lots is not increased and resultant lots equal to the standards of these regulations; The division of land into parcels of five (5) acres or more where no new street is involved.
- 5) "Lot". A developed or undeveloped tract of land in one ownership, legally transferable as a single unit of land.
- 6) "Lot of Record". A lot which is part of a subdivision or lot, which has been recorded in the Office of the Clerk of the Superior Court of appropriate jurisdiction; or a parcel of land, that has a deed description which has been recorded in the Office of the Clerk of the Superior Court of appropriate jurisdiction.
- 7) "Lot, Substandard" any lot existing at the time of adoption of this Ordinance, which has an area or a width which is less than required by this Ordinance, and is subject to the following exceptions and modifications:
 - a) Adjoining lots in same ownership when two (2) or more adjoining and vacant lots within a non-approved development with continuous frontage are in a single ownership at the time of application and such lots have a frontage or lot area less than is required by the district in which they are located, such lots

- must be replatted so as to create one or more lots which conform to the minimum frontage and yard requirements of the district;
- b) Single lot when a lot has an area or frontage which does not conform with the requirements of the district in which it is located, but was a lot at the effective date of this ordinance, such a lot may be used for any use allowed in the zoning district in which it is located as long as all other requirements of this Ordinance are met.
 - 8) "Lot. Through or Double-Frontage". A lot having frontage on two (2) streets that are approximately parallel.
 - 9) "Maintenance Bond" A maintenance bond is a bond issued to assure that all infrastructure and street improvements are in good condition at the time of public dedication. The bond's primary function is to assure that all repairs are made to the subdivision's infrastructure, due to damage caused during construction or other associated construction in the development and assure that the public incurs minimum, if any cost; associated with or as a result of a subdivision development. The maintenance bond is executed only if the developer refuses to make proper corrective action.
 - 10) "Street". Any publicly maintained way for vehicular traffic which has been accepted for maintenance as a street by the City of Bremen. For the purposes of this resolution, streets are divided into the following categories:
 - a) "Major Thoroughfare" - a principle arterial highway carrying through traffic, and is intersected by collector streets as designated as such on the Transportation Plan of the City of Bremen.
 - b) "Minor Thoroughfare" or "Collector Street" - A principle street carrying traffic that provides access to intersecting local streets. The collector street intersects a major thoroughfare and is designated as such on the Transportation Plan of the City of Bremen
 - c) "Local Street" - A street used primarily for access to abutting properties that has a terminal point or intersects a collector street.
 - d) "Industrial Street" - A street serving primarily industrial developments.
 - e) "Alley" - A minor vehicular way providing service access to the back or sides of properties abutting a street.
 - f) "Cul-de-sac" - A local street with only one outlet, sometimes called a "dead-end" street.
 - g) "Marginal Access Street" - a local street parallel and adjacent to a major thoroughfare, expressway, limited access highway or railroad right-of-way, which provides access to abutting properties.
 - 11) "Subdivider". The person having sufficient proprietary interest in the land being subdivided, and who will have the authority and responsibility in the subdivision procedures to subdivide such land under these subdivision regulations, or the authorized agent of that person for the purpose of such proceedings.
 - 12) "Subdivision Regulations". The Land Subdivision Regulations of the City of Bremen, Georgia.
 - 13) "Planning Commission". The Planning and Zoning Commission of the City of Bremen, Georgia.

- 14) "Open Space". The term open space or common open space includes areas used for recreation, parks, and other public uses. When an open space is contained in a floodplain, no earth fill shall be allowed or building erected. Landscaping, natural trails and other passive improvements and uses are permitted.
- 15) "Infrastructure" The term "Infrastructure" shall include all of the following improvements: Roadway, water, sanitary, gas, cable tv, electric, storm water management facilities and other Right-of-way improvements when applicable.
- 16) "Buffer Zone Improvements" The term "buffer zone improvements" shall mean any improvements deemed necessary by the Planning Commission or when a landscape plan is presented by the developer or owner to aesthetically enhance a required buffer zone.

Section III: Block, Lot, and Right-of-Way Requirements

- 1) Block and Widths - Block lengths and widths shall be as follows:
 - a) Blocks shall be not greater than eighteen hundred (1800) feet or less than four hundred (400) feet in length.
 - b) Blocks shall be wide enough to provide two (2) tiers of lots of minimum depth. Perimeter lots of greater than minimum depth may be required when abutting upon limited access highways, major thoroughfares, expressways or railroads in order to provide adequate buffering.
 - c) Common walks within a right-of-way of not less than ten (10) feet may be required across blocks, if deemed essential by the Planning Commission, to provide adequate circulation between dwelling units or access to schools, playgrounds, shopping centers, parking lots or other community facilities.
 - d) Where a subdivision is traversed by a watercourse, drainage way, natural channel or stream, an undisturbed natural vegetative buffer shall be provided, at a minimum of twenty-five (25) feet, as measured from the top of the stream bank. All such buffers shall conform substantially to the limits of such watercourse plus any additional widths as necessary to accommodate future construction, as mandated by Carroll County's Code Enforcement Department which is certified by the Environmental Protection Department. Parallel streets may be required by the Planning Commission in connection with the above buffer.
- 2) Lot Sizes - The following lot size requirements shall be met:
 - a) Residential and nonresidential lots shall conform to the minimum dimensions and area requirements of the Zoning Ordinance of the City of Bremen (See Table of Area, Yard, and Height Requirements).
 - b) Any lot which is to be served by an individual septic tank shall a minimum size as determined by the Zoning Ordinance of the City of Bremen (See Minimum lot size for residential septic tank) and have an area as recommended by the appropriate county Health Department.
 - c) Commercial and Industrial lots shall be of adequate size to provide for the intended use and for the yards, the buffer areas and the off-street parking and loading and unloading requirements, of the Zoning Ordinance.

- 3) Lot Lines
 - a) All lot lines shall be perpendicular or radial to the street lines unless not practicable because of topographic or other natural feature.
- 4) Front Yard Setback Lines
 - a) A line meeting the front yard setback requirements of the City of Bremen's Zoning Ordinance shall be established on all lots.
- 5) Lots Abutting Public Streets
 - a) Each lot shall abut upon a publicly dedicated and maintained street.
- 6) Through or Double Frontage Lots
 - a) Through or double frontage lots shall be avoided except where essential to provide separation of residential development from traffic arteries or to overcome specific disadvantages of topography.
 - b) A buffer strip at least fifteen (15) feet wide and planted with evergreen trees and shrubs that grow at least eight (8) feet tall and provide an effective visual screen, with no right of access shall be required along the portion of a lot abutting such a traffic artery or other incompatible use.
- 7) Continuation of Existing Streets
 - a) Extension of existing streets shall be continued at the same or greater widths, but in no case less than the minimum width specified in this Ordinance.
- 8) Local Streets in a Subdivision
 - a) Local streets in a subdivision shall be so designed that their use by through traffic will be discouraged, but large enough to adequately be serviced by local fire rescue vehicle.
- 9) Street Intersections
 - a) Street intersections shall be as nearly at right angles as possible. No street intersection shall be at an angle less than sixty (60) degrees, unless required by an unusual circumstance and approved by the Planning Commission.
- 10) Right-of-Way Intersection Radius
 - a) The right-of-way intersection radius at street intersections shall be at least twenty-five (25) feet. Where the angle of the street intersection is less than ninety (90) degrees a larger radius may be required.
- 11) Street Jogs
 - a) Street jogs with the centerline offsets of less than one hundred-fifty (150) feet shall not be permitted.
- 12) Cul-de-sacs
 - a) Except where topographic or other condition make a greater length unavoidable or where the total number of lots or dwelling units fronting on the cul-de-sac street is less than twelve (12), the cul-de-sac streets shall not be greater than two-thousand (2,000) feet in length. They shall be provided at the closed end with a turnaround having a right-of-way diameter of at least one hundred (100) feet and a paved turnaround area with a minimum outside diameter of eighty (80) feet.
- 13) Temporary Cul-de-sacs
 - a) Temporary cul-de-sacs may be platted if deemed desirable by the City Engineer and Planner where the land adjoins property not subdivided. Such

temporary cul-de-sacs shall meet the requirements on Cul-de-sacs in this Ordinance.

- 14) Continuation of a Street on Adjoining Property that is Terminated by a Temporary Cul-de-sac
 - a) If adjoining property contains a street that is terminated by a temporary cul-de-sac. The subdivision plat shall provide for a continuation of this street on the property being developed.
- 15) Development Along a Major Thoroughfare, Limited Access Highway, Expressway or Railroad Right-of-Way
 - a) Where a subdivision abuts or contains a major thoroughfare; a limited access highway, an expressway or railroad right-of-way, the Planning Commission may require that a street approximately parallel to and on each side of such right-of-way and/or a non-access reservation strip of suitably planted material be used as a buffer zone. Lots shall have no access to a limited access highway, but only to the access streets.
- 16) Street Names
 - a) Streets that are obviously in alignment with existing streets shall be given the name of the existing Street. Names of new streets are subject to approval and shall not duplicate nor closely resemble or approximate those of existing streets.

Section IV: Water

A: Design Standards – Water

- 1) Minimum Water Line Size
 - a) Main ----- 8 inches
 - b) Service ----- $\frac{3}{4}$ inch
- 2) Minimum Flow Requirements
 - a) Residential Service ----- 2 gpm
 - b) Residential Fire Flow ----- 750 gpm
 - c) Commercial Fire Flow ----- 1000 gpm
- 3) Pressures for Residential Service
 - a) Minimum Pressure ----- 20 psi
 - b) Maximum Pressure ----- 150 psi
- 4) Distribution System Design
 - a) The water distribution system shall be designed to supply the minimum flow requirements to all points in the development. Subdividers shall obtain, at their own expense, a flow test from an approved contractor for each development involving water infrastructure or fire protection construction. Interconnections between existing water mains and new water mains are desirable. The flow test shall be monitored by the designated city inspector, to be scheduled no sooner than 72 hours after requested. Every effort is to be made to avoid “dead end” lines. Existing water mains that will not flow quantities sufficient to meet the requirements of the development shall be upsized by the subdivider. For the purpose of future loops in the system the

City may require the subdivider to extend the water mains to the edge of the property being developed. The City may require the subdivider to lay water mains outside the public right-of-way to loop the distribution system or avoid "dead end" lines.

- 5) Design Period
 - a) Water mains shall be designed to last for a period of 100 years. Special consideration shall be given to the future ultimate development of the area in which the development is located.
- 6) Water Line Location & Cover
 - a) Whenever possible the water main shall be located in the south or west corridor of the street or highway. When streets or highways are curbed the water main shall be located 5 feet behind the curb. When the streets or highways are shoulder the water main shall be located as approved by the City but no closer than 5 feet from the back of the right-of-way. Water mains shall be installed such that the minimum standard depth of cover is 4 feet and the maximum standard depth of cover is 5 feet.
- 7) Hydrant Locations & Venting of Mains
 - a) The maximum distance between fire hydrants shall be as follows or as required by the Fire Department:
 - (1) Residential ----- 500 feet
 - (2) Commercial or Industrial ----- 400 feet
 - b) Fire hydrants shall be located to allow the main to be vented to remove gaseous fluids and bleed to remove solids. Blow-offs will no longer be installed in the City's water distributions system.
- 8) Water Main Valving
 - a) Main line valves shall be located every 1000 feet for 12 inch and smaller mains and every 2000 feet for 16 inch and larger lines. These distances may be adjusted by the City if area grid work requires adjustment for proper hydraulic operation of the system. Whenever possible, valves should be located at intersections, near fire hydrants or other interconnection points in the system. Valves should always be in locations that can be conveniently accessed and never in paved areas. Three or four way valves will be installed at cross roads.
- 9) Backflow Prevention is required on every private connection regardless of tap size.
- 10) Design Period
 - a) 50 Years
- 11) Service Lines Beneath Pavements
 - a) PVC casing shall be required for all water service lines beneath paved surfaces in new residential and commercial subdivisions. The minimum casing size for residential service lines is 2-inch. The minimum casing size for commercial service lines is 4-inch, or greater is the city deems necessary.
- 12) Construction material and installation shall be in accordance with the current City specifications.

- 13) When a proposed development will abut an existing development, the subdivider will be required to interconnect the existing line with the proposed development. Every effort will be made to avoid "dead end" line configurations. For the purpose of future loops in the system, the City may, at its sole discretion, require the developer to extend the water main to the edge of his property or pay a fee to the City for this extension in the future. The fee will be based on a reasonable and customary estimate by the City and shall also be accompanied by all necessary easements.
- 14) The City, in its sole discretion, may require the subdivider to lay water lines outside the public right-of-way in its efforts to loop the water distribution system and minimize "dead end" line configurations (e.g., cul de sacs) within the bounds of the development.
- 15) The City may at its discretion reduce the minimum ground cover of a water line from 4.0 ft. to 2.5 ft. on a case-by-case basis depending on the quantity of rock encountered.
- 16) The City, in its sole discretion, may require the plans to include details of any and all elements of the design not covered by these specifications. A Professional Engineer registered in the State of Georgia shall certify all such details.
- 17) In order to facilitate future extension of the potable water distribution system, the City, in its sole discretion, may require the owner/developer to provide an easement through the property or extend an easement to the edge of the project property line.
- 18) In order to limit highway water line crossings, the City reserves the right to prohibit alongside bore water service for roadways that are 3 lanes (36 feet) or wider. If alongside bores are prohibited, water service must be obtained by extending the water line on the development's side of the roadway.
- 19) The Georgia EPD's MINIMUM STANDARDS FOR PUBLIC WATER SYSTEMS are included by reference in these Design Standards for Water.

B: Information To Be Shown On Plans – Water

- 1) Project name and valid registration stamp of the Professional Engineer registered in the State of Georgia. The stamp and signature of registered land surveyors or landscape architects are not acceptable. The registered Professional Engineer must also stamp any plan redesign. The registered Professional Engineer must sign across the stamp.
- 2) All construction drawings submitted to the City for review shall be professionally printed (AutoCad format or approved equal). Hand written notes are not acceptable and will not be reviewed.
- 3) Site plans should include street, street names, lot layout (if subdivision) or building locations (if multi-family, commercial or industrial), land lots and district, north arrow, water layout only.
- 4) Detailed plans of the location and the construction of water mains, valves, fire hydrants, and appurtenances.
- 5) Limits of the 100 year flood plain.

- 6) Location and size of water meters. For commercial subdivisions where lot use is unknown, meter size and location are not required.
- 7) Thrust blocks at all bends and tees. Thrust blocks shall be designed by a registered Professional Engineer licensed in the State of Georgia.
- 8) Type of material to be used.
- 9) Location and size of existing water lines surrounding the project.
- 10) Nearest existing line valves on the main.
- 11) Other utilities in area of potential conflict.
- 12) Existing ground elevation.
- 13) Proposed tie-in with existing lines.
- 14) Pressure-flow test results, development water demand and fire flow requirements.
- 15) Twenty-foot permanent easements are required where the water line crosses private property. More easement area may be required as deemed necessary by the City.
- 16) Plan and profile scales shall be:
 - a) Vertical: 1 inch = 5 feet or 1 inch = 10 feet
 - b) Horizontal: 1 inch = 20 feet or 1 inch = 50 feet
- 17) Sheet size is 24 inches x 36 inches. "Half-size" drawing sets will not be reviewed and will be returned to the engineer.
- 18) A general site location map shall be shown on the title sheet or first page.
- 19) All flood related information shown on the plans shall be as determined by a step-backwater analysis performed by a Professional Engineer licensed in the State of Georgia.
- 20) The following notes shall be required on all drawings submitted to the City:
 - a) All infrastructure construction shall conform to the City of Bremen's Land Subdivision Regulations, latest edition.
 - b) Notify the City Manager's Office at least 72 hours prior to beginning of construction on water and sewer. An inspector will be assigned and a pre-construction meeting scheduled at this time.
 - c) "As-Built" drawings shall be field verified and stamped by a registered Professional Engineer or land surveyor, licensed in the State of Georgia.
 - d) All contractors for water and sewer construction shall be on the City's Approved Contractors List. Contact the City Manager's Office for a copy of the List and/or applications.
 - e) Contractors have the responsibility to assure erosion control of sewer easements, particularly when sewer easements are in close proximity of drainage easements. See the assigned City inspector for details.
 - f) The contractor shall comply with all Utilities Protection Center requirements.
- 21) Appropriate details from the City's regulations shall be included in the plans.
- 22) Other details as necessary to convey the details and specifications of the design shall be included as necessary.
- 23) Additional items may be requested if deemed necessary by the City.

Section V: Sewer

A: Design Standards – Sewer

- 1) Minimum sewer size
 - a) Collector -----8 inches
 - b) Service -----6 inches
 - c) Force Main -----6 inches DIP
- 2) Design period -----50 years (per EPA)
- 3) Minimum sewer line slope: -----0.40%
- 4) Maximum sewer line slope:
 - a) Ductile Iron Pipe Requirements
 - (1) Slope < 10% ---- No special requirements.
 - (2) Slope 10% - 15% ---- Concrete collar required at the downstream manhole.
 - (3) Slope >15% - <25% ---- Concrete collar at every joint or Concrete collar at the downstream manhole and a certified compaction test*
 - (4) Slope >25% ---- Unacceptable
 - b) PVC Pipe Requirements
 - (1) Slope < 10% ---- No special requirements.
 - (2) Slope 10% - 20% ---- Concrete collar at every joint or concrete collar at downstream manhole and a certified compaction test*
 - (3) Slope >20% ---- Unacceptable
 - c) **Note:** All compaction tests must be performed and certified by a soil scientist or Professional Engineer registered in the State of Georgia and shall be to 95% standard Proctor compaction test (ASTM D 698). The number of tests required shall be based on field conditions as determined by the City inspector.
- 5) Flow Quantity and Parameters for Design Calculations
 - a) Detached Single Family Residence ---- 400 gpd per lot
 - b) Multi-Family Residence ---- 250 gpd per unit
 - c) Peak Factor ---- 2.5
 - d) **Note:** At peak flow, pipes shall flow no more than 25% depth with respect to pipe diameter. For example, an 8-inch gravity sewer line shall be designed such that depth at peak flow conditions does not exceed 2-inches.
- 6) Minimum Manning's "n" Factor .013
- 7) A sewer flow calculation table similar to the following shall be included with the plans:

Sewer Line I.D.	Number of Lots Falling to Line or Comm. Disch.	Average Daily Flow (ADF) @ 400 GPD per Lot	Peak Flow @ 2.5 x ADF	Sewer Line Size, Nom. Inches	Minimum Allowable Slope per City Standards	Minimum Proposed Sewer Line Slope

- 8) Velocity Requirements
 - a) Force Main
 - (1) Minimum ---- 2.0 fps
 - (2) Maximum ---- 10.0 fps
 - b) Gravity Sewer
 - (1) Minimum ---- 2.0 fps
 - (2) Maximum ---- 15.0 fps
 - c) Where velocities in gravity sewer lines greater than 15 fps are attained, the City, in its sole discretion, may require special provisions to protect against displacement by erosion and impact. Drop manholes and/or steel erosion plates can be constructed to reduce high flow velocities.
- 9) Infiltration Allowance ---- 50 gpd/in. Dia./Mile
- 10) Maximum distance between manholes ---- 300 feet
- 11) Sewer lines shall be located in the centerline of road rights-of-way, if possible.
- 12) Minimum ground cover shall not be less than 6 feet when possible.
- 13) Service lines stub-outs shall be plugged or capped with leak proof plugs or caps as manufactured by ETCO, Inc. or equal and the locations of each service shall be identified by station on the "As-Built" drawings.
- 14) Construction material and installation shall be in accordance with the current City construction specifications.
- 15) A horizontal separation of at least 10 feet must be maintained between the water main and the existing or proposed sewer. Explicit approval is required to reduce horizontal separation to less than the minimum standard referenced above. When water mains cross sewers, a minimum vertical separation of 18 inches must be provided between the two pipes (measured edge to edge). At crossings, one full length of water pipe must be located so that both joints are as far from the sewer as possible.
- 16) All sewers shall be designed to prevent damage from superimposed live, dead and frost induced loads. Proper allowances for loads on the sewer shall be made because of soil and potential ground water conditions, as well as the width and depth of the trench. The weight of soil above the sewer and the weight and buoyancy forces associated with the water must be taken into account.
- 17) DIP will be used on sewer lines with less than four feet of cover, greater than 13 feet of cover and all exposed sewer lines.
- 18) DIP or steel casing shall be used whenever storm water pipe overlays the sewer line.
- 19) DIP shall be used on sewer lines that cross streams and drainage ditches. Buried sewer lines beneath streams shall be encased in concrete a minimum of five feet beyond each stream bank.
- 20) Elevated sewer lines shall be DIP and supported by concrete pillars.
- 21) Buoyancy of sewers shall be considered in sewer design. The City, in its sole discretion, reserves the right to require additional soil cover and/or concrete

anchor blocks to prevent floatation of the pipe where high ground water conditions are anticipated.

- 22) Force mains shall be DIP.
- 23) All sanitary sewer service laterals at the easement line or right-of-way line shall be a minimum of two feet below any related finished floor elevation.
- 24) The subdividers of new subdivisions shall be required to install sewer laterals to all lots in sewerred subdivisions.
- 25) All sanitary sewer service laterals shall have a cleanout at the edge of the right of way.
- 26) Individual service laterals must serve only one dwelling. Under no circumstances shall two dwellings share the same public or private lateral.
- 27) Drainage from structures that could potentially cause infiltration or inflow (e.g., downspouts, swimming pools, garbage and trash receptacles, dumpsters, etc.) shall not connect to the sanitary sewer collection system.
- 28) The City, in its sole discretion, may require the plans to include details of any and all elements of the design not covered by these specifications. A Professional Engineer registered in the State of Georgia shall certify all such details.
- 29) In order to facilitate future extension of the sewer collection system, the City, in its sole discretion, may require the owner/developer to provide an easement through the property or extend the sewer line to the edge of the project property line.
- 30) All flood related information shown on the plans shall be as determined by a step-backwater analysis performed by a Professional Engineer licensed in the State of Georgia.
- 31) The standards commonly referred to as the "Ten State Standards" or the RECOMMENDED STANDARDS for WASTEWATER FACILITIES are included by reference in these Design Standards for Sewer.

B: Information To Be Shown On Plans – Sewer

- 1) Project name and valid registration stamp of the Professional Engineer registered in the State of Georgia competent in the design of sanitary sewer collection systems. A registered land surveyor is not acceptable. The registered Professional Engineer must stamp any plan redesigns. The registered Professional Engineer must sign across the stamp.
- 2) All construction drawings submitted to the City for review shall be professionally printed (AutoCad format or approved or equal). Hand written notes are not acceptable and will not be reviewed.
- 3) Proposed service area (acres) and the population that will be served by the project.
- 4) Total service area (acres) and the population that could ultimately be serviced by the project (i.e., include upstream users).
- 5) Existing and future sewage flow from upstream users based on existing land use, zoning (e.g., density per acre) and future use for 20-year period.

- 6) Site plan should include streets, street names, lot layout (if subdivision) or building locations (if multi-family, commercial or industrial), land lots and district, north arrow, sewer layout topography, streams, and storm drainage pipes.
- 7) 100 year flood plain.
- 8) Pipe location, size, flow direction, and grade.
- 9) Manhole location, size, identification, and elevation.
- 10) Service location, size, tracer peg location, and elevation.
- 11) Type of material to be used for pipe, manholes, etc.
- 12) Location and size of existing sewer lines within 1,000 feet of the project.
- 13) The nearest existing sanitary sewer manhole on existing sewer line.
- 14) Other utilities in areas of potential conflicts.
- 15) Existing ground elevation relative to proposed sewer line.
- 16) Proposed tie-in with existing lines.
- 17) Pressure-flow test results and development water demand.
- 18) Thrust blocks shall be designed by Professional Engineer licensed in the State of Georgia.
- 19) Twenty foot permanent easements if the sewer line crosses private property. No trees shall be planted within this easement. More easement area may be required as deemed necessary by the City.
- 20) Plan and profile scales shall be:
 - a) Vertical: One inch = 5 feet or 1 inch = 10 feet
 - b) Horizontal: One inch = 20 feet or 1 inch = 50 feet
- 21) Effect on existing or proposed pumping station produced by the proposed development. Lift stations must be shown on the drawings indicating recorded easements for roads, fences with gates and wash down potable water/backflow preventer, and telemetry system.
- 22) A recorded easement for further extending sewer lines in order not to impact neighboring property owners must be shown on all drawings.
- 23) Sheet size is 24 inches x 36 inches for all plans. "Half size" copies will not be reviewed and will be returned to the engineer or subdivider.
- 24) The following notes shall be required on all drawings submitted to the City:
 - a) All construction shall conform to City's regulations, latest edition.
 - b) Notify the City Manager's Office at least 72 hours prior to beginning of construction on water and sewer. An inspector will be assigned and a pre-construction meeting scheduled at this time.
 - c) "As-Built" drawings shall be field verified and stamped by a Professional Engineer or land surveyor licensed in the State of Georgia.
 - d) All contractors for water and sewer construction shall be on the City's Approved Contractors List. Contact the City Manager's Office for a copy of the List and/or applications.
 - e) Contractors have the responsibility to assure erosion control of sewer easements, particularly when sewer easements are in close proximity of drainage easements. See the assigned City inspector for details.

- f) The contractor shall comply with all Utilities Protection Center requirements.
- 25) Appropriate details from the City's regulations shall be included in the plans.
- 26) Other details as necessary to convey the details and specifications of the design shall be included as necessary.
- 27) Additional items may be requested if deemed necessary by the City.

Section VI: Stormwater

A: Design Standards – Stormwater

- 1) Minimum pipe size
 - a) Under Roads ---- 24 inch
 - b) Otherwise ---- 18 inch
- 2) Minimum pipe cover
 - a) Under Roads ---- 3 feet
 - b) Otherwise ---- 2 feet
- 3) Required Pipe Material
 - a) Under Roads ---- Reinforced Concrete or Ductile Iron
 - b) Otherwise ---- Reinforced Concrete, High Density Polyethylene, Ductile Iron, Bituminous Coated Hot-Dipped Galvanized Corrugated Steel, Aluminized Corrugated Steel, or Polyvinyl Chloride SDR-35
 - c) Concrete pipe shall be delivered in lengths of 8 feet or less. Corrugated pipe shall comply with Georgia D.O.T. thickness requirements. 42" – 48" corrugated steel pipe shall not be less than 14 gauge.
- 4) Minimum Slope ---- 0.50%
- 5) Maximum Slope:
 - a) Slopes < 10% ---- No special requirements.
 - b) Slopes 10% - 15% ---- Concrete collar required at the downstream manhole
 - c) Slopes >15% - <25% ---- Concrete collar at every joint or Concrete collar at the downstream manhole and a certified compaction test*
 - d) Slopes >25% ---- Unacceptable
 - e) **Note:** All compaction tests must be performed and certified by a soil scientist or Professional Engineer registered in the State of Georgia and shall be to 95% standard Proctor compaction test (ASTM D 698). The number of tests required shall be based on field conditions as determined by the CITY inspector.
- 6) Minimum Velocity ---- 2.5 feet per second for 2-year flow.
- 7) Outlets & Protection – Based on velocities for 100 year, 24 hour event
 - a) Velocities < 5 fps ---- Flared end section with well established vegetation at discharge of outlet section.
 - b) Velocities 5 fps – 10 fps ---- Flared end section with reinforced vegetation at discharge of outlet section or use permanent erosion control matting
 - c) Velocities > 10 fps ---- Headwall with structural protection such as riprap, slab, or baffles

- 8) Maximum Drop Inside Manhole ---- 10 feet
- 9) Hydrologic Methods
 - a) Hydrology design and runoff computations shall be based on the Georgia Stormwater Management Manual, Vol 2, latest edition.
 - (1) Modified Rational Method - Can be used to size culverts, pipes, channels, and detention structures that drain less than 25 acres.
 - (2) TR-55 Method - Shall be used for detention computations and to size culverts, pipes, and channels that drain 25 acres or more.
- 10) Predevelopment peak flows shall be based on unimproved natural conditions as stipulated in the Georgia Stormwater Management Manual.
- 11) Sizing Criteria
 - a) Pipes, channel, ditches, culverts, and any structure that conveys concentrated flow will be sized to convey the 100 year 24 hour storm peak flow.
 - b) Detention facilities will be sized to detain the 100 year 24 hour storm without an increase in runoff rates from pre-developed conditions.
- 12) Pollutant Removal
 - a) Water quality best management practices (BMP) must be installed to remove 80% of pollutants from the first 1.2 inches of rainfall. Total suspended solids (TSS) will be used as the primary indicator parameter. Turbidity may be used as a secondary indicator parameter with prior City approval. The City may require additional testing to demonstrate adequate removal of other pollutants of concern including but not limited to total petroleum hydrocarbons (TPH), heavy metals, or pesticides.
 - b) Acceptable BMPs include:
 - (1) Wet Retention Ponds
 - (2) Constructed Wetlands
 - (3) Bioretention Areas
 - (4) Sand Filters
 - (5) Infiltration Trenches
 - (6) Enhanced Swales
 - (7) Filter Strips
 - (8) Grassed Channels
 - (9) Submerged Gravel Wetlands
 - (10) Gravity Separators (Oil & Grit)
 - (11) Pervious Surfaces
 - (12) Hydrodynamic Devices
- 13) Best management practices not specified herein may be accepted by the City after thorough review of design details. A Professional Engineer registered in the State of Georgia shall certify all such details.
- 14) A detailed Stormwater Management Plan must be prepared and signed by a Professional Engineer registered in the State of Georgia. The study shall provide information on pre-developed and post-developed conditions and include computations to support the hydrology design. The plan shall also include post-construction performance of the permanent stormwater management system including structural, vegetative, and procedural controls.

B: Information To Be Shown On Plans – Stormwater

- 1) Project name and valid registration stamp of the Professional Engineer registered in the State of Georgia competent in the design of stormwater management systems. A registered land surveyor is not acceptable. The registered Professional Engineer must stamp any plan redesigns. The registered Professional Engineer must sign across the stamp.
- 2) All construction drawings submitted to the City for review shall be professionally printed (AutoCad format or approved or equal). Hand written notes are not acceptable and will not be reviewed.
- 3) Proposed service area (acres) and the population that will be served by the project.
- 4) Site plan should include streets, street names, lot layout (if subdivision) or building locations (if multi-family, commercial or industrial), land lots and district, north arrow, sewer layout topography, streams, and storm drainage pipes.
- 5) 100 year flood plain.
- 6) Pipe location, size, flow direction, and grade.
- 7) Manhole location, size, identification, and elevation.
- 8) Type of material to be used for pipe, manholes, etc.
- 9) Location and size of existing sewer lines within 1,000 feet of the project.
- 10) Other utilities in areas of potential conflicts. Proper separations per applicable standards shall be shown.
- 11) Existing ground elevation relative to proposed stormwater drain line.
- 12) Proposed tie-in with existing lines.
- 13) Twenty foot permanent easements if the stormwater drain line crosses private property. More easement area may be required as deemed necessary by the City.
- 14) Plan and profile scales shall be:
 - a) Vertical: One inch = 5 feet or 1 inch = 10 feet
 - b) Horizontal: One inch = 20 feet or 1 inch = 50 feet
- 15) A recorded easement for further extending stormwater drain lines in order not to impact neighboring property owners must be shown on all drawings.
- 16) Sheet size is 24 inches x 36 inches for all plans. "Half size" copies will not be reviewed and will be returned to the engineer or subdivider.
- 17) The following notes shall be required on all drawings submitted to the City:
 - a) All construction shall conform to City's regulations, latest edition.
 - b) Notify the City Manager's Office at least 72 hours prior to beginning of construction on stormwater drain lines. An inspector will be assigned and a pre-construction meeting scheduled at this time.
 - c) "As-Built" drawings shall be field verified and stamped by a Professional Engineer or land surveyor licensed in the State of Georgia.
 - d) Contractors have the responsibility to assure erosion control of sewer easements, particularly when sewer easements are in close proximity of drainage easements. See the assigned City inspector for details.

- e) The contractor shall comply with all Utilities Protection Center requirements.
- 18) Appropriate details from the City's regulations shall be included in the plans.
- 19) Other details as necessary to convey the details and specifications of the design shall be included as necessary.
- 20) Additional items may be requested if deemed necessary by the City.

Section VII: Streets

A: Design Standards – Streets

- 1) General
 - a) All streets, roadways driveways, parking lots and alleys shall comply with the minimum standards set forth in these regulations. No roadway, street, driveway, alley or parking lot shall be allowed to be unpaved and without curb and gutter.
 - b) The arrangement of local streets shall permit practical patterns, shapes, and sizes of development parcels. Street layout must strike a balance with proposed land use so as to not unduly hinder the development of land. Distances between streets, angles of intersections, numbers of streets, and related elements all have a bearing on efficient lot layout of an area.
 - c) Local streets shall be so laid out that cut through routes are not created. Where this cannot be accomplished optional traffic calming features will be considered by the city on a case-by-case basis.
Local non-residential streets shall be laid out so that use by through traffic will be discouraged. The functional and operational characteristics of the roadway shall be to provide access to adjacent nonresidential lots.
 - d) Collector streets shall be provided to channel through traffic movements within a development as part of or in addition to the current thoroughfare network.
 - e) Dead end streets designed to have one end permanently closed shall provide a cul-de-sac turnaround.
 - f) Cul-de-sacs shall conform to the layout and dimensional requirements as shown in the Standard Details.
 - g) Non-residential cul-de-sacs shall have a 60' paved radius.
 - h) Non-standard cul-de-sacs will be evaluated individually and may be constructed with a landscaped island (subject to approval by the Fire Marshall) to be maintained by the Home-Owners Association in perpetuity.
 - i) Streets shall either directly align or have offsets of a minimum of 125 feet for intersecting streets on opposite sides of the through street and a minimum of 250 feet for streets on the same side of the through street, as measured between centerlines of said streets.
 - j) When a proposed street is located near or paralleling an existing stream or drainage way. street construction must be above the projected fifty-year (50) flood high water elevation.
 - k) Traffic Control Devices (signs and pavement markings) will normally provided by the City on local residential streets. On major thoroughfares and for

nonresidential development, signs and pavement markings are to be provided by the subdivider.

2) Minimum Street Requirements

a) Minimum street requirements shall be as detailed in the following table:

Description	Right-of-Way	Topping Width (Back to Back)	GAB	Type "B" Binder	Type "E" Asphalt
Major Thoroughfares	100'	28'+	8"	2"	1&1/2"
Minor Thoroughfares; Collector	80'	28'	6"	2"	1&1/2"
Local	60'	24'	6"	2"	1&1/2"
Industrial	80'	28'+	8"	2"	1&1/2"
Cul-de-sac & Dead-End	110'	80'	Same as street	Same as street	2"
Alley	20'	10'	6"	0"	1&1/2"

3) Street Cross Sections

a) Street cross sections shall have 1/4" per foot crowns and four (4) foot shoulders. The side slopes shall not be steeper than two to one (2 to 1) for cut or fill sections.

4) Street Grades

a) Street grades shall not exceed the limits as given in the following table:

Description	Maximum Grade
Major Thoroughfare	7%
Minor Thoroughfare	8%
Industrial	5%
Collector	10%
Local and Dead-End	10%
Cul-de-sac	5%
Street Intersections	5%

5) Curve Design

- a) General
 - (1) Curve design shall be in accordance with good engineering practices considering probable traffic speed, traffic volume, and other appropriate factors.
 - b) Horizontal Curves
 - (1) Minimum radius of no less than two hundred (200) feet.
 - c) Vertical Curves
 - (1) Vertical alignment must be designed in conjunction with the horizontal alignment. All changes in street profile grades having an algebraic difference greater than 1% shall be connected by a parabolic curve.
 - (2) Minimum safe stopping sight distance is a direct function of the design speed of 25 mph in residential and 35 mph in local, non-residential, and commercial areas. A height of eye of 3½ feet and height of object of ½ foot shall be used to determine safe stopping sight distance relative to vertical curve design.
- 6) Curb & Gutter
- a) All streets and cul-de-sacs within a development shall have curb and gutter.
 - b) The subdivider shall specify either rolled or L-back curb and gutter.
 - c) All residential curb and gutter shall be roll-back.
 - d) Both curb types shall be 24" deep.
 - e) L-back curbs shall slope 1" per 18", be 6" thick, and rise 6".
 - f) Rollback curbs shall slope 3/4" per foot for 10" with a 12" radius roll, with the minimum thickness of 6" at the lowest point.
 - g) Concrete strength shall be 3000 psi at 28 days.
 - h) Expansion joints shall be provided at all drainage structures and curb returns. The maximum distance between joints shall be forty (40) feet with dumpy joints every ten (10) feet.
 - i) Curb radius measured to the back of curb.
 - j) Curb shall not be greater than thirty (30) feet at residential Street intersections.
 - k) Commercial, industrial, and cul-de-sac entrance radii shall not be less than forty (40) feet.
- 7) Street Intersections & Sight Distances
- a) General
 - (1) The horizontal sight distance at subdividing entrances is determined by the line of sight available two (2) feet above the road surface.
 - (2) The sight distance shall be measured along the existing edge of pavement beginning at the centerline of the proposed entrance and ending where the projected line of sight intersects the pavement.
 - (3) The line of sight is the projected line of visibility beginning at the entrance centerline and tangent to an obstruction two (2) feet above the road surface.
 - (4) Obstructions are vegetation, ground cover, signs, and existing topography.
 - (5) The vertical sight distance at the development entrance near a crest is determined by the line of sight available from the driver' s eye four (4) feet above the pavement to an object six (6) inches high at the centerline

of the entrance.

b) Street Locations

- (1) Street locations shall be designed to provide the minimum sight distances for stopping according to the following table:

Speed Limit	Minimum Horizontal Sight Distance (ft)	Minimum Vertical Sight Distance (ft)
25	150	200
30	200	200
35	250	250
40	325	300
45	400	400
50	475	475
55	550	550

c) Entrance Types

- (1) The entrance to the development should consider the number of lots served, the horizontal and vertical sight distances available at the existing road, and traffic flow patterns leaving the development.
- (2) Residential subdivisions with less than 20 lots and Commercial or Industrial subdivisions on a minor thoroughfare shall have a 75 foot radius curb and gutter entrance with a 50 foot taper.
- (3) Commercial or Industrial subdivisions on major thoroughfares and Residential subdivision with 20 to 200 lots shall have two hundred (200) feet each of acceleration and deceleration lanes along with those requirements previously mentioned at the entrance.
- (4) Residential subdivisions with over 200 lots shall have a left turn lane, a right lane merging into the acceleration lane in addition to those aforementioned requirements.
- (5) Depending on the location, Commercial or Industrial subdivisions may be required to have the same entrance as Residential subdivisions with over 200 lots.

d) Angle of Intersection

- (1) Intersections for new roadways shall not be at an interior angle less than 85° unless the intersection is otherwise warranted and approved for a stop-and-go traffic signal in which case the minimum angle shall be 80°.
- (2) Intersections of existing roadways shall be reviewed on a case-by-case basis using AASHTO, latest edition guidelines.

8) Street Naming and Selection Procedures

- a) All street names are subject to the approval of the City and the following guidelines shall be used when assigning street names:

- (1) Proposed streets that are obviously in alignment with other existing, named streets shall bear the names of such existing streets. Once a

name is assigned to any alignment, it may not change anywhere along the extension of that alignment.

- (2) A street name combination (primary name/type/suffix) may be used only once and may not be used in any other alignment.
- (3) Except within the same project, no proposed street name shall duplicate an existing street name within the City regardless of the use of any type such as "street", "avenue", "boulevard", "drive", "place", "way", "court", or other designation.
- (4) Proposed new names shall be reviewed for correct usage and reasonable meanings consistent with the language used. Such review shall also include correct spelling.
- (5) The subdivider shall coordinate street naming and assignment of necessary address with appropriate authorities.

9) Street Lights

- a) Street lights shall be provided by the developers of all new subdivisions or other developers utilizing roads or any combination, unless waived by the City.
- b) The applicable power company will design a lighting layout and submit it to the City for approval. Upon approval, the developer will pay the power company for all costs associated with the installation.
- c) The acceptance letter for subdividing will not be issued until this requirement is satisfied.

10) Driveways

- a) Driveways shall conform to Georgia DOT standard 9031 –J. The depth of commercial and residential driveways shall be constructed eight (8) and six (6) inch respectively.

11) Sidewalks

- a) Sidewalks shall be installed at the entrance of any subdividing and will continue along all streets within the subdividing.
- b) Sidewalks shall be 5 feet wide with the outside edge 1 foot from the back of the right-of-way.
- c) Sidewalk elevations are to be determine by the elevation of the road they parallel giving consideration to good drainage practices.
- d) Sidewalks are to have a traverse grade of 2% with drainage toward the street or road.
- e) The maximum allowable longitudinal sidewalk grade shall be 5% unless the street or road grade is of a steeper grade, in which case the sidewalk grade shall not exceed the street grade.
- f) Sidewalks will be a minimum thickness of 4" along streets, 6" through residential driveways and 8" through commercial and industrial driveways.
- g) Handicap ramps will be installed at entrance and exit on street, and anywhere else where applicable.

12) Off-Street Parking and Loading

- a) General Requirements of Off-Street Parking.
 - (1) Parking Spaces for all dwellings shall be located on the same lot with the principal building or not more than three hundred (300) feet from the

building entrance, as measured on a straight line.

- (2) When two or more uses of the same or different types, parking requirements may be satisfied by the use of a common parking facility provided, that the total number of spaces is not less than the sum of the individual requirements and that the use is within the distance specified in this ordinance.
- (3) Areas designated for off-street parking and loading shall not be reduced in size, or changed to any other use unless the permitted use which it serves is discontinued or modified, or unless equivalent parking or loading is provided on another approved site or a parking structure is used to the satisfaction of the Planning Commission and/or Board of Zoning Appeals.
- (4) Lighting of parking facilities shall be arranged so that light is reflected away from adjacent property and public street rights-of-ways.
- (5) A buffer area shall be required along property adjacent to residential property. The buffer zone shall be a densely planted width of trees and shrubs and be not less than 10 feet in width and 8 feet in height.

13) Landscaping of Parking Lots

- a) Landscaping for any parking lot with twenty or more spaces shall be provided with interior landscaping covering not less than five percent of the total area of the parking lot. The primary landscaping material used should be trees and shrub and should be dispersed reasonably throughout the site.

14) Parking Lot Design

- a) Parking stalls shall have a minimum width of nine (9) feet in width and eighteen (18) feet in length. When parallel parking is used at least a minimum width of twelve (12) feet shall be required. The interior driveways shall be a minimum of twelve (12) feet for one-way traffic circulation and twenty-four (24) feet for two-way traffic circulation.

15) Drainage, Construction and Maintenance

- a) All off-street parking, loading and service areas shall be constructed of concrete or asphalt. All such areas shall be at all times maintained at the expense of the owner(s) thereof and in a clean and orderly condition.

16) Pavement Marking and Signage

- a) Each off-street parking lot shall be clearly marked and pavement directional arrows and/or signs shall provide directional indicators in each travel way. Markers, directional arrows and signs shall be properly maintained so as to ensure the maximum efficiency. Signage designating private lots and/or tow zones shall be clearly placed and if necessary illuminated. Unattended lots that require payment shall have signage at all entrances and throughout the lot.
- b) All contractors shall furnish blue road markers to identify hydrant placements.

17) Parking Space Requirements By Use

- a) At the time of erection, enlargement or alteration of any principal building or structure by adding increased floor space for dwelling units, guest rooms, seats or sales space the minimum off-street parking requirements shall be increased accordingly. Adequate means of ingress and egress shall be

provided from a public street or alley by an automobile of standard size, in accordance with those standards outlined in the "Zoning Ordinance of the City of Bremen." A variance request may be applied for to waive said parking requirements due to hardship and/or some natural feature consideration not cause by the property owner.

18)ADA Parking Requirements

a) All developments within the City of Bremen shall have hard surface parking lots. All parking lots providing goods and/or services to the public shall meet the following guidelines as mandated by the Federal government to comply with the "Americans with Disabilities Act."

b) Minimum Number of Accessible Parking Spaces
ADA Standards for Accessible Design

Total No. of Parking Spaces Provided (per lot)	Total Minimum No. of Accessible Parking Spaces (60" & 96" aisles)	Van accessible Parking Spaces with a Minimum 96" wide Access Aisle	Accessible Parking Spaces with Minimum 60" wide Access Aisle
	Column "A"		
1 - 25	1	1	0
26 - 50	2	1	1
51 - 75	3	1	2
76 - 100	4	1	3
101 - 150	5	1	4
151 - 200	6	1	5
201 - 300	7	1	6
301 - 400	8	1	7
401 - 500	9	2	7
501 - 1000	2% of Total Parking Provided in each lot	1/8 of Column "A"	7/8 of Column "A"
1001 and over	20 plus 1 for each 100 over 1000	1/8 of Column "A"	7/8 of Column "A"

B: Information To Be Shown On Plans - Streets

- 1) Project name and valid registration stamp of the Professional Engineer registered in the State of Georgia competent in the design of streets and roadways systems. A registered land surveyor is not acceptable. The registered Professional Engineer must stamp any plan redesigns. The registered Professional Engineer must sign across the stamp.
- 2) All construction drawings submitted to the City for review shall be professionally printed (AutoCad format or approved or equal). Hand written notes are not acceptable and will not be reviewed.

service area (acres) and the population that will be served by the

- 4) Should include streets, street names, lot layout (if subdivision) or lots (if multi-family, commercial or industrial), land lots and dimensions, sewer layout topography, streams, and storm drainage pipes.
- 5) Flood plain.
- 6) Details of utility systems relevant to street and roadway design including utility data, flow direction, and grade.
- 7) Location, size, identification, and elevation.
- 8) Material to be used for construction aspects of streets and roadway design section.
- 9) Profile scales shall be:
 - a) One inch = 5 feet or 1 inch = 10 feet
 - b) Horizontal: One inch = 20 feet or 1 inch = 50 feet
- 10) Sheet size shall be 24 inches x 36 inches for all plans. "Half size" copies will not be returned to the engineer or subdivider.
- 11) The notes shall be required on all drawings submitted to the City:
 - a) Construction shall conform to City's regulations, latest edition.
 - b) Plans must be submitted to the City Manager's Office at least 72 hours prior to beginning of construction on streets and roadways. An inspector will be assigned and a pre-construction meeting scheduled at this time.
 - c) All drawings shall be field verified and stamped by a Professional Engineer or land surveyor licensed in the State of Georgia.
 - d) Contractors have the responsibility to assure erosion control of all disturbed areas, particularly when stormwater drainage ways are in close proximity to rights of ways. See the assigned City inspector for details.
 - e) The contractor shall comply with all Utilities Protection Center requirements.
- 12) Appropriate details from the City's regulations shall be included in the plans.
- 13) Other details as necessary to convey the details and specifications of the design shall be included as necessary.
- 14) Additional plans may be requested if deemed necessary by the City.

Section VIII: Construction & Installation Standards – Water

A: Scope

This specification covers the material requirements and installation procedures for water pipe, structures and appurtenances to be accepted into the City of Bremen system. Any water pipe, structures or appurtenances which the City has reason to believe is not in conformance with these specifications will not be accepted.

B: Quality Assurance

- 1) Craftsmanship/Workmanship

- a) All materials and components will be installed in accordance with the manufacturer's recommendations or in accordance with the American Water Works Association (AWWA) recommended methods. The methods that will yield the most reliable infrastructure will be the required method and the decision as to which is the most reliable will rest solely with the City.
- 2) Applicable Standards
 - a) The subdivider shall supply all products and perform all work in accordance with applicable standards of the American Society for Testing and Material (ASTM), American Water Works Association (AWWA), and American National Standards Institute (ANSI). Latest revisions of all standards are applicable.
- 3) Material Certification
 - a) If requested by the City, materials must be certified by the manufacturer as to having met applicable standards and tagged or marked such that tracking and identifying of materials requiring certification can be accomplished. Certification shall be supplied before installation can occur.
- 4) Substitutions
 - a) Whenever a product is identified in the specifications by reference to manufacturers' or vendors' names, trade names, catalog numbers, etc., the subdivider may freely choose from those referenced products which ones he wishes to provide. Any item or product other than those so designed shall be considered a substitution. The subdivider shall obtain prior approval from the City for all substitutions.

C: Acceptable Materials

The subdivider shall furnish all pipe fittings, valve tapping sleeves, hydrants and all other material required for the completion of the work as shown on the approved drawings or indicated by these specifications. The subdivider shall only furnish materials in accordance with the following:

- 1) Pipe Materials
 - a) Ductile Iron Pipe and Fittings: (4-inch diameter through 64-inch diameter)
 - (1) Ductile iron pipe shall be minimum class 50 cement lined and conform to AWWA C104 (**Note:** Where pipe provided is "pressure class," 350 PSI class shall be substituted for class 50 Ductile Iron Pipe unless otherwise specified in the contract documents, project design, or by design engineer). Fittings shall conform to AWWA C110, or AWWA C153 with minimum rated working pressure of 250 PSI. Pipe and fittings shall be furnished with a bituminous outside coating. Pressure pipe class and standard pipe class pipe thickness shall be determined by AWWA C150 Standards by an internal pressure of 350 psi working pressure, or an external loading, whichever loading yields the thickest pipe. Minimal external loading shall be determined from 2.5 feet cover, AWWA type 1 trench, American Association of State Highway Transportation Official (AASHTO) H-20 line loading, or greater external loading if depth of cover yields a thicker pipe using AASHTO H-20 loading with AWWA type 1

trench conditions.

- (2) Joints shall be push-on type, for pipe and standard mechanical joints for fittings. Push-on joints shall conform to AWWA C111. Restrained joint pipe (RJP) shall be either the bolted joint type, or modified push-on type with joint restraint using ductile iron components. Restrained joint pipe where required shall be American, U.S. Pipe or equal as approved by the City. The use of locking type gaskets may be allowed where the City deems appropriate.
 - (3) Ductile iron pipe fittings shall be produced in accordance with all applicable terms and provisions of ANSI/AWWA C153/A21.53 and ANSI/AWWA C111/A21.11. Fittings shall be cement lined and seal coated in accordance with ANSI/AWWA C104/A21.4.
 - (4) The subdivider is to provide the appropriate gaskets for mechanical or flange joints. Gaskets for flange joints shall be made of 1/8-inch thick cloth reinforced rubber; gaskets may be ring type or full face type.
 - (5) The subdivider is to provide the necessary fasteners for mechanical or flange connections. Fasteners shall all be as specified in ANSI B 17.2, and AWWA C111. All bolts and all nuts shall be treated in accordance with ANSI B 1.1, Coarse Thread Series, Class 2A and 2B fit.
 - (6) All pipes shall be furnished in lengths of at least 18 feet and fully gauged per AWWA Standards.
 - (7) Material acceptance will be on the basis of the City's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards.
- b) Polyvinyl Chloride (PVC) Pipe (two inch, four inch)
- (1) PVC pipe material shall be used as casing material only for copper service lines and shall be a minimum of Class 200.
- c) Copper Pipe and Fittings (3/4 inch – two inch)
- (1) Copper pipe shall be type "K" soft drawn copper water tube packed in coils or cartons when specified. (ASTM B43) AWWA C800.
 - (2) Copper pipe fittings shall be compression type brass. Tail pieces and meter couplings shall be cast brass threaded type. Copper Alloy No. C83600, ASTM B62 or ASTM B584.

2) Valves

- a) Buried valves shall be equipped with cast iron valve boxes. Extension stems will be provided where required. Valves shall be manufactured by Mueller, U.S., M & H, or equal as approved by the City and conform to AWWA C800.
- b) Curbing shall be marked using an approved method of cutting symbols into the top of the curb ("W" for water service and "V" for valves). Where no curbing exists, concrete valve markers shall be installed for each valve excluding fire hydrant valves. Valve markers, where appropriate, shall be located at the back of the right-of-way.
- c) Gate Valves
 - (1) Gate valves shall be required for diameters of 3 - 10 inches and shall be resilient seat type conforming to the requirements of AWWA C509 with flanged, and mechanical joint ends. Valves shall be furnished with O-ring type stem seals. All valves shall open in a counter clockwise

direction and close in a clockwise direction.

- d) Butterfly Valves
 - (1) Butterfly valves shall be required for diameters of 12 inches and larger and shall conform to AWWA Standard C504 with flanged, and mechanical joint ends.
- 3) Backflow Preventers
 - a) Backflow preventers shall be the reduced pressure zone type, double detector check type, or dual check type as determined by the City on a case-by-case basis. Backflow preventers shall conform to current requirements (ASSE 1013, or USC-FCCC) and be certified by a USC laboratory. The installation shall meet all applicable State, and AWWA M-14, and local codes. Backflow preventers shall be manufactured by Hersey (Becco), Watts, Febco, Ames or approved equal.
 - b) Sizes 3/4 inch through two inch shall have bronze bodies with threaded connections and bronze union on either side of the device.
 - c) Sizes 3 inch and larger shall be bronze or iron bodied with corrosion resisting moving parts and trim and flange connections.
- 4) Reduced Pressure Assemblies
 - a) Facilities using hazardous chemical or biological substances including but not limited to hospitals, medical clinics, veterinary clinics, and pest control facilities shall be equipped with reduced pressure zone (RPZ) back flow preventers with a fixed air gap. The device shall be equipped with four leak-proof test cocks for 5/8 inch and larger devices. A fixed air gap, or funnel, shall be installed at the relief port. A drain line shall be piped from the discharge side of the air gap and shall be supported independently from the device. The lowest point of the RPZ shall be a minimum of 12-inches above the floor drain for indoor applications or 12-inches above the drain flap invert for outdoor applications.
 - b) An auxiliary check valve and strainer shall be installed upstream of the device. Gate valves shall be installed upstream and downstream of the device.
- 5) Corporation and Curb Stops
 - a) Corporation and curb stops shall be ball valve type, shall be made of bronze conforming to ASTM B 61 or B 62, and shall be suitable for the working pressure of 175 PSI or greater.
 - b) Ends shall be suitable for compression type joint. Threaded ends for inlet and outlet of corporation stops shall conform to AWWA C 800; couplings not for connection to flared copper tubing shall conform to ANSI B 16.26. Corporation stops shall be manufactured by Hays, (Lee Brass) (5200 CF) Mueller (H-15008) Ford (F10003G) and/or McDonald (4701BT) or approved by the City. Curb stops shall be manufactured by Hays (Lee Brass) (4302CFW), Mueller (B25170R), Ford (B41233WG) and/or McDonald (6102WT) or approved by the City.
- 6) Valve Boxes
 - a) All valves shall be equipped with valve boxes. Valve boxes shall be heavy roadway type. The valve boxes shall be cast iron two-piece screw type with

drop covers. The valve boxes shall be adjustable up or down from the nominal required cover over the pipe. Typical valve box details are included in the Appendix. All valve boxes shall be manufactured by Higgins Foundry, U.S. Foundry, Tyler Pipe, and Opelika Foundry or as approved by the City.

7) Tapping Sleeves and Valves

- a) Tapping sleeves greater than two inches shall be of the split sleeve, mechanical joint type. Valves shall be gate valves furnished in accordance with the specifications shown above, with flanged connection to the tapping sleeve and mechanical joint connection to the branch pipe. The necessary bolts, glands, and gaskets shall be furnished. Tapping sleeves and valves shall be cast iron or ductile iron. Prefabricated tapping sleeves may be used on PVC upon approval by the City.

8) Tapping Saddles

- a) Tapping saddles up to two inches shall be ductile iron body type with O-ring gasket and alloy steel double straps. Connection shall be threaded as required. Tapping saddles shall be manufactured by Smith Blair, Mueller, Ford, Dresser or equal as approved by the City.

9) Fire Hydrants

- a) All fire hydrants shall conform to the requirements of AWWA C502 for 150 PSI working pressure and NFPA 1993 addition. Hydrants shall be the compression type, closing with line pressure. The valve opening shall not be less than 5 1/4 inches. All valves shall open counter clockwise.
- b) In the event of a traffic accident, the hydrant barrel shall break away from the standpipe at a point above grade and in a manner which will prevent damage to the barrel and stem, preclude opening of the valve, and permit rapid and inexpensive restoration without digging or cutting off the water. The means for attaching the barrel to the standpipe shall permit facing the hydrant a minimum of eight different directions.
- c) Hydrants shall be fully bronze mounted, with all working parts of bronze. Valve seat ring shall be bronze and shall screw into a bronze retainer.
- d) All working parts, including the seat ring, shall be removable through the top without disturbing the barrel of the hydrant. The opening nut shall match those on the existing hydrants. The opening threads shall be totally enclosed in an operating chamber separated from the hydrant barrel by a rubber O-ring stem seal and lubricated by a grease or oil reservoir.
- e) Hydrant shall be a non-freezing design and be provided with a simple, positive, and automatic drain, which shall be fully closed whenever the main valve is opened.
- f) Hose and pumper connections shall be threaded and pinned to seal them permanently to the hydrant barrel.
- g) Each hydrant shall have two 2 1/2 inch hose nozzle connections using standard threads (7.5 per inch) per National Standard Specs and one 4 1/2 inch nominal size connection with National Standard threads (4 per inch). Each connection shall be equipped with cap and chain.
- h) Hydrants shall be furnished with a mechanical joint shoe connection to the spigot of the six inch hydrant lead.

- i) Minimum depth of bury shall be 4.0 feet or as existing water main depths dictate. Provide extension section where necessary for vertical installation and in accordance with manufacturer's recommendations.
 - j) Fire hydrants shall be factory painted Red in color.
 - k) Hydrants shall be (A-423 Centurion Mueller) (M & H 129T) or U.S. Pipe Metropolitan, American, or equal as approved by the City.
- 10) Meter Boxes for 3/4 Inch x 5/8 Inch Meters
- a) Meter boxes shall be manufactured in the United States and made from high density polyethylene. Meter boxes shall be 12 inches in height and the bottom shall not be less than 18 inch in length x 13 inch in width. Meter boxes shall be Ametek, Carson Brooks Plastic, Inc. or equal. Cast iron lids with short legs shall be supplied with each meter box.
- 11) Fire Lines
- a) A double detector check valve (DDC) and vault shall be installed on all privately owned fire lines. The City, in its sole discretion, may also require developers to install fire line meters on a case by case basis. Fire line meters, where required, shall be the same size as the installed fire line and shall be manufactured by Invensys Metering Systems, Inc. or a City approved equal.
- 12) Material Inspection and Acceptance
- a) Approval materials for installation shall be on the basis of the manufacturer's written certification that the pipe was manufactured and tested in accordance with all applicable standards, latest revisions.
 - b) Each pipe shall be clearly marked as required by the governing ASTM Standard Specifications to show its class, date of manufacture and the name and trademark of the manufacturer.
 - c) Latitudes in workmanship and finish allowed by the ASTM Specifications notwithstanding, all pipe shall be first quality, have smooth exterior and interior surfaces and be free from cracks, blisters and other imperfections, and true to theoretical shapes and forms throughout each length. All pipes shall be subject to inspection by the City at the pipe plant, trench and other points of delivery for the purpose of culling and rejecting pipe, independent of laboratory tests. Pipe that does not conform shall be marked as such by the City and shall not be used in the work. On-the-job repairing of rejected pipe will not be permitted.

D: Handling Materials

- 1) Unloading
 - a) The subdivider shall furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings, valves and accessories. The subdivider will have equipment available at all times for use in unloading. Any materials dropped or dumped will be subject to rejection by the City without additional justification.
- 2) Handling

- a) The subdivider will handle pipe, fittings, valves and accessories carefully to prevent shock or damage. Pipe should be handled by rolling on skids, forklift, or front loader. The subdivider shall not use material damaged in handling.

E: Clearing

- 1) The subdivider shall clear the entire width of the permanent easement prior to trenching. All trees, growth, debris, stumps and other objectionable matter shall be removed. All unsuitable material shall be removed from the easement.

F: Excavation

- 1) The subdivider shall excavate all materials encountered, including rock, and dispose of excess excavated material not required for backfilling. All excavation shall be performed in accordance with applicable local, state, and federal regulations, including the Occupational Safety and Health Act of 1970 (PL 91-596).
- 2) Depth of Trenches
 - a) The subdivider shall excavate trenches to provide a minimum cover of four feet above the top of the pipe. Within the right-of-way of highways, streets, or roadways, the subdivider shall excavate to place the top of the pipe a minimum of four feet below the nearest pavement edge.
- 3) Width of Trenches
 - a) Trenches shall be excavated wide enough to allow proper installation of pipe, fittings, and other materials and not less than six inches clear of the outside barrel of the pipe on any side at any point.
- 4) Bell Holes
 - a) At each joint, the subdivider shall excavate bell holes of ample depth and width to permit the joint to be made properly and to relieve pipe bell of any load.
- 5) Earth Excavation
 - a) The subdivider shall excavate and prepare the trench bottom to support the pipe uniformly throughout its length. For both ductile iron pipe and PVC pipe, the trench shall meet all requirements of Standard Laying Condition Type 2 in accordance with AWWA C600.
 - b) If the trench is excavated to excessive width or depth, as determined by the Inspector, the subdivider shall provide a crushed stone bedding material meeting the requirements of Georgia D.O.T. Specification 800.01 for No. 57 stone and bed the pipe to achieve Condition Type 4 in accordance with AWWA C600. Trench width, pipe bedding and installation shall be per the manufacturer's recommendation.
- 6) Rock Excavation
 - a) Rock (Defined) - Any material that cannot be excavated with a backhoe having a bucket curling force rated at not less than 18,300 pounds (Caterpillar Model 215 or equal), and occupying an original volume of at least 1/2 cubic yard.

- 7) Excavation - Where rock is encountered, the subdivider shall excavate to the minimum depth and width, which will provide six inches clearance beyond the outside diameter of the pipe bell. Trench width, pipe bedding and installation shall be per the manufacturer's recommendations.
- 8) Blasting
 - a) Only state licensed blasting contractors shall be employed by the subdivider and all blasting shall be monitored by seismographs. Liability insurance shall be required in the amount deemed appropriate by the City. The subdivider shall provide experienced workmen to perform blasting.
 - b) All blasting operations shall be conducted in accordance with all existing ordinances and regulations. The subdivider shall protect all structures from the effects of the blast and repair any resulting damage.
- 9) Removal of Rock - The subdivider shall not use excavated rock as backfill material. All rock which is surplus or not suitable for use as rip-rap shall be disposed of appropriately.

G: Existing Underground Utilities and Obstructions

- 1) It is the responsibility of the subdivider to locate all existing utilities along the path of construction. Drawings shall indicate underground utilities or obstructions that are known to exist. Where these or unforeseen underground utilities are encountered, the location and alignment of the water main may be changed to avoid interference upon written approval of the City.
- 2) It is the responsibility of the subdivider to have all existing utilities located prior to any trenching operation. Any utility that may be damaged in this operation will be at the expense of the subdivider.
- 3) Abandoning Existing Water Lines
 - a) Water System Mains
 - (1) The City must expressly approve in writing all water system mains that are to be removed from service and abandoned prior to their removal. The City may also require replacement of water lines encountered during construction that are not made of ductile iron pipe. The requirements for removing a water system main from service include but are not limited to the following:
 - (2) The developer shall be responsible for physically disconnecting the proposed abandoned main from the City's water distribution system. All penetrations into the City's system from the abandoned main shall be capped off and sealed to the City's satisfaction.
 - (3) The replacement main must be no less than the size of the existing main. The City, in its sole discretion, may require the existing water main to be replaced with a larger sized main.
 - (4) The developer shall be responsible for connecting all existing City customers, fire lines and taps that are served by the existing water main onto the replacement main. All costs of connecting existing City customers, fire lines and taps to the replacement main, including ancillary costs (e.g., meter and service line relocation, etc.), shall be

- borne by the developer.
- (5) The subdivider shall formulate a plan to minimize service interruptions to existing CITY customers. Said plan shall be subject to review and approval by the City.
 - (6) The replacement line shall meet all construction standards as stipulated in the latest edition of these specifications.
- b) Water Service Lines
- (1) Water service lines that are to be removed from service shall be terminated at the corporation stop.

H: Laying and Jointing Pipe and Fittings

The subdivider shall lay all pipe and fittings to accurately conform to the lines and grades shown on the drawings approved by the City and as follows:

- 1) Pipe Handling
 - a) The subdivider shall lower pipe, fittings, valves and accessories into the trench by suitable means. The subdivider shall not drop or dump pipe or accessories into the trench.
 - b) The subdivider shall clean pipe and fittings thoroughly with vegetable soap and water before installation. Care shall be taken to keep the pipeline clean until final acceptance.
 - c) If any pipe or other material is discovered to be defective or damaged after being laid, the subdivider shall remove and replace it.
- 2) Pipe Alignment and Gradient
 - a) The subdivider shall lay pipe straight in alignment of gradient or follow true curves as nearly as practical.
 - b) No joints shall be deflected more than the maximum deflection allowed by the manufacturer. The subdivider shall maintain the necessary surveying equipment at the job site to lay out angles and ensure that deflection allowances are not exceeded.
- 3) Expediting Work
 - a) The subdivider shall excavate, lay the pipe, and backfill as closely together as possible. Unjointed pipe shall not be left in the trench overnight. The subdivider shall backfill and compact the trench as soon as possible after laying, jointing and inspection are completed.
 - b) The exposed end of the installed pipe shall be sealed with a mechanical joint plug each day at the close of work and at all other times when work is not in progress. If necessary to backfill over the end of an uncompleted pipe, the end shall be closed with a mechanical joint plug. However, backfilling shall commence only after inspection.
- 4) Laying Pipe in Trenches

The subdivider shall lay the pipe with solid bearing throughout its length as described below:

- a) Earth Trenches
 - (1) The bottom of the trench shall be graded to a true line. The pipe shall be laid in clean bedding material, free of rock, organics, and other materials

which, in the opinion of the inspector, are unsuitable. All pipes shall be installed and bedded per the manufacturer's recommendations.

b) Rock Trenches

- (1) The pipe shall be bedded in at least six inches of granular bedding material. The subdivider shall backfill with the same material to at least two feet above the pipe. All pipes shall be installed and bedded per the manufacturer's recommendations.

c) Wet Trenches

- (1) Pipe shall not be laid in water. The subdivider shall provide dewatering equipment to maintain a ground water level below the bottom of the pipe while pipe is being laid. Any damage that may result from the subdivider's dewatering processes is the responsibility of the subdivider.

5) Jointing

- a) All joints shall be made in accordance with all applicable ASTM and ANSI/AWWA Standards.

I: Connections to Existing Pipelines

- 1) Before laying pipe, the subdivider shall locate the points of connection to existing pipelines and uncover them as necessary for the City to confirm the nature of the connection to be made. The subdivider shall furnish all materials and make the connection to all existing pipelines.
- 2) The subdivider will be charged a connection fee to cover the expenses of the City. All taps being made into existing pressurized lines shall only be made by CITY approved subdividers with the City's inspection and using a method recommended by the DIPRA or the Uni-Bell Association. The City may, at its sole discretion, choose to perform the final tie-in to the system and charge the subdivider at a pre-determined rate. Tie-in to the existing system shall be the final act of the project and under no circumstances shall the tie-in be performed without City approval. Any communication with the public concerning temporary service outages or any other activities associated with the project shall be subject to the approval of the City. This shall include, but is not limited to, installation of individual fire hydrants, services, fire service, etc.

J: Thrust Restraint

- 1) The subdivider shall provide a restraint at all points where hydraulic thrust may develop. Restraints shall have a minimum design safety factor of 2.5 and shall be certified by a Professional Engineer registered in the State of Georgia. The subdivider shall install eyebolts and rods as required on all associated fittings, valves, and related piping.
- 2) Retainer Glands
 - a) Retainer glands shall be equal to ACIPCO A 90875.
- 3) Concrete Blocking
 - a) Concrete blocking shall be provided for all bends, tees, valves, and other points where thrust may develop. Concrete shall have a compressive

strength of not less than 3000 PSI, with not less than 5.5 bags of cement per cubic yard and a slump between 2 ½ to four inches. For job mixed concrete, the subdivider shall submit the concrete mix design for approval by the City. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C94. Reinforcing steel shall conform to the requirements of ASTM A615, Grade 40.

- b) The subdivider shall form and pour concrete blocking at fittings as shown on the construction drawings as designed by the developer's Professional Engineer licensed in the State of Georgia and as directed by the City.
- c) Blocking shall be poured against undisturbed earth. Increase dimensions when required by over excavation. Concrete shall not cover bolts or nuts. Precast thrust blocks are unacceptable without prior approval.

K: Backfilling

- 1) The subdivider shall backfill and compact the soil to prevent settlement and displacement of the pipe. Before heavy construction equipment is permitted to cross over a pipe, an earth fill shall be constructed to an elevation of at least three feet over the top of the pipe or to an elevation as required by the manufacturer, whichever is greater.
- 2) Suitable Material
 - a) The subdivider shall backfill trenches with earth only. Rock material excavated from trenches shall not be used in the backfill material. If necessary, the subdivider shall furnish suitable earth material to backfill the trench.
- 3) Backfilling Procedure
 - a) The subdivider shall place initial backfill material in the bottom of the trench and up to two feet above the pipe in six inch layers. The material shall be compacted in place one on each side and top of the pipe.
 - b) The subdivider shall place and compact final backfill material in 12 inch layers if mechanical tamping equipment is used to achieve proper compaction. Final backfill material may be placed in two foot layers when compacting with heavy tamping equipment.
- 4) Backfill Under Roads
 - a) Backfill underlying pavement and backfill under dirt and gravel roads shall be compacted to 95% of the maximum dry density as determined by the Standard Proctor Compaction Test (ASTM D 698). Compaction test may be required in existing or proposed streets, sidewalks, drives, and other existing or proposed paved areas at varying depths and at intervals determined by the City engineer with a maximum of one required test for each 400 feet of water main construction, unless soil conditions or construction practices in the opinion of the City engineer warrants the need for additional tests.
- 5) Settlement
 - a) If the trenches settle, the subdivider shall refill, compact, and grade the top of the trench to conform to the adjacent surface.

L: Construction Along Highways, Streets, Roadways and Streams

- 1) Conformance with Governmental Agencies
 - a) The subdivider shall comply with all construction operation requirements, safety requirements, traffic control requirements, road maintenance requirements and repair requirements of the City of Bremen and/or the Georgia Department of Transportation while installing any water line and/or appurtenance along highways, streets and roadways. As required, the City shall procure D.O.T. permits necessary to complete the project. The subdivider shall be responsible for obtaining any and all permits from other governing bodies necessary to complete the project.
 - b) These other permitting agencies may include but are not necessarily limited to the following:
 - (1) Georgia Environmental Protection Division (EPD)
 - (2) United States Department of Agriculture – Natural Resources Conservation Service (USDA – NRCS)
 - (3) United States Army Corps of Engineers
- 2) Protection of Traffic
 - a) The subdivider is to provide and maintain suitable signs, barricades, and lights for protection of traffic. All highway signs removed for construction shall be replaced at the end of each day. The subdivider shall not close or block any highway, street, or roadway without first obtaining permission from the proper authorities. The subdivider shall provide trained and Georgia D.O.T. certified flagmen to direct and expedite the flow of traffic.
- 3) Construction Operations
 - a) The subdivider is to perform all work along highways, streets and roadways to minimize traffic interference.
- 4) Stripping
 - a) Where the pipeline is laid along road shoulders, the subdivider shall strip and stockpile all sod, topsoil, and other material suitable for shoulder restoration.
- 5) Trenching, Laying and Backfilling
 - a) Trench excavation shall not be open cut any further ahead of pipe laying operations than is necessary. The subdivider shall backfill and remove excess material immediately behind laying operations. Complete excavation and backfill for any portion of the trench in the same day. All lines shall be plugged at the end of each day.
- 6) Shaping
 - a) The subdivider shall reshape damaged slopes, side ditches and ditch lines immediately after completing backfilling operations. Topsoil, sod, and any other materials removed from shoulders shall be replaced.
- 7) Excavated Materials
 - a) The subdivider shall not place excavated material along highways, streets, and roadways in a manner that obstructs traffic. All scattered excavated material shall be swept off the pavement. If all material cannot be removed from the pavement, the subdivider is to notify the Governmental Agency having jurisdiction over the street or roadway so that they can assist the

subdivider in clean up efforts. The subdivider shall be responsible for any fees or damage resulting from construction activity.

M: Removing and Replacing Pavement

- 1) Removing Pavement
 - a) The subdivider shall remove existing pavement as necessary for installing the pipe line and appurtenances. The subdivider shall accept full responsibility for the pavement/roadway during all construction activities. The subdivider shall also be responsible for securing all pavement cut permits from City, or other governing authority.
 - b) The City may procure permits from D.O.T. upon request from the subdivider. Prior to obtaining a D.O.T. permit, the City, in its sole discretion, may require the developer to post bond up to and including 100% of the cost of replacing the roadway impacted by the proposed construction activity.
- 2) Marking Pavement
 - a) Before removing any pavement, the subdivider shall mark the pavement neatly paralleling the pipeline and existing street lines. The marks shall be spaced the width of the trench.
- 3) Breaking Pavement
 - a) The subdivider shall break the asphalt pavement along the marks by scoring with a rotary saw and breaking below the score by the use of jack hammers or other suitable tools.
- 4) Machine Pulling Pavement
 - a) No pavement shall be pulled with machines until it is completely broken and separated from the pavement that is to remain.
- 5) Damage to Adjacent Pavement
 - a) The subdivider shall not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, the subdivider is responsible for removing and replacing the damaged pavement.
- 6) Sidewalks
 - a) Sidewalks shall be removed and replaced to their full width.
- 7) Curbs and Gutters
 - a) The subdivider shall remove and replace or tunnel under any curb encountered.
- 8) Driveways
 - a) Driveways shall be removed and replaced to their full width to the satisfaction of the property owner.
- 9) Replacing Pavement
 - a) Upon completion of the placing and consolidation of the backfill, the subdivider shall arrange to have the compaction tested by an independent testing laboratory approved by the City. After the compaction testing has been satisfactorily completed, reported to the City, and approved by the City Engineer; the subdivider shall replace all pavement, sidewalks and curbs that had to be removed.

10) Materials to be Replaced

- a) The subdivider shall place the materials for the pavement to the dimensions shown on the drawings. The following types of sub-bases will be replaced:
 - (1) Graded Aggregate Base
 - (a) The subdivider shall furnish graded aggregate base (GAB) in two sizes of such gradation that when combined in approximately equal quantities, the resulting mixture is well graded from course to fine and meets the gradation requirements of Section 816 of the Georgia D.O.T. standard specifications.
 - (2) Black Base
 - (a) The base for all paved roadways shall conform to the requirements of the Georgia State Highway Department of Transportation Specifications for the black base (Hot Mix). A Pug Mill Rotary Drum type mixer shall be used with a minimum capacity of not less than 50 tons per hour for asphalt production. The base shall be applied and compacted in two courses by asphalt spreader equipment of design and operation approved by the City. After compaction, the black base shall be smooth and true to establish profiles and sections.
 - (3) Surface Course
 - (a) The surface course for all pavement, including paint or tack coat when required by the governing agency, shall conform to the requirements of the Georgia State Highway Department of Transportation Specifications for Asphaltic Concrete, Section 400, Type "E" (Modified Top). The subdivider shall produce the surface course in an asphalt plant of the same type as noted above for black base.
 - (b) The surface course shall be applied and compacted in a manner approved by the City. Any high, low or defective areas shall be immediately corrected by cutting out the course, replacing with fresh hot mix, and immediately compacting it to conform and thoroughly bonding it to the surrounding area.
 - (4) Concrete
 - (a) The subdivider shall provide concrete and reinforcing for concrete pavement in accordance with the requirements of the Georgia State Highway Department of Transportation Specifications for Portland Concrete Pavement.

11) Supervision and Approval of Pavement Restoration

- a) Pavement restoration shall meet the requirements of the regulatory agency responsible for the pavement. The subdivider shall obtain city approval of all pavement restorations before providing final payment to the pavement contractor.
 - (1) Pavement Replacement
 - (a) Prior to replacing the pavement, the subdivider shall make a final cut in concrete pavement nine inches back from the edge of the trench. The subdivider shall make the cut using a rotary saw. Asphalt pavement shall be removed nine inches back from the edge of the trench other suitable tools. The subdivider shall replace all street and roadway pavement as shown on the drawings. All driveways, sidewalks, and

curbs shall be replaced with the same material and to the same dimensions as existing.

(2) Pavement Failure

- (a) Should any pavement restoration or repairs fail or settle for a period of one year following construction, the subdivider shall promptly restore or repair all defects. All paving replacements must be acceptable to the appropriate governing body.

N: Boring and Tunneling

- 1) The subdivider shall procure all bore permits from the D.O.T. and provide proof of permitting at the request of the City.
- 2) The subdivider shall furnish and install tunnel liner or pipe casing and install the pipeline therein.
- 3) The subdivider shall operate well points or drainage systems in the vicinity of the tunnel or casing construction to prevent the accumulation of flood water in the tunnel or casing and to maintain the ground water table below the tunnel or casing invert.
- 4) The subdivider shall take precautions to construct the tunnel so that no settlement of the over passing roadway, railway or any other structure will occur. In order to prevent such settlement, the use of poling plates, breast boards, shields, and soil solidification or a combination of these methods may be necessary. The City shall not be responsible for any damage that may result from the tunnel construction.
- 5) The subdivider shall furnish all material and equipment and perform all labor required to install steel pipe casing at the locations indicated on the drawings. Boring design and materials shall be per all AREA, AASHTO, Georgia D.O.T., and other applicable standards.
- 6) Casing Material and Size Requirements
 - a) Steel casing pipe shall be Schedule 30 steel pipe manufactured from steel conforming to ASTM A 139, Grade B. All casing size and thickness shall be as follows:

Pipe Diameter (inches)	Casing Diameter (inches)	Wall Thickness Under Highways (inches)	Wall Thickness Under Railroads (inches)
4	8	0.25	0.50
6	12	0.25	0.50
8	16	0.25	0.50
10	16	0.25	0.50
12	20	0.25	0.50
14	24	0.25	0.50
16	36	0.375	0.50
18	36	0.375	0.50
20	36	0.375	0.50
24	36	0.375	0.50

30	40	0.50	0.625
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Note: The steel sleeves shall be coated inside and outside with two coats of bitumastic paint prior to delivery on the job site.

- 7) Joint Usage of Casing Pipe
 - a) The subdivider shall not install any pipe in an existing steel casing that is being used for any other purpose without the written approval of the City.
- 8) Casing Pipe Installation
 - a) The subdivider shall install the steel casing pipe by the dry boring method. The subdivider shall bore the hole and install the casing through the soil simultaneously by a cutting head on a continuous auger mounted inside the casing pipe to the preceding section in accordance with the AWS recommended procedures. After the boring and installation of the casing is complete, the subdivider shall install a cleaning plug on the rig and clean the casing.
- 9) Rock Formations
 - a) In the event that rock is encountered during the installation of the pipe casing that, in the opinion of the City, cannot be removed through the casing, the City shall direct the subdivider to complete the crossing by installing a tunnel.
- 10) Tunneling
 - a) The subdivider shall install the tunnel liner in strict accordance with the Department of Transportation (D.O.T.) and/or Railroad Company requirements. The subdivider shall provide any special insurance coverage required by the governing body.
 - b) The tunnel installer shall have a minimum of five years of experience in the construction of tunnels of a similar size. The subdivider shall submit evidence of the installer's experience for review by the City.
- 11) Blasting Permits
 - a) Prior to any work involving explosives the subdivider shall make application to the D.O.T., or other appropriate agencies for a blasting permit. This permit will be in addition to any tunneling permit not involving explosives. The subdivider shall comply with all requirements and conditions of the permits including required submittals.
- 12) Traffic Control Requirements
 - a) The subdivider shall schedule the work so as not to interfere with or in any way endanger traffic flow on the highway or railway. The subdivider shall provide all required safety measures as specified in the Georgia Manual on Uniform Traffic Control Devices.
- 13) Tunnel Liner Plate Materials
 - a) Tunnel liner plates shall be manufactured from steel conforming with ASTM A569 with the following mechanical properties before cold forming:
 - (1) Minimum tensile strength = 42,000 PSI
 - (2) Minimum yield strength = 28,000 PSI
 - (3) Elongation, two inches = 30%
 - b) Liner plates shall be 10 gauge, with the neutral axis diameter shown on the drawings for each crossing.

- c) Minimum coatings required shall be galvanized in accordance with ASTM A 123 for liner plates and hot-dip galvanizing in accordance with ASTM A 153 for all other hardware. Additional protection required shall consist of a full bituminous coating meeting the requirements of ASSHTO M 190.
- d) All plates shall be punched for bolting on both longitudinal and circumferential seams or joints and shall be so fabricated as to permit complete erection from the inside of the tunnel. The plates shall be equipped with two inch standard pipe half-couplings welded into a hole in the center of the plate for grouting of voids occurring outside of the liner. Couplings shall be fitted with threaded cast-iron plugs. Bolts shall be no less than 5/8 inch diameter. The subdivider shall submit shop drawings showing details of the plate's size, length and width for review by the engineer, the City and Georgia D.O.T.

14) Tunnel Construction Methods

- a) Liner plates shall be installed as soon as possible, but no more than five feet of tunnel shall remain unlined while tunneling operations are in progress. Not more than one foot of tunnel shall be left unlined at the end of the day's operation. The subdivider shall locate the liner plates with grout couplings at the top of the tunnel at intervals not to exceed five feet. Additional plates with grout couplings shall be installed on each side of the tunnel between the top couplings.
- b) Systems of standard pipe, fitting, hose, and special grouting outlets embedded in the liner plates shall be provided by the subdivider. Care shall be taken to ensure that the parts of the system are maintained free from dirt. Grout composed of cement, sand, and water shall be forced under pressure into the grouting connections. Grouting shall be started in the lower connections and shall proceed until grout begins to flow from upper connections. Connections shall then be made to these holes and the operation continued to completion.
- c) Apparatus for mixing and placing grout shall be of a type approved by the engineer and the Georgia D.O.T. and shall be capable of mixing effectively and stirring the grout and then forcing it into the grout connections in a continuous uninterrupted flow.
- d) After grouting is completed, pressure shall be maintained by means of stop cocks, or other suitable devices until the grout has set sufficiently. After the grout is set, grout holes shall be completely filled with dense concrete and finished neatly without evidence of voids or projections.
- e) After the tunnel has been completely constructed, the subdivider shall thoroughly clean the interior and shall place structural quality concrete of a strength approved by the City within the invert of the tunnel. The subdivider shall screen and trowel the top of the exterior of a pipe width placed on proper grade within the tunnel. As the pipe is jointed, it shall be drawn into position inside the tunnel.

15) Installation of Pipe in Casing or Tunnel

- a) After the installation of the casing or tunnel is complete, the subdivider shall install the pipeline by a method that has received prior approval of the designing engineer and the City.

16) Casing Pipe Closure

- a) The subdivider shall close the ends of the casing with four inch brick walls, plastered with Portland cement mortar. Brick and mortar shall meet the requirements for manhole materials.

17) Tunneling Closure

- a) A brick bulkhead shall be constructed at both ends of the tunnel with a drain at the lower end. The bulkhead shall be a three course mortared brick wall, plastered with Portland cement mortar and waterproofed with asphaltic roofing cement. Brick and mortar shall meet the requirements for manhole materials.

18) Boring Safety

- a) The subdivider shall provide all necessary bracing, bulkheads, and shields to ensure complete safety to all traffic at all times during the boring operation. All work shall be performed in such a manner as to not permanently damage the roadbed or interfere with normal traffic over it. If, in the opinion of the City, the installation is being conducted in an unsafe manner, the subdivider will be required to stop work and bulkhead the heading until suitable agreements are reached between the subdivider and the City. The City will not be responsible and shall be saved harmless, in the event of delays to the subdivider's work resulting from any cause whatsoever.

19) Tunneling Safety

- a) The subdivider shall begin the tunneling operation in a pit, sheeted and shored as necessary and being at and proceeding from one end. The subdivider shall observe all applicable requirements of all governing agencies and shall conduct the operations in such a manner that all work will be performed below the level of the roadbed. All work shall be coordinated and scheduled with all governing agencies.
- b) A temporary bulkhead against the face of the excavation shall be provided and placed during the cessation of work where the heading is within 20 feet of railroad tracks or highway pavement.

O: Stream and Ditch Crossing

- 1) At all points where banks or streams or drainage ditches are disturbed by excavation or where natural vegetation is removed, the subdivider shall carefully compact backfill and place rip-rap to prevent subsequent settlement and erosion.
- 2) This requirement applies equally to construction along the sides of a stream or drainage ditch, as well as the crossing of streams or drainage ditches. The subdivider shall place rip-rap a distance of not less than 10 feet upstream and 10 feet downstream from any disturbed area. Actual distance of rip-rap will be determined by the inspector. Rip-rap shall be extended from one foot below the stream bed to the top of the bank and shall be placed to conform with the natural slope of the stream bank.
- 3) The top of all pipe entering or crossing streams shall be at a sufficient depth below the natural bottom of the stream bed to protect the water line. In general, the following cover requirements must be met:

- a) One foot of cover is required where the water line is located in rock
- b) A minimum of three feet of cover is required where the water line is not located in rock. The City, in its sole discretion, may require additional cover depending on the size and flow rate of the stream.
- c) The top of the water line shall be placed at least four inches below the bottom of the channel pavement for paved stream channels.

P: Testing

- 1) "As-Built" drawings meeting all requirements as stipulated, must be received and approved by the City before a project can be released for testing.
- 2) The City reserves the right to continuously and/or periodically inspect construction methods to ensure compliance with these specifications. Unless other provisions have been specifically approved by the City, water lines and related facilities will be inspected and tested by the subdivider with testing and line sterilization certified by the City before acceptance to the City's system.
- 3) Testing Procedures
 - a) When a length of pipe approved by the City is ready for testing, the subdivider shall fill the line with water, bleed out all air, and perform a leakage test.
 - b) The subdivider shall provide a test pump, an accurate water meter, and all other accessories required to make the test. The subdivider shall provide a corporation stop at each high point on the pipe to bleed off air. The subdivider shall provide and remove all temporary bulkheads, plugs, and flanges required to perform the pressure test.
 - c) The pipeline shall be tested at 250 PSI measured at the lowest point. The test shall be performed for a minimum of two hours. The main shall not have detectable pressure loss at any time during the two hour period.
 - d) If leaks are detected, the subdivider shall locate and repair all leaks and retest the line. If results are not totally satisfactory, the City may require testing for a longer period of time.
- 4) Existing Valves
 - a) The subdivider shall not operate valves in the existing system. Subdividers violating this provision are subject to immediate removal from the City's Approved Subdividers List.
- 5) Disinfecting Pipeline
 - a) The subdivider shall disinfect all installed potable water lines and all other pipelines which may have been contaminated by the work.
 - b) The subdivider shall prepare a one percent chlorine solution using high-test calcium hypochlorite (HTH) and place an adequate quantity of this solution into the water mains to obtain a minimum chlorine concentration of 50 mg/L. Application of the chlorine may be at the time of filling for pressure testing. At the end of 24-hours, the City shall test for chlorine residual; if found to be less than 25 mg/L, the subdivider shall add chlorine solution, and the City shall re-test again after 24-hours. The following is the minimum quantity of solution required per 100 feet of pipeline to obtain the desired concentration:

Pipe Diameter (inches)	Quantity (gallons)	Strength (%)
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1	0.02	1
2	0.08	1
3	0.18	1
4	0.32	1
6	0.73	1
8	1.30	1
10	2.04	1
12	2.88	1
14	0.38	10
16	0.50	10
18	0.63	10
20	0.78	10
24	1.12	10
30	1.72	10

- c) After completing chlorination, the subdivider shall flush the line with potable water and test for the amount of chlorine residual at the point of discharge until the chlorine residual is equal to the chlorine residual of the water used for flushing. The City shall allow the pipeline to remain full for 24 hours and take samples for bacteriological and turbidity examination. The City shall analyze these samples. Results must be acceptable to the State. If the samples are not satisfactory, the subdivider shall perform additional sterilization until acceptable samples are obtained.
- d) Sampling determinations of chlorine residual for sterilization and flushing shall be performed by the City's laboratory personnel. The City shall be requested to perform such sampling and testing no less than 48 hours prior to the requested sampling time.
- e) Water shall be de-chlorinated per State Regulations.

Q: Protection and Restoration of Work Area

- 1) The subdivider shall return all items and all areas disturbed, directly or indirectly, by work under these specifications to their original condition or better as quickly as possible after work is started.
- 2) The subdivider shall protect or remove and replace, with the City's approval, all fences, piers, docks, walkways, mailboxes, pipelines, drain culverts, power and telephone lines and cables and other improvements that may be encountered in the work.
- 3) The subdivider shall not disturb cultivated trees or shrubbery unless approved by the City. Any such trees or shrubbery which must be removed shall be heeled in and replanted under the direction of an experienced nurseryman.
- 4) The subdivider shall not cut trees for the performance of the work except as absolutely necessary. Trees that shall remain in the work area shall be protected from damage from equipment. The subdivider shall not store spoil from excavation against the trunks. The subdivider shall remove excavated material stored over the root system of all trees within 30 days to allow proper natural watering of the root system. All damaged trees over three inches in diameter

shall be repaired by an experienced nurseryman. All trees and brush that require removal shall be promptly and completely removed from the work area and disposed of by the subdivider. No stumps, wood piles, or trash piles will be permitted on the work site.

- 5) The subdivider shall replant grass removed or damaged in residential areas using the same variety of grass and at the first appropriate season. Outside of developed areas, the subdivider shall plant the entire area disturbed by the work in rye, fescue, bermuda or other suitable ground cover upon the completion of work in the area. In all areas, the subdivider shall promptly re-establish permanent grass to match or exceed original conditions.
- 6) Erosion and sedimentation control shall be per Georgia Environmental Protection Division standards and per the requirements of applicable local governmental standards. The subdivider shall plan excavation work to prevent erosion and the washing of soil into adjacent streams. The subdivider shall limit the amount of open excavation at any one time. Spoil shall be placed in the proper place and all natural water routes shall be kept open. Subdividers must fully comply with erosion and sedimentation control act, and the Nation Pollutant Discharge Elimination System general permit, where applicable.
- 7) The subdivider shall dispose of materials cleaned and grubbed during the construction of the project in accordance with the applicable codes and rules of the appropriate regulatory agencies, county, state and federal.
- 8) Subdividers must prevent discharges of pollutants onto soils and into surface water where applicable. Subdivider shall comply with Federal Petroleum spill prevention rules set forth in 40 CFR 112.

R: Safety

- 1) Subdividers are advised that certain hazards are inherent to utility work including but not limited to vehicle traffic, trench cave ins, existing utilities, and heavy equipment. Subdividers are solely responsible for job-site safety. Subdividers are responsible for compliance with all applicable OSHA regulations, including those found in CFR Part 1926. The City shall not be held responsible for safety violations of the subdivider.

Section IX: Construction and Installation Standards - Sewer

A: Scope

This specification covers the material requirements and installation procedures for all sanitary sewer pipe, structures and appurtenances to be accepted into the Bremen-City Water and Sewer City (City) sewer system. However, this does not limit the City's ability to require and/or accept other materials, construction techniques, or engineering when deemed appropriate by the City. Any sewer pipe, structures or appurtenances which the City has reason to believe are not in conformance with these specifications will not be accepted.

B: Quality Assurance

- 1) Craftsmanship/Workmanship
 - a) All materials and components will be installed in accordance with the manufacturer's recommendations or in accordance with the American Water Works Association (AWWA) recommended methods. The methods that will yield the most reliable infrastructure will be the required method and the decision as to which is the most reliable will rest solely with the City.
- 2) Applicable Standards
 - a) The subdivider shall supply all products and perform all work in accordance with applicable standards of the American Society for Testing and Material (ASTM), American Water Works Association (AWWA), and American National Standards Institute (ANSI). Latest revisions of all standards are applicable.
- 3) Material Certification
 - a) If requested by the City, materials must be certified by the manufacturer as to having met applicable standards and tagged or marked such that tracking and identifying of materials requiring certification can be accomplished. Certification shall be supplied before installation can occur.
- 4) Substitutions
 - a) Whenever a product is identified in the specifications by reference to manufacturers' or vendors' names, trade names, catalog numbers, etc., the subdivider may freely choose from those referenced products which ones he wishes to provide. Any item or product other than those so designed shall be considered a substitution. The subdivider shall obtain prior approval from the City for all substitutions.
- 5)

C: Pipe Materials

- 1) Polyvinyl Chloride Gravity Sewer Pipe (6-inch diameter through 15-inch diameter)
 - a) Pipe
 - (1) PVC gravity sewer pipe shall be SDR 35 manufactured in accordance with ASTM D 3034-2000 or latest revision, and supplied in lengths of approximately 13-feet.
 - b) Joints
 - (1) Joints for pipe and fittings shall be of the bell and spigot type with a confined elastomeric gasket having the capability of absorbing expansion and contraction without leakage. The joint system shall be identical for pipe and fittings and performed in strict conformance with ASTM D 3212 and ASTM F 477.
 - c) Fittings
 - (1) Fittings for pipe shall be one piece with no solvent-welded joints. No field fabrication of fittings will be allowed. All such fabrication shall be performed at the factory and the fittings delivered ready for use.

- 2) Ductile Iron Pipe and Fittings (four-inch diameter through 64-inch diameter):
 - a) Pipe
 - (1) Ductile iron gravity sewer pipe shall conform to AWWA C104 and shall be a minimum Pressure Class 350 thickness for eight inch diameter pipes and smaller; higher class thickness pipe shall be utilized as per the depth of cover or otherwise specified in the contract documents, project design, or by the design engineer. All ductile iron pipe shall have cement mortar lining. Fittings shall conform to AWWA C110 with a rated working pressure of 150 PSI. Pipe and fittings shall be furnished with a bituminous outside coating. All pipe with less than 4 feet or more than 13 feet of cover shall be ductile iron pipe.
 - (2) Ductile iron pipe fittings shall be produced in accordance with all applicable terms and provisions of ANSI/AWWA C153/A21.53 and ANSI/AWWA C111/A21.11. Fittings shall be cement lined and seal coated in accordance with ANSI/AWWA C104/A21.4.
 - (3) All publicly owned sanitary sewer lines crossing drainage ditches and streams shall be constructed of ductile iron pipe as described in this section. Buried sewer lines beneath streams shall also be encased in concrete a minimum of five feet beyond each stream bank (concrete shall have a minimum 28-day strength of 3,000 psi). Encasements are subject to exceed five feet beyond the stream bank, depending on stream bank stability.
 - b) Joints
 - (1) Pipe shall have push-on joints. All non-restrained fittings shall be mechanical joint type. Joints shall conform to AWWA C111. Restrained joint pipe and restrained joint fitting shall be either the bolted joint type or modified push-on joint type with joint restraint using ductile iron components. Restrained joint pipe on piers shall have bolted joints and shall be specifically designed for clear spans of at least 18-feet. Ductile iron pipe must be approved by the City prior to installation and must meet AWWA Standards. The use of locking type gaskets may be allowed where the City deems appropriate.
- 3) Reinforced Concrete Pipe (30-inch diameter or greater unless approved by the City):
 - a) Pipe
 - (1) Pipe shall be reinforced concrete bell and spigot with type two cement and calcareous aggregate conforming to ASTM C 76 for Wall C pipe. Pipe shall be supplied in lengths of at least eight feet.
 - b) Joints
 - (1) Pipe shall have rubber gasket type joints with steel end rings conforming to ASTM C 443. A rectangular groove shall be supplied in the spigot end to receive the rubber gasket, and it shall be so formed to a rectangular shape and confined on all four sides. Bell and spigot surfaces shall be accurately formed and smooth to provide a close sliding fit with a nominal clearance of 1/16-inch.
 - c) Testing
 - (1) Concrete pipe with a diameter of 60 inches or greater shall undergo a

certified material test and inspection of manufactured pipe for defects and imperfections as defined in paragraph 4.1.2 of ASTM C 76. Concrete pipe with a diameter between 30 inches and 60 inches shall in addition undergo plant load bearing testing. Test results on pipe, joint material and made-up joints must be performed by an independent testing laboratory approved by the City. Results to be supplied shall include materials, absorption, crushing (where applicable), and hydrostatic leakage tests on pipe of each size in accordance with applicable specifications.

- d) Lining
 - (1) The reinforced concrete pipe shall be epoxy lined.
- e) Contractor Inspection
 - (1) The contractor shall inspect pipe after delivery for laboratory stamp, shape, cracks, uniformity, blisters and imperfect surfaces, hammer test, damaged ends, and gasket grooves. The contractor will not accept or use repaired or patched pipe or pipe with repaired or patched gasket grooves or shoulders.
- 4) Pipe Material Transitions
 - a) Transitions of pipe material are permitted at manholes only. The use of FERNCO and other such couplings designed to allow pipe material transitions between manholes are not acceptable.
- 5) Material Inspection and Acceptance
 - a) Acceptance of the material will be based upon the City's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with all applicable standards, latest revisions.
 - b) Each pipe shall be clearly marked as required by the governing ASTM Standard Specifications to show its class, date of manufacture and the name and trademark of the manufacturer.
 - c) Latitudes in workmanship and finish allowed by the ASTM Specifications notwithstanding, all pipe shall be first quality, have smooth exterior and interior surfaces and be free from cracks, blisters and other imperfections, and true to theoretical shapes and forms throughout each length. All pipe shall be subject to inspection by the City at the pipe plant, trench and other points of delivery for the purpose of culling and rejecting pipe, independent of laboratory tests. Pipe that does not conform shall be marked as such by the City and shall not be delivered or used in the work. On-the-job repairing of rejected pipe will not be permitted.
 - d) Any pipe or special items which have been broken, cracked or otherwise damaged before or after delivery or which have failed to meet the required tests, shall be removed from the site of the work and shall not be used therein.

D: Excavation

- 1) The contractor is to perform all excavation of every description and of whatever substance encountered to the depth shown on the approved construction drawings for all sewers, manholes, piers, conduits, and other appurtenances. All

excavation is to be performed in strict conformance with the Occupational Safety and Health Act of 1970 (PL 91-596) or latest applicable revision. The contractor is responsible for acquiring all applicable City and County permits.

- 2) Excavation shall be accomplished by open cut unless otherwise directed. No tunneling shall be done, except as approved by the City and/or directed by the City Road Department, the City of Bremen or the Georgia Department of Transportation. It is the responsibility of the contractor to ascertain all permits required by all governing agencies prior to installing any sewer pipe or appurtenances beneath their roadway pavement.
- 3) The top portion of the sewer pipe trenches may have sloping or vertical sides to widths that will not cause damage to adjoining structures, roadways, pavements, utilities, and private property. For untimbered trenches and trenches held by stay bracing only, the width of the lower portion of the trench to a height of two-feet shall be as specified in the "Maximum Trench Widths and Depths" Section of these specifications. Where skeleton and solid sheeting is used, trench width may be increased to dimensions approved by the City, but shall not be greater than that necessary to clear the walls when lowering pipes into the trench. Where in the opinion of the City trench excavation may damage adjoining poles, roadways, utilities, and private property, the City may order suitable sheeting to be installed for their protection. Such orders shall in no way relieve the contractor from that responsibility of protection of these facilities, nor shall the lack of those orders relieve the contractor from that responsibility. If trenches are excavated to widths in excess of the above limitations, or collapse because of insufficient bracing and sheeting, the developer will be required to use special methods of constructing pipe foundations and backfilling as specified herein. All construction must meet or exceed OSHA Standards.
- 4) Trench excavation shall not advance more than 600 feet ahead of pipe laying, unless approved. The bottom of all trenches shall be smooth and flat and with backfill material affording full bearing of the pipe barrel. The depth and width required shall be as directed by the City. Excavation in excess of the depth required for proper trenching shall be corrected by one of the special methods specified herein, as ordered by the City. Bell holes shall be excavated in a manner that will relieve pipe bells of all load, and ensure support is provided throughout the length of the pipe barrel. Excavation in excess of the depths required for manholes and other structures shall be corrected by placing a sub-foundation of #57 stone, surge stone or some combination thereof.
- 5) If trenches are excavated to excessive dimensions or collapse because of inadequate or improperly placed bracing and sheeting, the pipe shall be laid using the next class of bedding. If over excavation for manholes and other structures occurs, the area under the structure or manhole shall be backfilled with granular bedding material to the required grade.
- 6) The contractor shall provide bracing and sheeting when required by regulations or to prevent damage to adjoining structures, roadways, pavements, utilities, trees, or private property which are specifically required to remain.
- 7) Timber

- a) Timber for shoring, sheeting, or bracing shall be sound and free of large or loose knots and in good condition. Size and spacing shall be in accordance with OSHA regulations.
 - b) Remove bracing and sheeting in units when backfill reaches the point necessary to protect the pipe and adjacent property. Leave sheeting in place when in the opinion of the City it cannot be safely removed. Cut off sheeting left in place at least two feet below the surface.
- 8) Steel Sheet Piling
- a) Continuous lockjoint steel sheet piling may be substituted for timber sheeting when approved by the City. Steel piling may be removed, without cutting, provided the rate of removal is kept in pace with the tamping and backfilling operations to assure complete filling of the void created by the withdrawal of the piling. Complete withdrawal of the piling in advance of tamping and backfilling will not be permitted. Piling, where ordered to be left in place by the City for reasons of safety, will be cut off where directed.
- 9) Trenches requiring dewatering shall be dewatered continuously to maintain a water level at least 2 ft. below the bottom of the trench. Dewatering running sand shall be accomplished by well pointing. Where soil conditions do not permit use of well pointing, construct French drains of crushed stone or gravel to conduct water to a gravel filled sump. The contractor shall have a stand-by pump available at all times while conducting dewatering operations. All accumulated water shall be removed from the trench before placing bedding or haunching, laying pipe or placing backfill.
- 10) Any problems arising from the dewatering process shall be the responsibility of the contractor. Dewatering wells must be removed and all voids filled when the job is completed.
- 11) If, in the opinion of the City, the subgrade is by nature too soft and/or excessively wet for the proper installation of sewer pipe, the City may order the contractor to undercut the ditch and backfill with crushed stone or gravel not larger than 3/4 inch in size and/or may order the contractor to use D.I.P. The stone shall be brought to grade and compacted.

E: Rock Excavation

- 1) Rock shall be defined as any material that cannot be excavated with a backhoe having a bucket curling force rated at not less than 18,300 pounds (Caterpillar Model 215 or equal), and occupying an original volume of at least 1/2 cubic yard.
- 2) Where rock is encountered in trenches, it shall be excavated to the minimum depth that will provide eight inches or more clearance below the pipe barrel and manholes. Remove boulders and stones to provide a minimum of six inches clearance between the rock and any part of the pipe or manhole.
- 3) Blasting
 - a) Only licensed blasting contractors shall be employed and all blasting shall be monitored by seismographs. Liability insurance shall be required in the amount deemed appropriate by the City. The contractor shall provide only experienced workmen to perform blasting. All blasting operations shall be

conducted in accordance with all existing ordinances and regulations. All structures shall be protected from the effects of the blast. The contractor shall be responsible for repairing any resulting damage. If the contractor persistently uses excessive blasting charges or blasts in an unsafe or improper manner, the City may direct the contractor to employ an independent blasting consultant to supervise the preparation for each blast and approve the quantity of each charge. The blasting contractor shall be insured.

- 4) Excavated rock shall not be used as backfill material. Rock that is surplus or not suitable for use as rip-rap shall be disposed of.

F: Bedding – Flexible Pipe

- 1) The following bedding materials and installation requirements shall be followed for polyvinyl chloride pipe being installed.
- 2) The bottom of the trench shall be flat and excavated to the minimum depth below the bottom of the pipe barrel as shown on the drawings. Trench width and pipe bedding shall be per the manufacturer's recommendations.
- 3) The contractor shall place and compact the bedding material to the proper grade. The bedding material shall be carefully placed by hand and hand tamped to provide full support under the pipe and to the top of the pipe. The contractor shall be cautious when tamping so no voids will be present in the backfill in the haunch area of the pipe. No compaction of the backfill other than hand tamping will be allowed until the backfill above the pipe reaches two feet above the top of the pipe.
- 4) Crushed stone bedding shall meet the requirements of ASTM C 33 No. 57, No. 6 or No. 67 stone. All pipe shall be installed and bedded per the manufacturer's recommendations.

G: Bedding – Rigid Pipe

- 1) Bedding for reinforced concrete pipe shall be in accordance with ASTM C 12. Bedding standards shall be placed in accordance with the depths of installation shown on the approved drawings relative to ASTM C 12.
- 2) For ductile iron pipe the contractor shall excavate the trench to 1/4 the nominal pipe diameter below the depth shown on the approved plans. Bedding material shall be placed and compacted by the contractor to the proper grade. Bedding shall then be carefully placed and compacted to provide full support under and up to the center line of the pipe.
- 3) In most instances, clean native soil meeting the Class I material requirements may be used for bedding of ductile iron pipe. Crushed stone bedding material shall meet the requirements of ASTM C 33 No. 57, No. 6, or No. 67 stone. All pipe shall be installed and bedded per the manufacturer's recommendations.
- 4) Bell holes shall be provided in all classes of bedding so as to relieve pipe of all load.

- 5) The determination of the bedding class shall be from the actual width of the trench. If the contractor increases the width of the trench for his convenience or due to collapse of trench walls so that a higher class of bedding is required, the increased cost of same shall be borne by the contractor. If the bearing value of the subgrade is determined by the contractor or the City to be inadequate for a particular class of bedding, the contractor shall substitute a higher class of bedding. In inundated areas, the contractor shall add the necessary granular bedding material to stabilize the pipe trench as determined by the City.

H: Backfilling

- 1) The contractor shall backfill all trenches fully to restore the ground surface to its original condition. Before heavy construction equipment is permitted to cross over a pipe, an earth fill shall be constructed to an elevation of at least three feet over the top of the pipe or to an elevation as required by the manufacturer, whichever ever is greater.
- 2) The contractor shall dispose of all surplus material. Backfill material cannot contain any rock larger than six inches square or any trees, stumps or limbs. The right-of-way shall be cleared of all limbs, brush, trees, stumps, roots and rocks. The right-of-way shall be sloped with the contour of the land so that the right-of-way does not act as a ditch for water run off.
- 3) Suitable backfill material is earth material excavated from the trench that is clean and free of rock, organics and other unsuitable material. The contractor should use extreme care when selecting the initial backfill material to be placed to a depth of 12 inches over the top of the pipe. This initial backfill material shall be free of all rock and clods that could damage the pipe in any way. If the backfill material excavated from the trench is not suitable for use as initial backfill material, the contractor shall obtain suitable materials elsewhere. Unsuitable material shall be disposed of off-site in accordance with applicable regulations.
- 4) The contractor shall place the initial backfill material carefully around the pipe or over the bedding material covering PVC or ductile iron pipe in uniform six-inch layers to a depth of at least 24 inches above the pipe bell. Each layer shall be compacted thoroughly without disturbing or damaging the pipe. Caution should be taken when compacting backfill material above polyvinyl chloride pipe.
- 5) The backfill material over PVC pipe should be compacted by hand tamping until a depth of two feet above the top of the pipe is reached. The contractor shall backfill on both sides of all types of pipe simultaneously too prevent side pressures.
- 6) The contractor shall compact the backfill in six-inch layers if using light power tamping equipment, such as a "jumping jack." The contractor shall compact the backfill in two-foot layers if using heavy tamping equipment, such as a hammer with tamping feet.
- 7) Backfill to be placed under roads shall be compacted to 95% Standard Proctor Density per ASTM D 698 or as required by all local governmental agencies that have jurisdiction over the road. Compaction tests may be required in existing or proposed streets, sidewalks, drives and other existing or proposed paved areas

at varying depths and at intervals as determined by the City engineer with a minimum of one test on each job, and a maximum of one required test for each 400 feet of sewer main construction unless soil conditions or construction practices, in the opinion of the City, warrants a need for additional tests.

- 8) If trenches settle, the contractor shall refill and grade the surface to conform to the adjacent surfaces.
- 9) Where trenches are along dirt streets and paved roads open to vehicular traffic or across driveways, the remaining 12 inches of backfill up to the traveled surface shall be made with crusher run stone, compacted and maintained until all removed pavement, as necessary, is replaced.
- 10) Where final grades above the pre-existing grades are required to maintain minimum cover, the contractor is to supply additional fill material to meet the final grade requirements shown on the drawings. The contractor may utilize excess material excavated from the trench if the material is suitable. If the excess excavated materials are not suitable or if the quantity available is not sufficient, the contractor shall provide additional fill material.

I: Manholes

- 1) Manholes shall be precast per applicable ASTM C 478 standards. Manholes shall be eccentric. Manholes shall have copolymer coated plastic steps on centers between 12 and 16 inches for all manholes over two feet in depth. All manholes shall have flexible boot seals conforming to ASTM C923 where the sewer pipes enter and leave the manhole. A-Lok X-Cel Pipe to Manhole Connectors are considered a suitable alternative. All flexible rubber boot seals shall be jointed to the manhole at the manufacturing plant. Holes for pipe entering or leaving the manhole shall be a minimum of six inches above the base floor of the manhole at the plant or in the field and a rubber boot installed. Vertical manhole sections shall be jointed with gaskets conforming to ASTM C443 or with double mastic.
- 2) All manhole bases, risers and cones that are to be installed after December 31, 2004 shall be manufactured in such a way that the spigot end of the section is at the highest elevation and the bell end of the section is at the lowest elevation. Manholes shall be cast using the wet cast method. Dry cast manhole sections shall be unacceptable.
- 3) Manhole lift holes that fully penetrate the manhole wall shall be unacceptable for manholes installed after December 31, 2004. Acceptable lifting devices include Key Lok as manufactured by A-LOK Products or approved equal.
- 4) Existing manholes shall be cored prior to making connections to new sewer lines or laterals. Once the new connection has been made, the existing manhole shall be sealed with Kor-N-Seal or an City approved equal. All connections shall conform to ASTM C443.
- 5) The City, in its sole discretion, may require brick manholes that are encountered during construction to be replaced, by the contractor, with new manholes that meet the standards as described in Section 9.1.1 of these specifications.

- 6) Minimum manhole diameter shall be in accordance with the largest pipe size entering the manhole as prescribed below:

Diameter of Largest Pipe	Minimum Manhole Diameter
< 24"	4 ft.
30"	4 ft.
36"	5 ft.
42"	6 ft.
48"	7 ft.

- 7) Manhole trenches shall be excavated to a minimum of 12 inches below the planned elevation of the base of the manhole. The contractor shall place and compact 12 inches of stone bedding material as a foundation for the manhole and set the bottom of the manhole to the required grade shown on the approved plans before constructing the manhole.
- 8) All bedding material shall be crushed stone, unless shown or specified otherwise. Crushed stone bedding material shall meet the requirements of ASTM C 33 No. 57 and No. 67 stones.
- 9) Excavated material may be used for backfilling manholes above bedding if suitable and approved by the City. Backfill shall be placed in six-inch layers and compacted to 95% Modified Proctor per ASTM standards.
- 10) Manhole inverts shall be carefully constructed using grout and brickwork.
- 11) Cement grout shall be made of one part cement to three parts clear sharp sand and hydrated lime equal to 5% to 10% of the volume of cement. Gravel can also be used as a filler material in the formation of inverts. All brick shall be best grade, all hard-burned common in accordance with ASTM C62-01, Grade SW or No. 2 paving brick and have a regular and smooth face. When submerged in water 24 hours, brick shall not absorb more than 10% of their weight of water. Factory precast inverts are also acceptable.
- 12) Invert channels shall be properly formed, rounded, and troweled smooth. Inverts shall be formed to the top of the pipe at the back of the table and 3/4 of the pipe at the channel. The bench shall have a two-inch in 12-inch slope. Special care shall be taken to lay the channel and adjacent pipes to grade. The minimum fall across the invert shall be 0.2 ft. The inverts shall have a cross section of the exact shape of the pipes to which it connects. Changes in size and grade shall be made gradually and evenly. Changes in the direction of the sewer and entering branch or branches shall have a true curve of a radius as large as the size of the manhole will permit. The connections of the sewer with the wall and channel of the manhole shall be tight and smooth. When brick filler material, not brick pavers, is used in the construction, the depth of grout above the brickwork shall be at least two inches thick.
- 13) Where velocities in gravity sewer lines greater than 15 fps are attained, the City, in its sole discretion, may require special provisions to protect against displacement by erosion and impact. Drop manholes and/or steel erosion plates can be constructed to reduce high flow velocities.

- 14) All manholes outside paved areas shall be built to have top elevations approximately two feet above finished grade or as directed by the City.
- 15) Watertight manhole rings and covers are to be used wherever the manhole top may be flooded by high water (e.g., all manholes located within the 100-year flood plain) or street runoff. Manhole adjustment rings shall be sealed with a flexible rubber seal. Acceptable products include Infi-Shield (Sealing Systems, Inc., Loretto, MN), Cretex (Cretex Specialty Company (Waukesha, WS), Flexrib Seals (Milford, NH) or approved equal.
- 16) Manholes in paved areas shall be built to top elevations even with the existing grade. Adjustments of ring and covers for street resurfacing shall be accomplished utilizing an adjustment ring allowing vertical adjustments beginning with $\frac{3}{4}$ inch minimum and increasing at $\frac{1}{4}$ inch intervals up to 4 inches in height. Concrete grade rings, manufactured by McArthur Concrete Products, Inc. or approved equal, shall be used to adjust manhole top elevations in low lying areas of the roadway. Mastic shall be used to seal between the grade rings. The use of bricks to adjust manhole top elevations shall be limited to the high areas (e.g., the crown) of the roadway. Adjustment rings shall be "clear-span manhole adjusting ring" (manufactured by Cretex Speciality Products) or equal. Ring and cover adjustments in general shall not be greater than 10 inches unless approved by the City.
- 17) Drop connections will be required where called for on the drawings. Drop pipes shall be the same size as the sewer that they serve. Openings in walls of precast concrete manholes for drop connections shall not be made at joints. Drop connection fittings and DIP riser pipes shall be supported by a footing of Class "C" concrete, due to the unequal earth pressures that would result from the backfilling operation in the vicinity of the manhole. Drop connections for precast concrete manholes shall conform with the typical details for drop manholes shown in the Appendix. Drop connections shall be carefully backfilled to prevent dangerous side pressures.
- 18) Manhole rings and covers shall be per the City's standard drawings shown in the Appendix. All casting shall be manufactured domestically and shall weigh at least 95% of the estimated weight specified in the detail drawings. Covers shall be either the non-traffic, traffic, or bolt-down watertight type. Traffic type manhole covers will be used when the manhole is to be placed in pavement and/or will be subjected to vehicular loadings. Bolt-down watertight manhole covers will be used on all manholes to be placed in flood plain areas and other areas as determined by the City.
- 19) Where shown on the drawings, a 12 foot long pipe stub for future sewer connections shall be laid on proper grade and alignment and plugged with a factory plug with the same type joint as used on the sewer pipe. The location of the end of the stub out is to be flagged in the field by the contractor and indicated on the "As-Built" drawings to be supplied to the City by the developer.
- 20) Developers shall install a plug and a trash screen in the existing manhole that ties to all new sanitary sewer line extensions. The plug and trash screen shall not be removed until the City has accepted the new sanitary sewer line extension.

J: Force Mains

- 1) All force mains and fittings shall be ductile iron pipe per AWWA standard C151. Class of pipe shall be as required for working pressure plus surge pressure and as directed by the City.
- 2) All fittings shall be mechanical joint per AWWA standards.
- 3) Force main and fittings shall be installed per AWWA standards. All bends, tees and crosses shall be blocked. Air release valves shall be installed in all high points and other areas as required.
- 4) Sewer force mains must be marked with tape to identify the pipe as a sewer force main in order to prevent accidental water service taps. Sewer force mains shall have a minimum of 4 ft. of cover.

K: Lateral Sewers

- 1) The contractor shall install wyes or tees in the locations shown on the plans for connection of existing or future service lines. The contractor shall install service lines with proper grades and alignment to the property line where shown on the drawings or otherwise required. Service lines for future service shall be plugged using Etco Stoppers or equal at the right-of-way line using the stopper of the appropriate size.
- 2) All laterals shall extend from the sewer line to the edge of the right-of-way (no more than five feet from the edge of the property line). For sewer laterals entering roadway manholes, the curbing shall be cut with the symbol "X" to identify the sewer lateral location. All sewer laterals shall be tapped into any sewer trunk line using the appropriate tapping machine. Dry sewer laterals shall have permanently glued caps.
- 3) Laterals shall be installed using polyvinyl chloride pipe or ductile iron pipe in accordance with the material requirements based on depth of cover. Lateral and sewer mains are to be bedded and backfilled in accordance with bedding requirements shown on the plans and in the Appendix of these specifications.
- 4) Service lines with cleanouts must have a bronze top with a bronze cap when installed in parking areas. All cleanouts must be kept at surface level or lower (preferably buried).

L: Pipe Laying

- 1) The contractor shall clear the entire width of the permanent easement before excavating. The contractor shall remove from the site all trees, growth, debris, stumps and other objectionable matter. The construction easement should only be cleared if necessary.
- 2) The drawings shall show the alignment and grade of the sewer and the position of the manholes and other appurtenances. The grade line shown on the sewer profile and called for on the plans shall be the grade of the invert of the pipe. The contractor shall use laser equipment to establish the pipe alignment and grade

required on the plans. The pipe shall be laid so that the pipe bells are upstream to the direction of the sewage flow.

- 3) It is the responsibility of the contractor to locate all existing utilities along the path of his construction.
- 4) Where unforeseen underground utilities or obstructions are encountered, the location and alignment of the sewer may be changed, upon written approval of the City, to avoid interference.
- 5) The contractor shall lower pipe, fittings, and accessories into the trench by suitable means. The contractor shall not drop or dump pipe or accessories into the trench.
- 6) Care shall be taken to keep the pipeline clean until final acceptance.
- 7) If any pipe or other material is discovered to be defective or damaged after being laid, the contractor shall remove and replace it.
- 8) The contractor shall excavate, lay the pipe, and backfill as closely together as possible. Unjointed pipe shall not be left in the trench overnight. The contractor shall backfill and compact the trench as soon as possible after laying and jointing is completed.
- 9) The exposed end of the installed pipe shall be closed with a mechanical joint plug each day at the close of work and at all other times when work is not in progress. If necessary to backfill over the end of an uncompleted pipe, the end shall be closed with a mechanical joint plug. However, backfilling shall commence only after inspection.

M: Replacing or Upsizing Sewers

- 1) The City must expressly approve all sewer system components that are to be removed from service and abandoned prior to their removal. The requirements for removing sewer system components from service include but are not limited to the following:
 - a) The replacement pipe must be no less than the size of the existing sewer. The City, in its sole discretion, may require the existing sewer to be replaced with a larger sized sewer.
 - b) The developer shall be responsible for connecting all existing CITY customers that are served by the existing sewer onto the replacement sewer. All costs of connecting existing CITY customers to the replacement sewer, including ancillary costs (e.g., service line relocation, etc.), shall be borne by the developer.
 - c) The contractor shall formulate a plan to minimize service interruptions to existing CITY customers. Said plan shall be subject to review and approval by the City.
 - d) The replacement line shall meet all construction standards as stipulated in the latest edition of these specifications.
 - e) The top sections of manholes and lift stations that are to be taken out of service shall be removed and the remaining manhole section shall be backfilled and compacted.

- f) Abandoned pipelines shall be cut near the manhole penetration and capped. The City, in its sole discretion, may require the developer to fill the abandoned pipeline with grout.
- g) The developer shall remove the pumps and other ancillary equipment from abandoned lift stations and return all lift station components to the City.

N: Construction Along Highways, Streets, Roadways, and Streams

- 1) Conformance with Governmental Agencies
 - a) The subdivider shall comply with all construction operation requirements, safety requirements, traffic control requirements, road maintenance requirements and repair requirements of the City of Bremen and/or the Georgia Department of Transportation while installing any water line and/or appurtenance along highways, streets and roadways. As required, the City shall procure D.O.T. permits necessary to complete the project. The subdivider shall be responsible for obtaining any and all permits from other governing bodies necessary to complete the project.
 - b) These other permitting agencies may include but are not necessarily limited to the following:
 - (1) Georgia Environmental Protection Division (EPD)
 - (2) United States Department of Agriculture – Natural Resources Conservation Service (USDA – NRCS)
 - (3) United States Army Corps of Engineers
- 2) Protection of Traffic
 - a) The subdivider is to provide and maintain suitable signs, barricades, and lights for protection of traffic. All highway signs removed for construction shall be replaced at the end of each day. The subdivider shall not close or block any highway, street, or roadway without first obtaining permission from the proper authorities. The subdivider shall provide trained and Georgia D.O.T. certified flagmen to direct and expedite the flow of traffic.
- 3) Construction Operations
 - a) The subdivider is to perform all work along highways, streets and roadways to minimize traffic interference.
- 4) Stripping
 - a) Where the pipeline is laid along road shoulders, the subdivider shall strip and stockpile all sod, topsoil, and other material suitable for shoulder restoration.
- 5) Trenching, Laying and Backfilling
 - a) Trench excavation shall not be open cut any further ahead of pipe laying operations than is necessary. The subdivider shall backfill and remove excess material immediately behind laying operations. Complete excavation and backfill for any portion of the trench in the same day. All lines shall be plugged at the end of each day.
- 6) Shaping
 - a) The subdivider shall reshape damaged slopes, side ditches and ditch lines immediately after completing backfilling operations. Topsoil, sod, and any other materials removed from shoulders shall be replaced.

- 7) Excavated Materials
 - a) The subdivider shall not place excavated material along highways, streets, and roadways in a manner that obstructs traffic. All scattered excavated material shall be swept off the pavement. If all material cannot be removed from the pavement, the subdivider is to notify the Governmental Agency having jurisdiction over the street or roadway so that they can assist the subdivider in clean up efforts. The subdivider shall be responsible for any fees or damage resulting from construction activity.

O: Removing and Replacing Pavement

- 1) Removing Pavement
 - a) The subdivider shall remove existing pavement as necessary for installing the pipe line and appurtenances. The developer shall accept full responsibility for the pavement/roadway during all construction activities. The developer shall also be responsible for securing all pavement cut permits from City, or other governing City.
 - b) CITY may procure permits from D.O.T. upon request from the developer. Prior to obtaining a D.O.T. permit, the City, in its sole discretion, may require the developer to post bond up to and including 100% of the cost of replacing the roadway impacted by the proposed construction activity.
- 2) Marking Pavement
 - a) Before removing any pavement, the subdivider shall mark the pavement neatly paralleling the pipeline and existing street lines. The marks shall be spaced the width of the trench.
- 3) Breaking Pavement
 - a) The subdivider shall break the asphalt pavement along the marks by scoring with a rotary saw and breaking below the score by the use of jack hammers or other suitable tools.
- 4) Machine Pulling Pavement
 - a) No pavement shall be pulled with machines until it is completely broken and separated from the pavement that is to remain.
- 5) Damage to Adjacent Pavement
 - a) The subdivider shall not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, the subdivider is responsible for removing and replacing the damaged pavement.
- 6) Sidewalks
 - a) Sidewalks shall be removed and replaced to their full width.
- 7) Curbs and Gutters
 - a) The subdivider shall remove and replace or tunnel under any curb encountered.
- 8) Driveways
 - a) Driveways shall be removed and replaced to their full width to the satisfaction of the property owner.
- 9) Replacing Pavement

- a) Upon completion of the placing and consolidation of the backfill, the subdivider shall arrange to have the compaction tested by an independent testing laboratory approved by the City. After the compaction testing has been satisfactorily completed, the subdivider shall replace all pavement, sidewalks and curbs that had to be removed.

10) Materials to be Replaced

- a) The subdivider shall place the materials for pavement to the dimensions shown on the drawings. The following types of sub-bases will be replaced:
 - (1) Graded Aggregate Base
 - (a) The subdivider shall furnish graded aggregate base (GAB) in two sizes of such gradation that when combined in approximately equal quantities, the resulting mixture is well graded from course to fine and meets the gradation requirements of Section 816 of the Georgia D.O.T. standard specifications.
 - (2) Black Base
 - (a) The base for all paved roadways shall conform to the requirements of the Georgia State Highway Department of Transportation Specifications for the black base (Hot Mix). A Pug Mill Rotary Drum type mixer shall be used with a minimum capacity of not less than 50 tons per hour for asphalt production. The base shall be applied and compacted in two courses by asphalt spreader equipment of design and operation approved by the City. After compaction, the black base shall be smooth and true to establish profiles and sections.
 - (3) Surface Course
 - (a) The surface course for all pavement, including paint or tack coat when required by the governing agency, shall conform to the requirements of the Georgia State Highway Department of Transportation Specifications for Asphaltic Concrete, Section 400, Type "E" (Modified Top). The subdivider shall produce the surface course in an asphalt plant of the same type as noted above for black base.
 - (b) The surface course shall be applied and compacted in a manner approved by the City. Any high, low or defective areas shall be immediately corrected by cutting out the course, replacing with fresh hot mix, and immediately compacting it to conform and thoroughly bonding it to the surrounding area.
 - (4) Concrete
 - (a) The subdivider shall provide concrete and reinforcing for concrete pavement in accordance with the requirements of the Georgia State Highway Department of Transportation Specifications for Portland Concrete Pavement.

11) Supervision and Approval of Pavement Restoration

- a) Pavement restoration shall meet the requirements of the regulatory agency responsible for the pavement. The subdivider shall obtain agency approval of all pavement restorations before requesting final payment. The subdivider shall obtain the City's approval of pavement not the responsibility of a regulatory agency such as the City of Bremen.
 - (1) Pavement Replacement

- (a) Prior to replacing the pavement, the subdivider shall make a final cut in concrete pavement nine inches back from the edge of the trench. The subdivider shall make the cut using a rotary saw. Asphalt pavement shall be removed nine inches back from the edge of the trench other suitable tools. The subdivider shall replace all street and roadway pavement as shown on the drawings. All driveways, sidewalks, and curbs shall be replaced with the same material and to the same dimensions as existing.
- (2) Pavement Failure
 - (a) Should any pavement restoration or repairs fail or settle for a period of one year following construction, the subdivider shall promptly restore or repair all defects. All paving replacements must be acceptable to the appropriate governing body.

P: Boring and Tunneling

- 1) The subdivider shall procure all bore permits from the D.O.T. and provide proof of permit before boring or tunneling. The developer is responsible for securing all bore permits from City, County or other governing authorities. The subdivider shall furnish and install tunnel liner or pipe casing and install the pipeline therein.
- 2) The subdivider shall operate well points or drainage systems in the vicinity of the tunnel or casing construction to prevent the accumulation of flood water in the tunnel or casing and to maintain the ground water table below the tunnel or casing invert.
- 3) The subdivider shall take precautions to construct the tunnel so that no settlement of the over passing roadway, railway or any other structure will occur. In order to prevent such settlement, the use of poling plates, breast boards, shields, and soil solidification or a combination of these methods may be necessary. The City shall not be responsible for any damage that may result from the tunnel construction.
- 4) The subdivider shall furnish all material and equipment and perform all labor required to install steel pipe casing at the locations indicated on the drawings. Boring design and materials shall be per all AREA, AASHTO, Georgia D.O.T., and other applicable standards.
- 5) Casing Material and Size Requirements
 - a) Steel casing pipe shall be Schedule 30 steel pipe manufactured from steel conforming to ASTM A 139, Grade B. All casing size and thickness shall be as follows:

Pipe Diameter (inches)	Casing Diameter (inches)	Wall Thickness Under Highways (inches)	Wall Thickness Under Railroads (inches)
4	8	0.25	0.50
6	12	0.25	0.50
8	16	0.25	0.50
10	16	0.25	0.50
12	20	0.25	0.50

14	24	0.25	0.50
16	36	0.375	0.50
18	36	0.375	0.50
20	36	0.375	0.50
24	36	0.375	0.50
30	40	0.50	0.625

Note: The steel casing shall be coated inside and outside with two coats of bitumastic paint prior to delivery on the job site.

- 6) Joint Usage of Casing Pipe
 - a) The subdivider shall not install any pipe in an existing steel casing that is being used for any other purpose without the written approval of the City.
- 7) Casing Pipe Installation
 - a) The subdivider shall install the steel casing pipe by the dry boring method. The subdivider shall bore the hole and install the casing through the soil simultaneously by a cutting head on a continuous auger mounted inside the casing pipe to the preceding section in accordance with the AWS recommended procedures. After the boring and installation of the casing is complete, the subdivider shall install a cleaning plug on the rig and clean the casing.
- 8) Rock Formations
 - a) In the event that rock is encountered during the installation of the pipe casing that, in the opinion of the City, cannot be removed through the casing, the City shall direct the subdivider to complete the crossing by installing a tunnel.
- 9) Tunneling
 - a) The subdivider shall install the tunnel liner in strict accordance with the Department of Transportation (D.O.T.) and/or Railroad Company requirements. The subdivider shall provide any special insurance coverage required by the governing body.
 - b) The tunnel installer shall have a minimum of five years of experience in the construction of tunnels of a similar size. The subdivider shall submit evidence of the installer's experience for review by the City.
- 10) Blasting Permits
 - a) Prior to any work involving explosives the subdivider shall make application to the D.O.T., or other appropriate agencies for a blasting permit. This permit will be in addition to any tunneling permit not involving explosives. The subdivider shall comply with all requirements and conditions of the permits including required submittals.
- 11) Traffic Control Requirements
 - a) The subdivider shall schedule the work so as not to interfere with or in any way endanger traffic flow on the highway or railway. The subdivider shall provide all required safety measures as specified in the Georgia Manual on Uniform Traffic Control Devices.
- 12) Tunnel Liner Plate Materials
 - a) Tunnel liner plates shall be manufactured from steel conforming with ASTM A569 with the following mechanical properties before cold forming:

- (1) Minimum tensile strength = 42,000 PSI
- (2) Minimum yield strength = 28,000 PSI
- (3) Elongation, two inches = 30%
- b) Liner plates shall be 10 gauge, with the neutral axis diameter shown on the drawings for each crossing.
- c) Minimum coatings required shall be galvanized in accordance with ASTM A 123 for liner plates and hot-dip galvanizing in accordance with ASTM A 153 for all other hardware. Additional protection required shall consist of a full bituminous coating meeting the requirements of ASSHTO M 190.
- d) All plates shall be punched for bolting on both longitudinal and circumferential seams or joints and shall be so fabricated as to permit complete erection from the inside of the tunnel. The plates shall be equipped with two inch standard pipe half-couplings welded into a hole in the center of the plate for grouting of voids occurring outside of the liner. Couplings shall be fitted with threaded cast-iron plugs. Bolts shall be no less than 5/8 inch diameter. The subdivider shall submit shop drawings showing details of the plates size, length and width for review by the engineer, the City and Georgia D.O.T.

13) Tunnel Construction Methods

- a) Liner plates shall be installed as soon as possible, but no more than five feet of tunnel shall remain unlined while tunneling operations are in progress. Not more than one foot of tunnel shall be left unlined at the end of the day's operation. The subdivider shall locate the liner plates with grout couplings at the top of the tunnel at intervals not to exceed five feet. Additional plates with grout couplings shall be installed on each side of the tunnel between the top couplings.
- b) Systems of standard pipe, fitting, hose, and special grouting outlets embedded in the liner plates shall be provided by the subdivider. Care shall be taken to ensure that the parts of the system are maintained free from dirt. Grout composed of cement, sand, and water shall be forced under pressure into the grouting connections. Grouting shall be started in the lower connections and shall proceed until grout begins to flow from upper connections. Connections shall then be made to these holes and the operation continued to completion.
- c) Apparatus for mixing and placing grout shall be of a type approved by the engineer and the Georgia D.O.T. and shall be capable of mixing effectively and stirring the grout and then forcing it into the grout connections in a continuous uninterrupted flow.
- d) After grouting is completed, pressure shall be maintained by means of stop cocks, or other suitable devices until the grout has set sufficiently. After the grout is set, grout holes shall be completely filled with dense concrete and finished neatly without evidence of voids or projections.
- e) After the tunnel has been completely constructed, the subdivider shall thoroughly clean the interior and shall place structural quality concrete of a strength approved by the City within the invert of the tunnel. The subdivider shall screen and trowel the top of the exterior of a pipe width placed on proper grade within the tunnel. As the pipe is jointed, it shall be drawn into position inside the tunnel.

14) Installation of Pipe in Casing or Tunnel

- a) After the installation of the casing or tunnel is complete, the subdivider shall install the pipeline by a method that has received prior approval of the designing engineer and the City.

15) Casing Pipe Closure

- a) The subdivider shall close the ends of the casing with four inch brick walls, plastered with Portland cement mortar. Brick and mortar shall meet the requirements for manhole materials.

16) Tunneling Closure

- a) A brick bulkhead shall be constructed at both ends of the tunnel with a drain at the lower end. The bulkhead shall be a three course mortared brick wall, plastered with Portland cement mortar and waterproofed with asphaltic roofing cement. Brick and mortar shall meet the requirements for manhole materials.

17) Boring Safety

- a) The subdivider shall provide all necessary bracing, bulkheads, and shields to ensure complete safety to all traffic at all times during the boring operation. All work shall be performed in such a manner as to not permanently damage the roadbed or interfere with normal traffic over it. If, in the opinion of the City, the installation is being conducted in an unsafe manner, the subdivider will be required to stop work and bulkhead the heading until suitable agreements are reached between the subdivider and the City. The City will not be responsible and shall be saved harmless, in the event of delays to the subdivider's work resulting from any cause whatsoever.

18) Tunneling Safety

- a) The subdivider shall begin the tunneling operation in a pit, sheeted and shored as necessary and being at and proceeding from one end. The subdivider shall observe all applicable requirements of all governing agencies and shall conduct the operations in such a manner that all work will be performed below the level of the roadbed. All work shall be coordinated and scheduled with all governing agencies.
- b) A temporary bulkhead against the face of the excavation shall be provided and placed during the cessation of work where the heading is within 20 feet of railroad tracks or highway pavement.

Q: Stream and Ditch Crossing

- 1) At all points where banks or streams or drainage ditches are disturbed by excavation or where natural vegetation is removed, the contractor shall carefully compact backfill and place rip-rap to prevent subsequent settlement and erosion.
- 2) This requirement applies equally to construction along the sides of a stream or drainage ditch, as well as the crossing of streams or drainage ditches. The contractor shall place rip-rap a distance of not less than 10 feet upstream and 10 feet downstream from any disturbed area. The actual distance of rip-rap will be determined by the inspector. Rip-rap shall be extended from one foot below the

stream bed to the top of the bank and shall be placed to conform to the natural slope of the stream bank.

- 3) The top of all sewers entering or crossing streams shall be at a sufficient depth below the natural bottom of the stream bed to protect the sewer line. In general, the following cover requirements must be met:
 - a) One foot of cover is required where the sewer is located in rock.
 - b) A minimum of three feet of cover is required where the sewer is not located in rock. The , in its sole discretion, may require additional cover depending on the size and flow rate of the stream.
 - c) Buoyancy calculations for pipes located below stream channels shall be submitted with the plans for review by the City.
 - d) The top of the sewer line shall be placed at least four inches below the bottom of the channel pavement for paved stream channels.
- 4) Sewer pipe crossing streams or drainage ditches shall be ductile iron pipe. Ductile iron pipe crossing streams shall be encased in concrete a minimum of five feet beyond the edge of each stream bank. The contractor shall use either stone rip-rap or sand-cement rip-rap throughout the job. The rip-rap shall meet the same material requirements as described above.

R: Concrete Piers

- 1) Support shall be provided for all joints in pipes utilized for aerial crossings. The support shall be designed to prevent overturning and settlement. Expansion jointing shall be provided between above ground and below ground sewers. For aerial stream crossings, the impact of flood waters and debris shall be considered. Ductile iron pipe with restrained mechanical joints is required.
- 2) The design of concrete piers shall be stamped and signed by a Professional Engineer licensed in the State of Georgia. Design calculations for concrete piers shall be submitted to the City for review and comment. The City, in its sole discretion, may require a certified geotechnical engineering firm to inspect and approve any and all phases of pier construction. The developer shall be responsible for hiring and compensating the City approved geotechnical engineer as required.

S: Testing and Acceptance

- 1) The City reserves the right to continuously and/or periodically inspect construction methods to ensure compliance with these specifications. Unless other provisions have been specifically approved by the City, sewer lines and related facilities will be inspected and tested by the contractor with testing certified by the City before acceptance or continuity is established with the City's system. All lines must be clean and obstructions removed prior to requesting inspection and testing. The contractor shall flush out lines and manholes before testing and inspection. All pipes not passing testing shall be considered unacceptable and shall be re-laid or replaced by the contractor or developer at the cost of the contractor/owner/ developer.

- 2) The contractor shall be required to test the sanitary sewer system for water tightness (and deflection if PVC) and all lines shall be televised.
- 3) The contractor shall conduct tests to determine the water tightness of the gravity sewers when completed. The City shall observe the tests with the contractor furnishing all labor, equipment and materials required in connection therewith. It is agreed that the sewer shall be tested in sections, each section extending between two adjacent manholes or from the end of the sewer to the nearest manhole. The contractor may with the City's approval elect to use either an infiltration test, an exfiltration test, or the low pressure air test.
- 4) Pipeline Exfiltration Test
 - a) The sewer at the upstream side of the lower manhole and the upstream side of upper manhole in each section shall be closed with a watertight bulkhead and the sewer filled with water until the water elevation in the upstream manhole is not less than two feet above the top of the sewer pipe or two feet above ground water elevation in the trench, whichever is higher. The exfiltration will be determined by measuring the amount of water required to maintain the above stated water elevation for a period of one hour from the start of the test. The entire length of section to be tested shall be filled and maintained full of water for a period of approximately 24 hours prior to the start of the test.
 - b) The amount of infiltration shall not exceed 50 gallons per inch of pipe diameter per 24 hours per mile of sewer in each and every section tested in accordance with the above.
 - c) In the event the allowable leakage rates are not met, the contractor shall determine the location(s) where excess water is entering or leaving the sewer. The sewer and/or the manholes shall be repaired in a manner satisfactory to the City and retested until the leakage in the sewer is within the allowable limits. All leakage tests shall be conducted under the supervision of the City or its representative.
- 5) Low Pressure Air Test Procedures
 - a) In lieu of performing an exfiltration test to determine the water tightness of the sewer laterals, the contractor may elect to perform a low pressure air test as specified in ASTM C828 for clay pipe, ASTM C924 for concrete, Uni-bell UNI-B-6-98 for PVC.
- 6) Deflection Testing of Gravity Sewers
 - a) All polyvinyl chloride gravity sewer lines shall be tested for excessive deflection. Testing for deflection shall be accomplished by the ability of the installed gravity sewer line to pass a go, no go mandrel test. A mandrel of not less than 5% allowable deflection shall be pulled through each section of sewer pipe at least 15 to 30 days after installation.
 - b) All pipes not passing this mandrel shall be considered to have reached the limit of its serviceability and shall be re-laid or replaced by the contractor or developer at no additional cost to the City.

- c) The City at its discretion reserves the right to have the PVC line retested for deflection utilizing a mandrel allowing 7.5% deflection at one year from acceptance, (ASTM D2122). No mechanical pulling devices will be used.
- 7) Mandrel Sizing
- a) The outside diameter of the mandrel shall be based upon 5% of the internal base diameter of PVC pipe stated in ASTM D 3034, Table 1, latest revision, and have dimension calculated by using the outside dimensions and the minimum wall thickness listed. The City shall approve all mandrels used by the contractor before the testing is performed.
- 8) Televising of Gravity Sewers
- a) All new sewer lines shall be inspected via televising. The contractor shall thoroughly clean the entire sewer system by jetting or applicable methods prior to filming to avoid refilming costs (see above). If conditions indicate repairs are necessary, refilming will be required, at the owners expense. However, the contractor may avoid refilming by performing all corrective work in the presence of an City inspector upon the City's discretion.
 - b) The initial filming shall be scheduled by the Engineering Department of the City when the contractor or developer advises that all lines are ready. The initial filming will be performed at the expense of the contractor, any additional televised inspection will be performed at the expense of the developer/owner/contractor reimbursable to the City at crew rates as specified in Chapter 4 of the City's Rules and Regulations. All filming shall be done by persons and/or firms qualified in such work, if required.
 - c) The contractor shall perform all filming (video taping) in accordance with the following requirements:
 - (1) All filming shall be on VHS format with speed as required to obtain optimal observation of any defects in the sewer line.
 - (2) Film shall be in good focus with a five foot minimum depth of field with adequate but not excessive lighting. A footage counter on the film must be provided.
 - (3) The camera drag line shall not obstruct the view of the flow line of the sewer pipe.
 - (4) The film, if performed by a firm other than the City, shall be submitted to the City in cassettes complete with a brief report as to the findings. The location and condition of service connections, water, debris, mud, etc., for each section between manholes and any observation of the filmer should be reported. A brief map or sketch on an 8 ½ inch x 11 inch sheet of paper of the improvements shall be supplied. The sketch shall indicate the following:
 - (a) The firm doing the filming
 - (b) Manhole number
 - (c) Distance between manholes
 - (d) Flow direction
 - (e) Street names
 - (f) North arrow
 - (g) Project name
 - (h) Date of filming

- (i) Distance to defects/problems
- (5) Each manhole on the film shall be marked with the following information:
 - (a) Manhole number
 - (b) Manhole to which the camera is traveling
 - (c) Size and material of the pipe
 - (d) Street name
 - (e) Date of filming
- 9) Force Main Testing
 - a) The contractor shall furnish, install and remove all temporary bulkheads, flanges, or plugs required to perform the pressure tests, and furnish all equipment and labor to carry out the tests. The contractor shall pressure test force mains at the pressure specified by the City measured at the lowest point. Tests shall be performed for a minimum of two hours at 250 PSI. Leakage shall not exceed the AWWA standards.
 - b) If leaks are detected the contractor shall locate, repair and retest the force main. The repair methods must be approved by the City. If the results are not totally satisfactory, the City may require testing for a longer period of time.
- 10) Vacuum Testing Manhole Structures
 - a) The contractor shall make arrangements to have each manhole tested under negative pressure (vacuum) in accordance with ASTM C1244 prior to acceptance by the City. For manholes located beneath pavement, vacuum tests shall be conducted after the base coat of asphalt has been laid. Cement based products such as grout and other brittle materials shall not be used to repair manholes that have failed a vacuum test. Acceptable repair products include Rubber Neck by K. T. Snyder or approved equal, applied to the clean exterior of the manhole.
 - b) The City, in its sole discretion, may require manholes that fail vacuum tests to be replaced in their entirety and retested.
- 11) Exfiltration Testing Manhole Structures
 - a) The City, in its sole discretion, may also require contractors to perform an exfiltration test on manholes in addition to the vacuum test described above. All exfiltration tests shall be witnessed by a City representative. Once all inlets have been plugged, the manhole shall be filled with potable water to the top of the ring. To pass the exfiltration test, the water surface in the manhole shall be no lower than ½ inch below the top of the ring after one hour.
 - b) Cement based products such as grout and other brittle materials shall not be used to repair manholes that have failed an exfiltration test. Acceptable repair products include Rubber Neck by K. T. Snyder or approved equal, applied to the clean exterior of the manhole.

T: Lift Station Standards

- 1) Lift stations must be designed by a Professional Engineer licensed by the State of Georgia and comply with the following City standards:
 - a) Design calculations, signed by a Professional Engineer, must be submitted to the City for review and shall contain the following computations:

- (1) Capacity at peak flow
 - (2) System head – tabulated and plotted on pump performance curve
 - (3) Cycle time – including starts per hour for peak flow and average flow conditions
 - (4) Buoyancy calculations
 - (5) Storage volume – show volume of storage available in the event of a power outage
- b) Drainage basin flow shall be calculated for the natural drainage basin area flowing into the proposed lift station. Flow calculations shall be based upon acreage, usage per established zoning, anticipated densities and development type if there is evidence of potentially greater wastewater flow being generated in excess of established zoning.
 - c) The lift station influent line invert shall be set so that all upstream gravity flow into the lift station can be achieved. The influent pipe shall be sized at a minimum slope per "10 State Standard" for basin flow with a peaking factor of 2.5 (or greater as specified by the City). This influent pipe shall be stubbed out to a point 20 feet from the pump station.
 - d) The lift station shall be sized based upon the anticipated upstream flow that will be realized in a seven-year period of basin development. The amount of development in a basin is judgmental and will be determined by the City.
 - e) The wet well shall be sized for peak flow conditions using a peaking factor of 2.5 (or greater as specified by the City). The allowable number of pump cycles per hour shall be determined by dividing the pump manufacturer recommended pump starts per hour by 1.3. The wet well shall have a plugged stub so that an additional wet well can be installed and interconnected when future flows dictate additional wet well storage. The stub out shall be at least as large as the influent pipe.
 - f) Pumps must be submersible pumps as manufactured by FLYGT, unless otherwise specified by the City.
 - g) The lift station layout shall be such that a driveway will access the pump loading point. The lift station access drive can be either paved or gravel as directed by the City. The pump station driveway slope shall not exceed 10%. Drives shall be minimum 12 feet wide, eight-inches deep crusher run per Georgia D.O.T. standards. The sub-base shall be compacted to 95% standard proctor per ASTM D698 standards.
 - h) The pump station layout shall be configured so the station can be expanded to the ultimate size to pump the ultimate upstream flow. Initial and future land requirements including access for the pump station shall be obtained by the developer and donated to the City in fee simple.
 - i) The force main shall be sized for a minimum of two feet per second flow with the pump station operating at minimum flow. All force mains shall be ductile iron pipe. Force mains shall have concrete thrust blocks as required at all bends. All fittings shall be mechanical joints. Air release valve locations and sizes shall be as required by the City. Sewer force mains must be marked by tape to identify the pipe as a sewer force main in order to prevent accidental water service taps.

- j) Pump motors shall be sized for the ultimate basin flow. Pumps shall be sized when possible so that ultimate basin flow conditions can be achieved by increasing impeller size.
- k) Surge valves shall be utilized when force main surges are in excess of 150 p.s.i. Surge valves shall be mechanical and shall be field adjustable from 0 to 100% of the rated pressure capacity.
- l) Either cushion swing check valve or hydraulic activated pump plug valves shall be used on the pump discharge as directed by the City. Pump check valves shall have adjustable rapid closure in the event of power failure. An accumulator system shall be utilized to actuate plug check valves in the event of water pressure failure. The accumulator shall operate all valves through two complete open and closing cycles.
- m) Dual electric feeds shall be provided from the utility grid when available. If dual feeders are not available, a generator receptacle shall be required with all motor control centers and shall be compatible with other like stations.
- n) Building architecture shall be per the requirements of the City. For pump station with pumps in excess of 120 hp, motor starters, motor control centers, and miscellaneous electric controls shall be housed in a building. Pump control panels for stations below 120 hp shall be pedestal mounted in a NEMA 4 enclosures. Pump stations shall sense wet well levels for stop-start pumps with floats.
- o) Lift stations shall have telemetry installed to monitor power failure, high wet well pump failure and other sensing points as required by the City.
- p) Lift stations shall have a six foot high security fence and security light. The security fence shall be topped with standard 3 strand barbed wire.
- q) A potable water supply line and backflow preventer is required on all lift stations. The water supply line must be capable of delivering a minimum of 20 gpm through a spigot located within the lift station fence.
- r) A wet well vent pipe with a bird screen is required on all lift stations.
- s) All sewer lift stations shall have either additional wet well storage for a total capacity of 24 hours at a reduced flow rate of 200 gpd per house or shall have a standby electrical generator with an electronic transfer switch that will automatically switch the station to generator power when the electric utility power system fails. The generator shall self-test at least once per week. Telemetry is required on all lift stations regardless of basin.
- t) The level control systems, telemetry and generator and all associated equipment shall be of a brand, type and configuration acceptable to the City and compatible with the City's existing sewer lift stations.
- u) A telephone jack and a 120v, GFI receptacle will be added to each lift station.
- v) The following is a listing of minimum requirements for generators:
 - (1) The standby generator shall be commissioned in accordance with NFPA 110 Standards. Provide factory test, startup by a supplier authorized by the manufacturer, and on-site testing of the system.
 - (2) The generator shall be housed in a weatherproof enclosure. Quiet site soundproofing shall be provided to reduce noise to 68 db at a distance of 7 meters for natural gas powered generators and 70 db at a distance of 7 meters for diesel powered generators. The City will determine the

generator fuel type on a case-by-case basis.

- (3) The entire standby generator set shall be warranted for a period of five years from the date of commissioning.
- (4) Outdoor weather-protective housing with critical grade exhaust muffler shall be installed. The housing shall have hinged side access doors and a rear control door. All doors shall be lockable. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturers standard color. Vibration isolators as recommended by the generator set manufacturer shall be provided. The generator must be mounted far enough away from obstructions to allow all doors to be opened 90°. All conduits and gas lines shall be installed underground. Equipment shall be installed on concrete housekeeping pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and seismic requirements of the site.
- (5) Generator shall be supplied with all auxiliary systems necessary for operation (i.e. batteries, battery charger, block heater, etc.).
- (6) Engine mounted, thermostatically controlled, coolant heater(s) shall be required for each engine. Heater voltage shall be as shown on the project drawings. The coolant heater shall be UL499 listed and labeled.
- (7) The coolant heater shall be installed on the engine with silicone hose connections. The coolant heater installation shall be specifically designed to provide proper venting of the system. The coolant heaters shall be installed using quarter turn ball valves to isolate the heater for replacement of the heater element. The quarter turn ball valves shall allow the heater element to be replaced without draining the engine cooling system or significant coolant loss.
- (8) An AC power connection box shall be provided for a single AC power connection to the coolant heater system.
- (9) The coolant heater(s) shall be sized as recommended by the engine manufacturer to warm the engine to a minimum of 100F (40C) in a 40F ambient, in compliance with NFPA110 requirements, or the temperature required for starting and load pickup requirements of this specification.
- (10) The generator set shall operate at 1800 rpm and at a voltage of as specified by the City. The power supply shall be three phase, four-wire, 60 hertz. Voltage regulation shall be plus or minus 1.0 percent for any constant load between no load and rated load. Random voltage variation with any steady load from no load to full load shall not exceed plus or minus 0.5 percent.
- (11) Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed plus or minus 0.25%. An electronic governor system shall provide automatic isochronous frequency regulation.
- (12) The generator set shall be provided with a mounted main line circuit breaker, sized to carry the rated output current of the generator set on a continuous basis.
- (13) The standby power system shall include an automatic transfer switch.

Transfer switch shall be rated for 100% of full load. This switch shall be provided with indicators for all phases of operation and be equipped with a fully programmable timer for exercising the equipment. The switch must be selectable for load or no load. The switch shall be configured with in-phase transition or neutral delay.

- (14) The generator shall be load tested at 100% full load on site for a period of four hours using resistive load banks. Notify City of Bremen inspector prior to test, and provide certification letter from the manufacturer.
- (15) Three complete sets of O & M manuals and keys shall be provided for the generator and the automatic transfer switch.
- (16) The generator control system must include a programmable control device to allow automatic start-up and test functions. Test functions can be programmed for daily, weekly or monthly testing (this will be in the transfer switch). Connections for remote monitoring of function and failure must be provided.
- (17) Pump stations are required to have continuous standby power. Generators rated 100 KW and below are to be installed to operate on natural gas. If gas is unavailable, a letter of exception must be obtained from City of Bremen. Generators above 100 KW shall be diesel powered with 100 gallons minimum fuel storage capacity or 24-hour operating time, whichever is greater. Fuel storage shall be accomplished by the use of corrosion-resistant double wall sub-base fuel tank only, no underground storage will be allowed. A leak detection device shall be provided in the interstitial space for sensing fuel leakage. The device contact shall be connected to the generator control panel terminals for telemetry.
- (18) Generators shall be a Generac Power System
- (19) The generator set shall be serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.
- (20) The generator manufacturer shall provide a 60-month comprehensive warranty to include parts and labor. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.
- (21) Transfer switches shall be in NEMA-4 enclosure obtained from the following manufacturers/representatives:
 - (a) Cummins-Onan
 - (b) ASCO
 - (c) Hubbell
 - (d) GE Zenith
- (22) The transfer switches shall be configured to switch back when power is restored to the station.
- (23) A generator ground grid shall be provided. The ground grid design shall be in accordance with the National Electric Code (NEC) and subject to City approval.

- (24) The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be not less than 4 hours in duration. Training date shall be coordinated with the facility owner.
- (25) Generator shall be sufficient in size to operate all pumps simultaneously in full load during a power outage.

U: Protection and Restoration of the Work Area

- 1) The contractor shall return all items and all areas disturbed, directly or indirectly, by work under these specifications to their original condition or better as quickly as possible after work is started.
- 2) The contractor shall protect or remove and replace with the City's approval all fences, piers, docks, walkways, mailboxes, pipelines, drain culverts, power and telephone lines and cables and other improvements that may be encountered in the work.
- 3) The contractor shall not disturb cultivated trees or shrubberies unless approved by the City. Any such trees or shrubberies that must be removed shall be heeled in and replanted under the direction of an experienced nurseryman.
- 4) The contractor shall not cut trees for the performance of the work except as absolutely necessary. Trees that shall remain in the vicinity of the work area shall be protected from damage from equipment. The contractor shall remove excavated material stored over the root system of all trees within 30 days to allow proper natural watering of the root system. All damaged trees over three inches in diameter shall be repaired by an experienced nurseryman. All trees and brush that require removal shall be promptly and completely removed from the work area and disposed of by the contractor. No stumps, wood piles, or trash piles will be permitted on the work site.
- 5) The contractor shall replant grass removed or damaged in residential areas using the same variety of grass when the first appropriate season occurs. Outside of developed areas, the contractor shall plant the entire area disturbed by the work in rye, fescue, bermuda, or other suitable ground cover upon the completion of work in the area. In all areas, the contractor shall promptly re-establish permanent grass to match or exceed original conditions.
- 6) Erosion and sedimentation control shall be per Georgia Environmental Protection Division standards and per the requirements of applicable local governmental standards. The contractor shall plan excavation work to prevent erosion and the washing of soil into adjacent streams. The contractor shall limit the amount of open excavation at any one time. Spoil shall be placed in the proper place and all natural water routes shall be kept open. Contractors must fully comply with erosion and sedimentation control act, and the National Pollutant Discharge Elimination System general permit where applicable.
- 7) The contractor shall dispose of all materials cleaned and grubbed during the construction of the project in accordance with the applicable codes and rules of the appropriate regulatory agencies, County, State and Federal.

- 8) Contractors must prevent discharges of pollutants onto soils and into surface water where applicable. Contractors shall comply with Federal Petroleum Spill Prevention rules set forth in 40 CFR 112.
- 9) Grease Traps
- 10) The following are the requirements for the Bremen-City Water and Sewer City relating to grease traps:
 - a) A Professional Engineer licensed in the State of Georgia must design traps and design calculations must be submitted to the City for review.
 - b) All garages, car washes, and auto repair facilities shall install a grease trap or oil separator.
 - c) All food establishments shall install a grease trap.
 - d) Grease traps are to be located outside of the building.
 - e) Grease traps are to process kitchen waste only. Sanitary sewage shall not enter the grease trap.
 - f) Grease trap volume shall be designed so as to ensure compliance with pretreatment standards as specified in the City's Rules and Regulations, latest edition.
 - g) The minimum grease trap volume is 1,000 gallons, provided all pretreatment standards are met. The developer shall submit all necessary calculations to justify the proposed grease trap volume.
 - h) All outdoor grease traps shall fall to a dedicated manhole that will be used for testing purposes (a.k.a. a test manhole). The test manhole shall have a single invert in from the grease trap and a single invert out to the sanitary sewer lateral. Sanitary sewage shall not be plumbed through the test manhole.
 - i) The City, in its sole discretion, may consider approving smaller indoor grease traps provided the restaurant has no indoor cooking facilities or dish washing facilities and the indoor grease trap is at least a 40 pound unit that will be located away from the sink.
 - j) The City, in its sole discretion, may require the installation of a grease trap if the development has the potential to discharge oil or grease to the wastewater collection (e.g., industrial facilities, food distribution centers, etc.).
 - k) In case of certain fast food restaurants or establishments that are operating 24-hours or with the potential to discharge large quantities of oils, grease, solids or wastewaters, larger grease trap capacities may be required. The Bremen-City Water and Sewer City may approve pre-packaged or manufactured grease traps with proper engineering and application review.

V: Sand and Grit Separators

- 1) The City, in its sole discretion, may require the installation of sand and grit separators if the development provides an opportunity for sand and/or grit to enter the sanitary sewer collection system.

Section X: Construction & Installation Standards – Stormwater

A: Scope

This specification covers the material requirements and installation procedures for all pipe, structures, and appurtenances to convey, detain, or treat stormwater runoff to be accepted into the City of Bremen (City) storm sewer system. However, this does not limit the City's ability to require and/or accept other materials, construction techniques, or engineering when deemed appropriate by the City. Any pipes, structures, or appurtenances which the City has reason to believe are not in conformance with these specifications will not be accepted. Where discrepancies may inadvertently occur between this document and the City's Rules and Regulations, the Rules and Regulations shall govern.

B: Quality Assurance

- 1) Craftsmanship/Workmanship
 - a) All materials and components will be installed in accordance with the manufacturer's recommendations or in accordance with the American Water Works Association (AWWA) recommended methods. The methods that will yield the most reliable infrastructure will be the required method and the decision as to which is the most reliable will rest solely with the City.
- 2) Applicable Standards
 - a) The subdivider shall supply all products and perform all work in accordance with applicable standards of the American Society for Testing and Material (ASTM), American National Standards Institute (ANSI), and the construction standards of the Georgia Department of Transportation (D.O.T.). Latest revisions of all standards are applicable.
- 3) Material Certification
 - a) If requested by the City, materials must be certified by the manufacturer as to having met applicable standards and tagged or marked such that tracking and identifying of materials requiring certification can be accomplished. Certification shall be supplied before installation can occur. Materials that are not specified by the City shall fully comply with construction standards of the Georgia Department of Transportation (D.O.T.).
- 4) Substitutions
 - a) Whenever a product is identified in the specifications by reference to manufacturers' or vendors' names, trade names, catalog numbers, etc., the subdivider may freely choose from those referenced products which ones he wishes to provide. Any item or product other than those so designed shall be considered a substitution. The subdivider shall obtain prior approval from the City for all substitutions.

C: Erosion Control

- 1) All subdividers are expected to comply with requirements to control erosion and sedimentation as set forth in local land disturbance permits and site design drawings. Erosion and sedimentation control measures shall be designed, installed, and maintained in accordance the Manual for Erosion and Sediment Control in Georgia, Latest Edition.
- 2) Subdividers must also comply with current requirements of the Georgia Rules and Regulations for Erosion and Sedimentation Control (Chapter 391-3-7) and the Georgia NPDES General Permit for Stormwater Discharges Associated with Construction Activities. Documents prepared for NPDES compliance such as Erosion Sedimentation and Pollution Control Plans, Monthly Reports, and other data collected for NPDES compliance such as rainfall measurements must be provided to the City upon request.

D: Pollution Prevention

- 1) Pollutants shall not be discharged into receiving waters of the storm sewer system. All discharges to the storm sewer system shall be composed entirely of storm water.
- 2) Subdividers must comply with the Georgia Rules and Regulations for Water Quality Control (Chapter 391-3-6).
- 3) Petroleum shall be stored, used, and handled in full accordance with the Federal Spill Prevention, Control, and Countermeasure (SPCC) Rule found in 40 CFR Part 112. Sampling and remediation shall be performed in accordance with Georgia Underground Storage Tank Rules in the event of a spill. All fuel nozzles shall have fully functional automatic shut off devices to prevent overspills. Fuel tanks shall be placed so as to be as far as possible from receiving waters or storm drains. The City may prohibit on-site storage of petroleum based products on the proximity of the site to receiving waters or wetlands. If any amount of petroleum impacts a body of surface water, the spill must be reported to the National Response Center at 1-800-424-8802 and the Georgia EPD at 1-800-241-4113. The City shall also be notified of any reportable spills or releases.

E: Pipe Materials

- 1) The subdivider shall notify the City when pipe is delivered so that City inspectors can inspect pipe for laboratory stamp, shape, cracks, uniformity, blisters and imperfect surfaces, damaged ends, and gasket grooves. The City will not accept or use repaired or patched pipe or pipe with repaired or patched gasket grooves or shoulders.
- 2) All pipe materials shall comply with standards of the local governing City(s). If not specified by the local governing City(s), materials must meet Georgia D.O.T. standards.

F: Excavation

- 1) The subdivider is to perform all excavation of every description and of whatever substance encountered to the depth shown on the approved construction drawings for all sewers, manholes, piers, conduits, and other appurtenances. All excavation is to be performed in strict conformance with the Occupational Safety and Health Act of 1970 (PL 91-596) or latest applicable revision. The subdivider is responsible for acquiring all applicable City and County permits.
- 2) Excavation shall be accomplished by open cut unless otherwise directed. No tunneling shall be done, except as approved by the City and/or directed by the County Road Department, the City of Bremen or the Georgia Department of Transportation. It is the responsibility of the subdivider to ascertain all permits required by all governing agencies prior to installing any sewer pipe or appurtenances beneath their roadway pavement.
- 3) The top portion of the sewer pipe trenches may have sloping or vertical sides to widths that will not cause damage to adjoining structures, roadways, pavements, utilities, and private property. For untimbered trenches and trenches held by stay bracing only, the width of the lower portion of the trench to a height of two-feet shall be as specified in the "Maximum Trench Widths and Depths" Section of these specifications. Where skeleton and solid sheeting is used, trench width may be increased to dimensions approved by the City, but shall not be greater than that necessary to clear the walls when lowering pipes into the trench. Where in the opinion of the City trench excavation may damage adjoining poles, roadways, utilities, and private property, the City may order suitable sheeting to be installed for their protection. Such orders shall in no way relieve the subdivider from that responsibility of protection of these facilities, nor shall the lack of those orders relieve the subdivider from that responsibility. If trenches are excavated to widths in excess of the above limitations, or collapse because of insufficient bracing and sheeting, the subdivider will be required to use special methods of constructing pipe foundations and backfilling as specified herein. All construction must meet or exceed OSHA Standards.
- 4) Trench excavation shall not advance more than 200 feet ahead of pipe laying, unless approved. The bottom of all trenches shall be smooth and flat and with backfill material affording full bearing of the pipe barrel. The depth and width required shall be as directed by the City. Excavation in excess of the depth required for proper trenching shall be corrected by one of the special methods specified herein, as ordered by the City. Bell holes shall be excavated in a manner that will relieve pipe bells of all load, and ensure support is provided throughout the length of the pipe barrel. Excavation in excess of the depths required for manholes and other structures shall be corrected by placing a sub-foundation of #57 stone, surge stone or some combination thereof.
- 5) If trenches are excavated to excessive dimensions or collapse because of inadequate or improperly placed bracing and sheeting, the pipe shall be laid using the next class of bedding. If over excavation for manholes and other structures occurs, the area under the structure or manhole shall be backfilled with granular bedding material to the required grade.

- 6) The subdivider shall provide bracing and sheeting when required by regulations or to prevent damage to adjoining structures, roadways, pavements, utilities, trees, or private property which are specifically required to remain.
- 7) Timber
 - a) Timber for shoring, sheeting, or bracing shall be sound and free of large or loose knots and in good condition. Size and spacing shall be in accordance with OSHA regulations.
 - b) Remove bracing and sheeting in units when backfill reaches the point necessary to protect the pipe and adjacent property. Leave sheeting in place when in the opinion of the City it cannot be safely removed. Cut off sheeting left in place at least two feet below the surface.
- 8) Steel Sheet Piling
 - a) Continuous lockjoint steel sheet piling may be substituted for timber sheeting when approved by the City. Steel piling may be removed, without cutting, provided the rate of removal is kept in pace with the tamping and backfilling operations to assure complete filling of the void created by the withdrawal of the piling. Complete withdrawal of the piling in advance of tamping and backfilling will not be permitted. Piling, where ordered to be left in place by the City for reasons of safety, will be cut off where directed.
- 9) Trenches requiring dewatering shall be dewatered continuously to maintain a water level at least 2 ft. below the bottom of the trench. Dewatering running sand shall be accomplished by well pointing. Where soil conditions do not permit use of well pointing, construct French drains of crushed stone or gravel to conduct water to a gravel filled sump. The subdivider shall have a stand-by pump available at all times while conducting dewatering operations. All accumulated water shall be removed from the trench before placing bedding or haunching, laying pipe or placing backfill.
- 10) Any problems arising from the dewatering process shall be the responsibility of the subdivider. Dewatering wells must be removed and all voids filled when the job is completed.
- 11) If, in the opinion of the City, the subgrade is by nature too soft and/or excessively wet for the proper installation of sewer pipe, the City may order the subdivider to undercut the ditch and backfill with crushed stone or gravel not larger than 3/4 inch in size and/or may order the subdivider to use D.I.P. The stone shall be brought to grade and compacted.

G: Rock Excavation

- 1) Rock shall be defined as any material that cannot be excavated with a backhoe having a bucket curling force rated at not less than 18,300 pounds (Caterpillar Model 215 or equal), and occupying an original volume of at least 1/2 cubic yard.
- 2) Where rock is encountered in trenches, it shall be excavated to the minimum depth that will provide eight inches or more clearance below the pipe barrel and manholes. Remove boulders and stones to provide a minimum of six inches clearance between the rock and any part of the pipe or manhole.

- 3) Only licensed blasting subdividers shall be employed and all blasting shall be monitored by seismographs. Liability insurance shall be required in the amount deemed appropriate by the City. The subdivider shall provide only experienced workmen to perform blasting. All blasting operations shall be conducted in accordance with all existing ordinances and regulations. All structures shall be protected from the effects of the blast. The subdivider shall be responsible for repairing any resulting damage. If the subdivider persistently uses excessive blasting charges or blasts in an unsafe or improper manner, the City may direct the subdivider to employ an independent blasting consultant to supervise the preparation for each blast and approve the quantity of each charge. The blasting subdivider shall be insured.
- 4) Excavated rock shall not be used as backfill material. Rock that is surplus or not suitable for use as rip-rap shall be disposed of.

H: Backfilling

- 1) The subdivider shall backfill all trenches fully to restore the ground surface to its original condition. Before heavy construction equipment is permitted to cross over a pipe, an earth fill shall be constructed to an elevation of at least three feet over the top of the pipe or to an elevation as required by the manufacturer, whichever is greater.
- 2) The subdivider shall dispose of all surplus material. Backfill material cannot contain any rock larger than six inches square or any trees, stumps or limbs. The right-of-way shall be cleared of all limbs, brush, trees, stumps, roots and rocks.
- 3) Suitable backfill material is earth material excavated from the trench that is clean and free of rock, organics and other unsuitable material. The subdivider should use extreme care when selecting the initial backfill material to be placed to a depth of 12 inches over the top of the pipe. This initial backfill material shall be free of all rock and clods that could damage the pipe in any way. If the backfill material excavated from the trench is not suitable for use as initial backfill material, the subdivider will obtain suitable materials elsewhere.
- 4) The subdivider shall place the initial backfill material carefully around the pipe or over the bedding material covering pipe in uniform six-inch layers to a depth of at least 24 inches above the pipe. Each layer shall be compacted thoroughly without disturbing or damaging the pipe. Caution should be taken when compacting backfill material above HDPE.
- 5) HDPE pipe shall be backfilled on both sides of all types of pipe simultaneously to prevent side pressures. Soil backfill shall be compacted by hand tamping until a depth of two feet above the top of the pipe is reached.
- 6) The subdivider shall compact the backfill in six-inch layers if using light power tamping equipment, such as a "jumping jack." The subdivider shall compact the backfill in one-foot layers if using heavy tamping equipment, such as a hammer with tamping feet.
- 7) Backfill to be placed under roads shall be compacted to 95% Standard Proctor Density per ASTM D 698 or as required by all local governmental agencies that

have jurisdiction over the road. Compaction tests may be required in existing or proposed streets, sidewalks, drives, and other existing or proposed paved areas at varying depths and at intervals as determined by the City with a minimum of one test on each job, and a maximum of one required test for each 400 feet of storm pipe installed unless soil conditions or construction practices, in the opinion of the City, warrant a need for additional tests.

- 8) If trenches settle, the subdivider shall remove bad material, fill and re-tamp to match adjacent grade.
- 9) Where trenches are along dirt streets and paved roads open to vehicular traffic or across driveways, the remaining 12 inches of backfill up to the traveled surface shall be made with crusher run stone, compacted and maintained until all removed pavement is replaced.
- 10) Where final grades above the pre-existing grades are required to maintain minimum cover, the subdivider is to supply additional fill material to meet the final grade requirements shown on the drawings. The subdivider may utilize excess material excavated from the trench if the material is suitable. If the excess excavated materials are not suitable, or if the quantity available is not sufficient, the subdivider shall provide additional fill material.

I: Collection and Distribution Structures

- 1) All stormwater collection structures including inlets, catch basins, junction boxes, and flared-end sections shall comply with applicable standards of the local governing authorities. Materials not specified by the local governing authorities must comply with standards of the Georgia Department of Transportation.

J: Headwalls

- 1) For pipe outlets where the 100 year 24 hour storm discharge velocity exceeds 5 feet per second, install a pre-cast, reinforced concrete headwall and adequate outlet protection. Headwalls shall be pre-cast and delivered without damage. Cracked or pitted surfaces are not acceptable. Seal pipe to headwall with non-shrink grout. Concrete shall have 28 day strength of 4000 psi and reinforcing bars shall be #4 bars with a yield strength of 6000 psi.
- 2) Install so that headwall spills onto outlet protection to dissipate energy and reduce velocity as needed to prevent erosion. Outlet protection shall conform to the Manual for Erosion and Sediment Control in Georgia, latest edition.
- 3) Pipe outlets with 100 year 24 hour storm discharges greater than 5 feet per second shall have headwalls or flared end sections along with reinforced vegetation (permanent erosion control blankets).

K: Rip Rap Stone

- 1) Stone rip-rap shall be composed of field stone or quarry stone. Stone shall be hard, angular, durable, and highly resistant to the action of air and water. Slabby or shaly pieces will not be acceptable. The stone's specific gravity shall be 2.5

or higher. At least 50% of the stones shall be 50 lbs. or greater. All rip rap shall be placed over geotextile filter fabric.

- 2) The subdivider shall embed the stone rip-rap neatly so as to form a compact layer at least 12 inches thick. The rip-rap shall be placed in such a way that the smaller stones are not segregated but evenly distributed. Chinking stones shall be placed in the crevices between the larger stones to produce a dense, well-graded mass.

L: Installation

- 1) The subdivider shall clear the permanent easement before excavating. The subdivider shall remove all trees, growth, debris, stumps, and other objectionable matter from the site. The construction easement should only be cleared if necessary.
- 2) The drawings shall show the alignment and grade of the storm sewer and the position of the manholes, headwalls, and other appurtenances. The grade line shown on the storm sewer profile and called for on the plans shall be the grade of the invert of the pipe. Pipe shall be laid so that the pipe bells are upstream to the direction of the flow. Inlets, catch basins, ponds, and other structures shall be installed so that locations and invert elevations match those shown on the design drawings.
- 3) It is the responsibility of the subdivider to locate all existing utilities along the path of construction.
- 4) The subdivider's drawings shall indicate all known underground utilities and obstructions. Where unforeseen underground utilities or obstructions are encountered, the location and alignment of the storm structures may be changed to avoid conflict(s) upon written approval of the City.
- 5) The subdivider shall lower pipe, fittings, and accessories into the trench by suitable means. The subdivider shall not drop or dump pipe or accessories into the trench.
- 6) Care shall be taken to keep the inlets, pipes, appurtenances, and other structures clean until final acceptance. The subdivider shall remove and replace defective or damaged pipe sections, riser sections, cover, headwalls, or other installed materials.
- 7) The subdivider shall excavate, lay the pipe, and backfill as closely together as possible. Unjointed pipe shall not be left in the trench overnight. The subdivider shall backfill and compact the trench as soon as possible after laying and jointing is completed. The exposed end of the installed pipe shall be covered with plywood or filter fabric each day at the close of work and at all other times when work is not in progress. If necessary to backfill over the end of an uncompleted pipe, the end shall be closed with a mechanical joint plug, however, backfilling shall commence only after inspection.

M: Construction Along Highways, Streets, Roadways and Streams

- 1) The subdivider shall comply with all construction operation requirements, safety requirements, traffic control requirements, road maintenance requirements and repair requirements of the local governing authorities and/or the Georgia Department of Transportation while installing any structures, storm sewers or appurtenance along highways, streets and roadways. Subdividers must obtain permits from the local governing authorities and/or the State before the construction begins. As required, City shall procure D.O.T. and County permits necessary to complete the project. The subdivider shall be responsible for obtaining any and all permits from other governing bodies necessary to complete the project.
- 2) These other permitting agencies include but are not necessarily limited to the following:
 - a) Georgia Environmental Protection Division (EPD)
 - b) United States Department of Agriculture – Natural Resources Conservation Service (USDA – NRCS)
 - c) United States Army Corps of Engineers
- 3) The subdivider is to provide and maintain suitable signs, barricades, and lights for traffic protection. All highway signs removed for construction shall be replaced as soon as possible. The subdivider shall not close or block any highway, street or roadway without first obtaining permission from the proper authorities. The subdivider shall provide trained and Georgia D.O.T. certified flagmen to direct and expedite the flow of traffic.
- 4) The subdivider is to perform all work along highways, streets and roadways to minimize traffic interference.
- 5) Where the pipeline is laid along road shoulders, the subdivider shall strip and stockpile all sod, topsoil, and other material suitable for shoulder restoration.
- 6) Trench excavation shall not be open cut any further ahead of pipe laying operations than is necessary. The subdivider shall backfill and remove excess material immediately behind laying operations.
- 7) The subdivider shall reshape damaged slopes, side ditches and ditch lines immediately after completing backfilling operations. Topsoil, sod, and any other materials removed from shoulders shall be replaced. The City, in its sole discretion, may require subdividers to place erosion control blankets in ditch lines to promote a permanent stand of grass.
- 8) The subdivider shall not place excavated material along highways, streets, and roadways in a manner that obstructs traffic. All scattered excavated material shall be swept off the pavement. If all material cannot be removed from the pavement, the subdivider is to notify the governmental agency having jurisdiction over the street or roadway so that they may assist the subdivider in clean up efforts. The subdivider shall be responsible for any fees or damage resulting from construction activity.

N: Removing and Replacing Pavement

- 1) The subdivider shall remove existing pavement as necessary for installing pipe line and appurtenances. The subdivider shall accept full responsibility for the

pavement/roadway during all construction activities. The subdivider shall also be responsible for securing all pavement cut permits from the appropriate local governing City.

- 2) CITY may procure permits from D.O.T. upon request from the subdivider. Prior to obtaining a D.O.T. permit, the City, in its sole discretion, may require the subdivider to post bond up to and including 100% of the cost of replacing the roadway impacted by the proposed construction activity.
- 3) Before removing any pavement, the subdivider shall mark the pavement neatly paralleling the pipe line and existing street lines. The marks shall be spaced the width of the trench.
- 4) The subdivider shall break the asphalt pavement along the marks by scoring with a rotary saw and breaking below the score by the use of jack hammers or other suitable tools.
- 5) No pavement shall be pulled with machines until it is completely broken and separated from the pavement that is to remain.
- 6) The subdivider shall not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, the subdivider is responsible for removing and replacing the damaged pavement.
- 7) Sidewalks shall be removed and replaced to their full width.
- 8) The subdivider shall remove and replace or tunnel under any curb encountered.
- 9) Driveways shall be removed and replaced to their full width to the satisfaction of the property subdivider.
- 10) The subdivider shall place the materials for pavement replacement to the dimensions shown on the drawings. The following types of sub-bases and paving will be utilized as replacement systems:
 - a) Graded Aggregate Base
 - (1) The subdivider shall furnish graded aggregate base (GAB) in two sizes of such quantities that the resulting mixture is well-graded from coarse to fine and meets the gradation requirements of Section 816 of the State Highway of Georgia Department of Transportation Standard Specifications.
 - b) Black Base
 - (1) The base for all paved roadways shall conform to the requirements of the Georgia State Highway Department of Transportation Specifications for the black base (Hot Mix). A pug mix rotary drum type mixer shall be used with a minimum capacity of not less than 50 tons per hour for asphalt production. The base shall be applied and compacted in two courses by asphalt spreader equipment of design and operation approved by the City. After compaction, the black base shall be smooth and true to establish profiles and sections.
 - c) Surface Course
 - (1) The surface course for all pavement, including paint or tack coat when required by the local governing City, shall conform to the requirements of the Georgia State Highway Department of Transportation Specifications for Asphaltic Concrete, Section 400, Type "E" (Modified Top). The

subdivider shall produce the surface course in an asphalt plant of the same type as noted above for black base. The surface course shall be applied and compacted in a manner approved by the City. Any high, low or defective areas shall be immediately corrected by cutting out the course, replacing with fresh hot mix and immediately compacting it to conform and thoroughly bond it to the surrounding area.

d) Concrete

- (1) The subdivider shall provide concrete and reinforcing for concrete pavement in accordance with the requirements of the Georgia State Highway Department of Transportation Specifications for Portland Concrete Pavement.
- 11) Pavement restoration shall meet the requirements of the regulatory agency responsible for the pavement. The subdivider shall obtain agency approval of all pavement restorations before requesting final payment. The subdivider shall obtain the City's approval of restoration of pavement not the responsibility of a regulatory agency such as private roads and drives. The subdivider shall complete the pavement restoration as soon as possible after backfilling.
- 12) Prior to replacing the pavement, the subdivider shall make a final cut in concrete pavement nine inches back from the edge of the trench. The subdivider shall make the cut using a rotary saw. Asphalt pavement shall be removed nine-inches back from the edge of the trench other suitable tools. The subdivider shall replace all street and roadway pavement as shown on the drawings. All driveways, sidewalks, and curbs shall be replaced with the same material and to the same dimensions as existed prior to construction.
- 13) Should any pavement restoration or repairs fail during a period of one year following construction or the warranty period, the subdivider shall promptly restore or repair all defects. All paving replacements must be acceptable to the appropriate governing body.

O: Boring

- 1) Where necessary all stormwater pipes under roads shall be installed by horizontal boring. The City may procure all bore permits from the D.O.T. at the request of the subdivider. Bonding provisions as noted in Section 12.1 shall apply. The subdivider is responsible for securing all bore permits from the appropriate local governing City. The subdivider shall furnish and install tunnel liner or pipe casing and install the pipeline therein in accordance with the following specifications.
- 2) The subdivider shall operate well points or drainage systems in the vicinity of the boring to prevent the accumulation of flood water or ground water in the bore pits or the pipe.
- 3) The subdivider shall take precautions to construct the tunnel so that no settlement of the overpassing roadway, railway or any other structure will occur. In order to prevent such settlement, the use of poling plates, breast boards, shields, and soil solidification or a combination of these methods may be

necessary. The City shall not be responsible for any damage that may result from the tunnel construction.

- 4) The subdivider shall furnish all material and equipment and perform all labor required to install steel pipe casing at the locations indicated on the drawings. Boring design and materials shall be per all AREA, AASHTO, Georgia D.O.T., and other applicable standards. Pipe under roadways must be reinforced concrete or ductile iron with a minimum inside diameter of 24 inches.
- 5) All construction must meet or exceed OSHA requirements. The subdivider shall provide all necessary bracing, bulkheads and shields to ensure complete safety to all traffic at all times during the boring operation. All work shall be performed in such a manner as to not permanently damage the roadbed or interfere with normal traffic patterns. If in the opinion of the City the installation is being conducted in an unsafe manner, the subdivider will be required to stop work and bulkhead the heading until suitable agreements are reached between the subdivider and the City. The City will not be responsible and shall be saved harmless in the event of delays to the subdivider's work resulting from any cause whatsoever. All construction must meet or exceed OSHA requirements.

P: Inspecting and Acceptance

- 1) The City reserves the right to continuously and/or periodically inspect construction methods to ensure compliance with these specifications. Unless the City has specifically approved other provisions, culverts, pipes, drains, manholes, inlets, structures, and related facilities will be inspected by the City before acceptance of the project. All structures must be cleaned and debris and sediment removed prior to inspection. When requested by the City, the subdivider shall flush out lines and manholes before re-inspection. Wash water from flushing systems shall not be discharged untreated into State waters or any part of the storm sewer system owned and maintained by the City. All pipes and structures that present a safety hazard, are not properly installed, are found to be damaged, or are otherwise unable to function as designed shall be considered unacceptable and shall be re-laid or replaced by the subdivider or subdivider at the cost of the subdivider/subdivider/ subdivider.
- 2) In the event that the City believes there to be material and/or installation defects that are not readily ascertainable from manual inspection, the City may require the storm sewer system be televised. Televising of stormwater pipes shall be done by the subdivider at no expense to the City. The tapes in their entirety shall be submitted to the City for review. Tapes shall be identified as described in the Sewer Construction Standards Section of these Specifications.

Q: Protection and Restoration of the Work Area

- 1) The subdivider shall return all items and all areas disturbed, directly or indirectly, by work under these specifications to their original condition or better as quickly as possible after work is started.

- 2) The subdivider shall protect or remove and replace with the City's approval all fences, piers, docks, walkways, mailboxes, pipelines, drain culverts, power lines, telephone lines, cables and other utilities and improvements that may be encountered during construction.
- 3) The subdivider shall not disturb cultivated trees or shrubberies unless approved by the City. Any such trees or shrubberies that must be removed shall be heeled in and replanted under the direction of an experienced nurseryman.
- 4) The subdivider shall not cut trees for the performance of the work except as absolutely necessary. Trees that shall remain in the vicinity of the work area shall be protected from damage from equipment. The subdivider shall remove excavated material stored over the root system of all trees within 30 days to allow proper natural watering. An experienced nurseryman shall repair all damaged trees over three inches in diameter. All trees and brush that require removal shall be promptly and completely removed from the work area and disposed of by the subdivider. No stumps, wood piles or trash piles will be permitted on the work site.
- 5) The subdivider shall replant grass removed or damaged in residential areas using the same variety of grass when the first appropriate season occurs. Outside of developed areas, the subdivider shall plant the entire area disturbed by the work in rye, fescue, bermuda, or other suitable ground cover upon the completion of work in the area. In all areas, the subdivider shall promptly re-establish permanent grass to match or exceed original conditions.
- 6) Erosion and sediment control shall follow practices set forth in the Manual for Erosion and Sediment Control, Latest Edition published by the Georgia Soil and Water Conservation Commission. Where applicable, subdividers, subdividers and subdividers shall comply with the Georgia NPDES General Permit for Stormwater Discharges Associated with Construction Activity issued and enforced by the Georgia Environmental Protection Division. When requested by the City, subdividers, subdividers and subdividers shall provide copies of documents prepared for compliance such as rainfall measurements, monthly monitoring reports, monthly inspection reports, notices of intent, notices of termination and other pertinent records.
- 7) Where applicable, subdividers, subdividers and subdividers shall obtain a locally issued Land Disturbance Permit (LDP) that shall be posted on the job site. The general subdivider shall have the primary responsibility to make sure that LDP requirements are met by all subdividers and subdividers. The City shall perform frequent inspections during dry weather and wet weather to evaluate compliance with LDP requirements and assess installation and maintenance of best management practices.
- 8) Structural and vegetative best management practices shall be installed to control erosion and sedimentation as specified on the erosion control drawings and the Erosion Sedimentation and Pollution Control Plan. If the City's Inspector determines that BMPs have not been properly installed or maintained as designed, the inspector may order whatever actions are deemed necessary to bring erosion control measures into compliance up to and including full replacement of the BMPs. If the City's inspector determines that properly

installed and maintained erosion control measures are not adequate to protect receiving waters, the inspector may order additional measures to be taken. Improvements ordered by the City must be made within 48 hours or a Stop Work Order will be issued.

- 9) The subdivider shall dispose of all materials cleaned and grubbed during the construction project in accordance with the applicable codes and rules of the appropriate regulatory agencies, County, State and Federal.

Section XI: Construction Standards – Streets

A: General

- 1) Unless otherwise specifically set forth herein: all of the materials, methods of construction, and workmanship for the work covered in reference to street construction shall conform to the latest specifications of the Georgia Department of Transportation (Georgia DOT).
- 2) All streets, roadways driveways, parking lots and alleys shall comply with the minimum standards set forth in this Ordinance.
- 3) All lines and grades shall be set by subdivider's engineer or surveyor.

B: Sub-grade Preparation

- 1) Sub-grade preparation on all non-local streets shall be in accordance with GA DOT specifications and these Regulations. Sub-grade preparation for local streets shall meet and pass proof roll testing.
- 2) If any section of the sub-grade is composed of topsoil, organic, or other unsuitable or unstable material, such material shall be removed and replaced with suitable material and then thoroughly compacted as specified for fill, or stabilized with stone or a geo-textile or geo-grid.
- 3) Fill shall be placed in uniform, horizontal layers not more than eight inches thick (loose measurement). Moisture content shall be adjusted as necessary to compact material to 95% of maximum dry density except for the top twelve inches, which shall be compacted to 100% of maximum dry density.
- 4) After the earthwork has been completed, all storm drainage, water, and sanitary sewer utilities have been installed within the right-of-way as appropriate, and the back-fill in all such ditches thoroughly compacted, the sub-grade shall be brought to the lines, grades, and typical roadway section shown on the plans.
- 5) Utility trenches cut in the sub-grade shall be back-filled as specified herein. Compaction tests at the rate of one per 150 feet of trench shall be provided to verify compaction.
- 6) The sub-grade must pass proof roll testing regardless of compaction test prior to placement of the base material. With the approval of the City, a geo-textile or grid may be used to stabilize a sub-grade that does not pass proof-rolling.

- 7) Provisions shall be made to drain low points in the road construction when the final paving is delayed. A break in the berm section is required when the curbing has not been constructed. After installation, drainage under the curb is required.
- 8) No base shall be installed without proof roll or inspection of subgrade.

C: Roadway Construction Methods

- 1) Roadway Excavation, subgrade, graded aggregate base (GAB), asphaltic concrete materials, and construction methods shall comply with the Georgia Department of Transportation Standard Specifications for Construction of Roads and Bridges.
- 2) Provide 95% compaction (Standard Proctor) of fills up to within one foot of final grade. Provide.
- 3) Provide 100% compaction in upper one foot of fill in area under paving and two feet outside paving area.
- 4) Provide 100% compaction for upper one foot of existing and/or residual soils under paving and two feet outside of paving perimeter, scarify and re-compact to 100%.
- 5) Graded aggregate construction shall conform to Georgia D.O.T. Standard Specification 310 Graded aggregate base (GAB) for all streets shall be coated with a bituminous prime coat prior to applying any binder or asphalt in accordance with D.O.T. Standard Specification 412. Adequate time shall be given for the prime coat to cure.
- 6) Tack coat shall be applied to areas adjoining existing pavement, at joints where paving may have stopped temporarily, and along curb facing. The compacted thickness of the Graded Aggregate Base shall not be more than 1/2 less than the required thickness at any point.
- 7) If the GAB is segregated in any area, it shall be reworked until adequate gradation for compaction is achieved.
- 8) The Subgrade and Aggregate Base construction shall be inspected by the City Engineer while being proof rolled with a loaded tandem axial dump truck.
- 9) Curb and gutter shall be set true to line and the grade of the street, horizontally field staked, and finished to the section shown on the plans.
- 10) Inferior workmanship or unprofessional construction methods resulting in unacceptable curb and gutter will be cause for rejection of the finished work. Disturbed areas along all curbing shall be backfilled, stabilized, and grassed.

D: Materials

- 1) All concrete shall be, at a minimum, Class "A" (as defined by GA DOT) and have a minimum strength of 3,000 psi at 28 days unless otherwise specified in these regulations.

Section XII: Administration, Enforcement, and Penalties

A: Adoption, Amendments, and Appeals

- 1) Adoption of the Land Subdivision Regulations: Before the Mayor and City Council adopts this resolution or an amendment to it, the City shall hold a public hearing thereon, and shall give at least a fifteen (15) day notice but, shall not exceed forty-five (45) days notice, of the time and place of the public hearing that shall be published in a newspaper of general circulation in the City.
- 2) Amendment to the Land Subdivision Regulations: The land subdivision regulations may be amended from time to time by the Mayor and City Council, but no amendment shall become effective unless it shall have been proposed by or shall have first been submitted to the Planning Commission for review and recommendation. The Planning Commission shall have thirty (30) days within which to submit its report. If the Planning Commission fails to submit a report within the thirty (30) day period, it shall be deemed to have approved the proposed amendment.
- 3) Appeals - Article XV of the Zoning Ordinance of the City of Bremen

B: Legal Status

- 1) Conflicts with Other Laws: Whenever the regulations of this resolution impose more restrictive standards than are required under any other statute, the requirements of this resolution shall govern. Whenever the provisions of any other statute require more restrictive standards than are required by this resolution, the provisions of such statute shall govern.
- 2) Separability: Should any section or provision of this resolution be declared invalid or unconstitutional by any court of competent jurisdiction, such declaration shall not affect the validity of the resolution as a whole or any part thereof which is not specifically declared to be invalid or unconstitutional.
- 3) Repeal of Conflicting Resolutions: All resolutions or parts of resolutions in conflict herewith are hereby repealed.
- 4) Violations and Penalties: Any person, firm or corporation or other legal entity violating any of the provisions of this resolution shall be guilty of a misdemeanor and upon conviction, shall be fined not less than fifty dollars (\$50.00) nor more than one hundred dollars (\$100.00) for each offense. Each day such violation continues shall constitute a separate offense. The City or any other owner of real estate who would be damaged by such a violation, in addition to other remedies, may institute an injunction, mandamus or other appropriate action in proceeding to stop the violation.
- 5) Effective Date: This resolution shall take effect and be in force from and after the date of its adoption, the public welfare demanding it.

ADOPTED:

BY THE MAYOR AND CITY COUNCIL
OF THE CITY OF BREMEN, GEORGIA .

COUNCILMEN:


J. CHRISTOPHER COATS


W. O. PARRISH

Attested: 
BEVERLY CASH, City Clerk


SHARON SEWELL, Mayor


W. STEPHEN McINTOSH


DANNY L. ROBINSON

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