

PART III

CONSTRUCTION

3.1 APPLICATION:

3.1.1 To obtain approval for:

- A service extension.
- Main extension.
- Request for service to a new project.
- Upgrade or change in use or occupancy that affects the water service requirements of the existing property.

The proposer must complete the applicable service application forms contained in Appendix "A" and submit them to the Kent County Water Authority along with all supporting documents as required for the project contemplated.

3.1.2 Application for service must be made in writing on the prescribed form, and signed by the owner or duly authorized agent. The application must fully state the purpose for which the water will be used together with the proper legal description of the property, official town or city street and property owner of the premises or property to be supplied. All accompanying design drawings, calculations and pertinent detailed project data must be attached to the application.

3.1.3 In all cases where fire hydrants or services may be required, a letter of review detailing the needed fire flow demand requirements for both hydrants and sprinkler system must accompany the application submission. The review letter shall be signed by the local fire chief or district authority. The letter shall also identify the number of municipal and private hydrants and parties responsible for payment of the service charges. The design for any private fire hydrants shall show placement behind a master meter with an approved style backflow preventer. Deed restrictions and easements, where appropriate, shall be required for all private hydrant or fire service installations.

3.1.4 The proposal package must be in full compliance with all the rules, regulations, policies and material requirements of the Kent County Water Authority, along with any pertinent state and local regulations or codes:

- Should the proposal package be found deficient in any manner during the initial review, a full resubmission shall be required.
- All documents, along with the revised "Request for Plan Review Application" form, must be contained in the revised submission. The revised submission

package shall include all pertinent information from previous submissions and two (2) sets of the revised plans.

- 3.1.5 It is expressly understood that the developer and/or proposer is entirely responsible for providing a project proposal package and design that is in full compliance with the current rules and regulations. The Kent County Water Authority assumes no responsibility for project proposal packages or design that do not fully comply with current Kent County Water Authority's requirements, Rules and Regulations.
- 3.1.6 Any proposer receiving a review letter from the Kent County Water Authority must, within seven working days, respond in writing to the Kent County Water Authority as to the proposer's intentions to continue with the review process and tentative date the revised submission will be forwarded for review. If a response letter from the proposer is not received within fifteen (15) working days from the review letter mailing, the Kent County Water Authority shall regard the application process to have been terminated by the proposer and dispose of the submission package on file. The proposer is solely responsible to pursue and fulfill the requirements for the water service application process.
- 3.1.7 Approved application documents may be disposed of if no action is taken to either construct the project or request an extension of the approval prior to the six month expiration as defined in Section 3.6.

3.2 MAIN EXTENSION:

- 3.2.1 Extensions of distribution mains to and within real estate developments, or extensions supplying undeveloped territory will be made by the Kent County Water Authority or by a private contractor under the observation of the Kent County Water Authority, at the sole expense of the owner, provided satisfactory grades are established, permanent rights of way and/or easements are granted to the Kent County Water Authority. Main extensions shall be appropriately sized to balance the dynamic flow and hydraulic needs of the system. In all cases, the minimum main size for an extension of this nature shall be not less than 8" in diameter. The installation of any main shall include extending across the entire front and/or span between the property boundaries of the property to be serviced and shall be looped to an existing main as required by KCWA.
- 3.2.2 In all cases where a dead end main is to be installed on a dead end street or cul-de-sac the Kent County Water Authority reserves the right to have the main extended to another existing main or looped back to the feeder main with proper valving to prevent a dead end main condition.
- 3.2.3 The owner shall also install a branch of appropriate size, tee, pipe, valve, and gate box at sites designated by the governing fire authority for fire hydrants. The cost of fire hydrants shall be borne by the owner.

- 3.2.4 Title to the property installed under the above paragraphs shall be conveyed to the Kent County Water Authority upon termination of the one-year warranty period following completion acceptance of the work by the Kent County Water Authority. During the warranty period, the owner shall be solely responsible for all repairs or replacement of defective materials. Booster pump, master metered configurations, and all piping and appurtenances downstream of these shall remain the property of the owner.
- 3.2.5 The "Owner" on extensions of this character, shall mean the developer or such other party or parties with whom the contract is made, and their successors or assigns.

3.3 FINANCING EXTENSIONS:

- 3.3.1 Upon approval of an application for installation of distribution mains by the Kent County Water Authority, the extension will be charged to the applicant based on an estimated cost. The full amount must be deposited before the commencement of any installation work can be accomplished. Full payment of all expenses in connection with a contract for extensions in real estate developments or undeveloped territory will be required in advance of the beginning of any installation work.
- 3.3.2 Upon completion of the installation, the Kent County Water Authority shall determine the final cost and either return the unused estimated deposit or require the balance to be paid in full prior to water service activation.
- 3.3.3 All distribution mains shall become and remain the property of the Kent County Water Authority upon termination of a one-year warranty period following completion acceptance by the Kent County Water Authority. During the warranty period, the owner shall be solely responsible for all repair or replacement of defective material. Once the warranty period has expired, the Kent County Water Authority shall maintain the same as long as there is sufficient demand for water service in said location.
- 3.3.4 The Kent County Water Authority reserves the right to require the owner to engage and pay for the services of a private contractor to make any required installation or repair associated with an extension of this nature.

3.4 CALCULATIONS:

- 3.4.1 A registered, professional engineer licensed in the State of Rhode Island shall prepare all mathematical calculations. They shall be signed and stamped prior to submission by the engineer who prepared them.
- 3.4.2 Thrust block calculations shall be based on 1,500 pound per square foot lateral bearing pressure on undisturbed soil at one and one half times the anticipated working pressure, but not less than 150 psi. Restrained joint pipe and devices shall

be calculated based on one and a half times the working pressure anticipated with a safety factor of 1.5 and in accordance with the manufacturer recommendation of the restrained pipe or devices.

- 3.4.3 Calculations for water flow use shall be based upon projected average day, maximum day, peak-hourly, and maximum day plus fire flow demands expected from the proposal. A registered, professional engineer duly licensed by the State of Rhode Island shall fully document usage factors for each water flow use scenario within the proposal.
- 3.4.4 The Hazen Williams formula for flow shall be utilized for all calculations- "C" Value shall be calculated for, 100, 120 and 140 to model the aging of the existing pipe servicing the area. Losses for any new main, meters, backflow devices, all valves, fittings and appurtenances shall be accounted for in the final calculations. Water allocation demand multipliers shall be applied to the average daily flow anticipated and assumed constant for each flow regime.

<u>Description of Use</u>	<u>Maximum Day Multiplier</u>
Residential Development	
- Single Family Residences	2.3
- Condominiums	2.0
- Apartments	2.0
Commercial/Retail/Office	
- Retail/"Box Stores/ "Strip" Mail	1.5
- Restaurant	2.3
- Office/Professional	1.5
- Hotel/Motel	2.0
Industrial/Manufacturing (excluding wet processes)	
- Light Manufacturing	1.5
- Heavy Industrial (No Wet Process)	1.5
- Wet Process Industrial (i.e. dying, etc.)	4.0*

*Requires more specific information regarding demand use patterns. Multiplier will be specific to particular type of usage anticipated.

Peak hour factors shall be determined by the engineer based on the use anticipated. Literature sources can be provided for this determination.

- 3.4.5 Residential/Condominium - One hundred gallons per capita (average daily flow per capita per day) shall be used in the calculations per person with a minimum of four

people per dwelling for a two-bedroom home. Use two people per bedroom for a dwelling exceeding two bedrooms.

3.4.6 Industrial & Commercial - all industrial and commercial flows shall be based on one or a combination of the following:

- Flow conditions calculated per capita (average daily flow per capita per day) for employees and calculated demands for operations.
- Actual flow conditions for similar installations.
- Two sources from current printed literature in the New England area relating to business activity.

3.4.7 Irrigation - All irrigation flows shall be calculated on maximum day flows for devices and at the maximum day flow condition. Assumption shall be that the occurrence or use occurs on the maximum day flow condition in all flow calculations. Timers or sensors shall not be considered as an operational method to off set the coincidence of the maximum flow condition. Irrigation flows shall be factored into all computer- modeling requirements.

3.5 TIME OF REVIEW:

3.5.1 Each proposal for review shall be submitted in sufficient time for the Kent County Water Authority to investigate all aspects of the proposal. A minimum of three (3) weeks from the date of receipt of the submission shall be allotted prior to any response concerning acceptance or denial of the proposal. Additional time may be required for large development review. Owner or developer should allow for additional review time in their planning process.

3.5.2 The resubmission process for plans not meeting the design, material, calculation, and/or modeling criteria contained within these regulations shall require a minimum of three (3) weeks from the date of receipt of the resubmission prior to any response concerning acceptance or denial of the proposal.

3.6 DURATION OF WATER SERVICE CONSTRUCTION APPLICATION APPROVAL:

3.6.1 All application approvals are effective for six (6) months from the date of issuance, and will be null and void thereafter. However, the General Manager/Chief Engineer may grant a one (1)-time extension of not more than six (6) months. Once started, water service infrastructure construction must progress in a continuous manner to completion. Water service installation, as proposed in the design submission, must be entirely completed and activated up to each service stop, within one (1) year from the date of issuance of the water service construction approval at which time the supply allocation expires. Re-application of the expired portion will be required. There is no guaranty to the access or availability of water from the Kent County Water Authority system, should the original approval period expire.

3.7 DRAWINGS:

- 3.7.1 The applicant must furnish drawings, showing the location of the premises to be supplied together with the location of all valves, pipes, hydrants, tanks, sprinkler heads, proposed connection points, applicable details, general notes, utility conflict corrections, and other appurtenances to be installed on the premises at the time of making the application.
- 3.7.2 The applicant also agrees to furnish the Kent County Water Authority with drawings showing revisions to piping or appurtenances. The drawings shall become and remain the property of the Kent County Water Authority.
- 3.7.3 Drawings shall be submitted on a maximum size of 24" by 36" prints. Two (2) sets shall be submitted at the initial submission for indication of comments during the review stage. If a project is to be implemented in stages or phases, a master plan showing the entire site development, including all future expansion areas shall be submitted for review during the first submission.
- 3.7.4 Drawings shall not be at a scale less than 1-inch per 40 feet and no more than 1-inch per 20 feet.
- 3.7.5 All site plans shall contain contours at a minimum of 2 foot intervals based on National Geodetic Vertical Datum (N.G.V.D.) and not with assumed elevations. Site plans shall include a locus map at a scale of not less than 1 inch = 2,000 feet and a north arrow.
- 3.7.6 A thrust block or restrained joint pipe table shall be included on the plan reflecting the size(s) for all thrust blocks length of all restrained pipe per fitting style and the accompanying fittings proposed.
- 3.7.7 All drawings are to be signed and wet stamped by a registered, professional engineer licensed in the State of Rhode Island under whose direction the design has been prepared.
- 3.7.8 All applicable details shall be shown on the drawing sets.

3.8 WATER SYSTEM MODELING:

Projects, which may have a significant or appreciable impact on the water system, shall require the applicant to provide the Kent County Water Authority with a computerized hydraulic simulation model of the proposed modifications to the existing system. Analysis shall include domestic, fire flow, and irrigation demands of the project. Supply into the Kent County Water Authority system shall be evaluated on a case by case basis when in the opinion of the General Manager/Chief Engineer the size or proposed demands of the

development warrants this type of review. The model shall incorporate all necessary and required aspects of the existing Kent County Water Authority system. When in the opinion of the General Manager/Chief Engineer the proposed system modifications are of such magnitude that a full simulation of the entire system is deemed necessary, the current engineering firm of the Kent County Water Authority will be made available, at a cost to be borne by the owner. All models shall be performed by acceptable standards and to the full requirements of the rules and regulations. Acceptable methods shall include, but are not limited the “Haestad Method”, "Kentucky Program" or “Cybernet” modeling with both steady state and extended period simulations as deemed appropriate by Kent County Water Authority. Model runs shall include, but are not limited to average day, maximum day, peak hour and maximum day plus fire demand scenarios. Modeling shall be required for all proposals meeting one or more of the following criteria:

- Residential development, ten (10) or more houses or condominium units.
- All industrial facilities or parks.
- All commercial facilities or parks.
- Application for service in an area of the system where pressure variations exceeds 50% of the average operating pressure.
- Application for service in an area of the system where elevation may impact the ability of the system to consistently provide the minimum pressure or volume requirements for service.
- At the discretion of the Kent County Water Authority

3.9 FIRE FLOW TESTING:

3.9.1 Fire flow testing of the local system and or computer modeling shall be performed for all proposals as follows:

- Residential development ten (10) or more houses or condominium units.
- All industrial facilities or parks.
- All commercial facilities or parks.
- As required by the General Manager/Chief Engineer on a case-by-case review depending on system conditions and location.

3.9.2 The fire flow test report shall be provided prior to review and final approval of the proposal. The report shall review in detail the assumption, formulas, actual test procedure and results. Diagrams shall be provided of the tested system with hydrant locations and orientation of the proposal. Tests results shall be numerically and graphically shown. The "Universal Water Flow Test Summary Sheet" as published by Fire Protection Publications shall be utilized for graphic presentation.

3.9.3 All tests shall be performed under the direction of a Registered Professional Engineer, registered in the State of Rhode Island, with all results certified, stamped and signed by the Registered Professional Engineer under whose direction the tests have been performed.

- 3.9.4 Additional computer modeling comparison may be required when, in the opinion of the General Manager/Chief Engineer, the system demands for the development requires it.
- 3.9.5 The developer or proposer shall provide written evidence from the local fire department or district reflecting the fire department or district review and approval of the fire flow test results and approval of the fire protection design installation based on the available flows and NFPA Requirements.

3.10 FEES:

- 3.10.1 Fees pertaining to water service and main extensions or construction observation/inspection shall be paid in advance to the Kent County Water Authority. A current fee schedule will be available at the Kent County Water Authority offices.
- 3.10.2 Upon request, Kent County Water Authority will provide an estimate of anticipated water consumption resultant from the pressure test, chlorination and flushing processes. The proposer in advance of commencing any of these procedures shall pay the estimated water consumption.
- 3.10.3 All legal fees associated with easements, application for water service or main extension and/or matters pertaining to construction shall be billed at cost to the owner.

3.11 NOTIFICATION:

- 3.11.1 The owner or duly appointed representative shall notify Kent County Water Authority as follows:
 - 3.11.1.1 No less than (5) working days prior to construction commencement on any type of service or main extension installed within the system.
 - 3.11.1.2 No less than three (3) business days prior to pressure testing and/or chlorination the proposer shall provide Kent County Water Authority with written notification, detailing the proposed event schedule, connection points, equipment to be used, method of accomplishment, and safety precautions to be taken.
 - 3.11.1.3 No less than five (5) business days prior to conducting fire flow testing the proposer shall provide Kent County Water Authority with written notification, detailing the proposed event schedule, connection points, equipment to be used, method of accomplishment, safety precautions to be taken. It may also be required to advertise in the Providence Journal, the fire flow testing date, time and possible testing effects to the affected

customers at the sole cost of the requesting party. Kent County Water Authority shall review and approve text prior to advertisement. Approval is a precondition of conducting the testing and/or submitting the advertisement for publication.

3.12 INSPECTION:

- 3.12.1 Inspection of all installations shall be conducted to ensure compliance with the rules and regulations of the Kent County Water Authority. Kent County Water Authority employees shall be given full access to the project at all times for inspection or observation of construction in progress as deemed necessary by the Authority. Failure to construct the new extension of the system as per the approved design drawings or Kent County Water Authority's Rules and Regulations will cause immediate cessation of all construction work. Inspection fees must be paid in full prior to commencing installation work.
 - 3.12.1.1 The owner or developer is solely responsible to control their contractor in the progression of work to ensure the water infrastructure installation is accomplished in accordance with the requirements contained in the Kent County Water Authority Regulations and approved design. Any part of the installation found to be noncompliant shall be immediately corrected at the owner's cost to the satisfaction of Kent County Water Authority.
- 3.12.2 Full time resident construction observation may be required at the discretion of the General Manager/Chief Engineer based on conditions of the design, site or complexity of the project. The owner or developer shall pay all cost associated with full time construction observation services. A deposit reflecting the estimated cost of the full time construction observation services shall be paid in full prior to commencing any work on the water infrastructure installation.
 - 3.12.2.1 The owner or developer is solely responsible to control their contractor in the progression of work to ensure the water infrastructure installation is accomplished in accordance with the requirements contained in the Kent County Water Authority Regulations and approved design. Any part of the installation found to be noncompliant shall be immediately corrected at the owner's cost to the satisfaction of the Kent County Water Authority
- 3.12.3 Design drawings annotated with construction record information concurrent with construction progress shall be maintained at the job site and shall be available for the inspector of the Kent County Water Authority to view at any time. Drawings and records shall be legibly marked and record actual descriptions of installation specifications, changes, modifications, product data, measurements, and details not shown on the original drawing submittals. Failure to have these documents available for review or failure to have the proper documents prepared or updated will cause immediate cessation of all construction work and disconnection from the Kent

County Water system until such time as positive action to comply with those requirements have been taken to satisfy the Authority.

3.13 AS-BUILT/RECORD DRAWINGS:

3.13.1 Upon completion of all water main infrastructure and appurtenance work, the developer/owner shall provide a preliminary as-built drawing documenting the record of actual construction. The preliminary as-built drawing shall be on 24" x 36" sheets, plan scale 1" = 40' for review prior to activation of the new construction infrastructure. Upon approval by the Authority, water service may be activated to facilitate development of the site.

3.13.1.1 The owner/developer shall provide revised as-built drawing reflecting measurements from the building foundations and above grade permanent structures and or visible accessible permanent features to water appurtenances such as bends, valve boxes, services and so on. Valve boxes, curb boxes and telephone poles are not considered permanent features to retain measurements from. The final as-built drawings set shall accurately mark the location of each infrastructure component or appurtenance as constructed including, but not limited to:

- Measured horizontal and vertical locations of the above and below grade water main, valves, fittings, services, and appurtenances, referenced to permanent surface improvements, above grade permanent structures, and/or permanent visible and accessible features of the installation.
- Information concurrent with the actual construction.
- Distance from the main to curb box at each service.
- Three point measured swing ties from permanent surface improvements, above grade permanent structures and/or visible and accessible features of the installation to identify all bends, services and end caps.
- Depth of main at maximum of 50-foot intervals. Ties at every 100-foot interval, each recorded service and at each bend.
- Total overall footage.
- Detail of water main tap connection and all utility crossings.
- The completed water main and its proper orientation.
- Valve opening rotation (open left or open right)

3.13.2 All as-built drawings shall be prepared under the direction of a registered professional engineer or professional land surveyor in the State of Rhode Island and so stamped and signed. As-built drawings shall not be accepted with disclaimers in reference to verification of measurements. As-built drawings shall consist of a cover sheet, standard details modified to as-built conditions and all plan sheets.

- 3.13.3 Upon approval of the “blue line” submission, a 6-mil, double matte Mylar media and print "wet stamped" by a professional engineer or professional land surveyor must be submitted of the final “as-built” record drawings and will remain the property of the Kent County Water Authority upon its approval and acceptance.
- 3.13.4 Upon final approval, the contractor shall also provide the “as-built” in Auto Cad, latest edition digital format acceptable to the Kent County Water Authority. Layers shall be assigned as indicated in Appendix H.
- 3.13.5 Water service will not be activated until all requirements of this section have been met to the satisfaction of the Kent County Water Authority.

3.14 RESTRICTIONS:

- 3.14.1 No new services, service pipes or extensions will be laid during the months of November, December, January, February and March, except at the discretion of the Kent County Water Authority, or when the additional expense incident to the climatic conditions is borne by the applicant.
- 3.14.2 All valves in the Kent County Water Authority system are the property of Kent County Water Authority and as such shall not be opened by any individual other than with the approval of and in the presence of the Kent County Water Authority's representative.
- 3.14.3 Existing services that will not be reused, resultant from demolition of a building, structure or change in the service size to construct a new building, structure or change the occupancy requirements shall be disconnected and plugged at the main.
- 3.14.4 All contractors are strictly forbidden from operating any hydrants or valves within our system without approval from the General Manager/Chief Engineer, and under the direction of an assigned Kent County Water Authority employee on scene.
- 3.14.5 No sidewalk or other public place shall be opened for the laying of service pipes until the property owner, through a licensed plumber or utility contractor, obtains a permit from the proper city, town or state agency.
- 3.14.6 A minimum of ten-foot horizontal separation shall be maintained in the placement of water mains, services or appurtenances within the vicinity of sewer facilities or vice versa. Where water mains cross sewer mains, the crown of the sewer main shall be at least 18-inches below the bottom of the water main. In cases where it is not possible to maintain a 10-foot, horizontal separation or in the case of crossing the eighteen-inch, vertical separation, a deviation from this restriction may be allowed on a case by case basis with prior approval from the General Manager/Chief Engineer as to the proposed materials and interventions to be taken to protect the

water system from the possibility of contamination. In all cases, force main sewer infrastructure must be located below water mains.

- 3.14.7 A minimum of 24-inches horizontal separation shall be maintained in the placement of water mains, services or appurtenances within the proximity of other utilities such as gas, drainage, electrical or telephone. Where water mains cross other utilities, the vertical separation between the water infrastructure and utility shall be at least 18-inches. The placement of other utilities in the proximity of water facilities shall maintain these separation distances. In cases where it is not possible to maintain these separation distances, a deviation from this restriction may be allowed on a case-by-case basis with prior approval from the General Manager/Chief Engineer as to the proposed design considerations.
- 3.14.8 In situations where new sewer main is being installed below an existing asbestos cement water main, the contractor shall replace the asbestos cement water main with a full section of ductile iron pipe. The replacement section of ductile iron pipe shall be centered over the sewer crossing.

3.15 EASEMENTS:

- 3.15.1 In some instances, easements may be necessary to facilitate proper maintenance and construction of water mains. All required easements provided, established or deeded to Kent County Water Authority shall be a minimum of 20 feet in width at all points within its extent and as long as necessary to cover the water main and services. Depending on circumstances, additional width may be required by Kent County Water Authority. Actual width of easement shall be determined at time of final review of the project.
- 3.15.2 All water mains shall be centered upon all easements as well as all services up to and including the curb stops and hydrants. A radius of 10 feet projected over the center of the curb stop shall also be included. No buildings, walls or other permanent structures may be constructed or installed within the easement. The owner or developer is solely responsible to have an accurate, professional survey and staking of the easement prior to construction and ensure the water infrastructure is installed within the prescribed easement.
- 3.15.3 The proposer or their representative, in a format acceptable to Kent County Water Authority Legal Counsel, shall write all easements to Kent County Water Authority at no cost to the Kent County Water Authority. All easements shall include metes and bounds descriptions. Metes and bounds shall be shown on both the design drawings and separate recordable set of easement plans size as required by the city or town for filing.
- 3.15.4 Easements shall be approved in content and signed by the Kent County Water Authority prior to filing. Executed copies of the filing shall be provided to Kent

County Water Authority within five (5) days of the filing and in all cases prior to service activation of the main. All easements shall be prepared and filed at no cost to Kent County Water Authority.

- 3.15.5 The property owner shall reimburse the Kent County Water Authority for all legal fees of the Kent County Water Authority associated with any easement in accordance with Section 2.3.17. Payment of legal fees must be received prior to the water service activation of the project.

3.16 TAPPING VALVE AND SLEEVE:

- 3.16.1 A visual inspection and air test of the assembled tapping valve and sleeve shall occur prior to cutting into the pipe. A final inspection of the assembled valve shall occur prior to backfill. An authorized representative of the Kent County Water Authority shall witness all tests.
- 3.16.2 Tapping sleeves shall be utilized in all cases where the main cannot be shut down for installation of a standard "T" connection.
- 3.16.3 All size on size tapping sleeves shall be full size cast iron or ductile iron, mechanical joint with stainless steel fasteners made in the North America, as approved by the Kent County Water Authority.
- 3.16.4 Sleeve couplings and accessories shall be pressure rated to at least equal that of the pipe. Couplings shall be ductile iron. The interior of the coupling shall be epoxy-coated in accordance with American Water Works Association ASTM & ANSI standards. Coating shall be thermosetting epoxy with a minimum dry film thickness of 10 mils and a maximum of 20 mils. Fabricated sleeves will be allowed only on ductile iron mains, cast iron mains or PVC mains with prior approval by the Kent County Water Authority.
- 3.16.5 All sleeves shall be installed in strict compliance with the manufacturer's recommendations; copies of the installation guidance shall be available on site during installation.
- 3.16.6 Water main on branch side of tapping sleeve shall be restrained in accordance with pertinent sections of the rules and regulations.

3.17 HYDRANTS:

- 3.17.1 The minimum depth shall be 5' – 0", as measured from the hydrant barrel bury line to the top of the pipe to which the hydrant is connected.
- 3.17.2 Hydrants shall be located a minimum of 2'-0" behind face of curb or edge of pavement. Where sidewalks are present, the hydrant shall be installed behind the

sidewalk face to provide for unobstructed pedestrian flow. Final placement of a hydrant must accommodate the 36 inch minimum horizontal clearance (ADA requirement) behind hydrant in path of pedestrian flow. In some situations, the setback location shall be as directed by the fire chief or as local ordinances dictate. In all cases the hydrant shall be positioned on the same side of the street as the main. A full 360 degree four (4) foot minimum diameter clear swing distance is required for full operation of the operating nut.

- 3.17.3 Hydrants shall be set plumb and at bury grade line, as set by the manufacturer with the steamer port facing the roadway. Under no circumstances, shall a hydrant installation obstruct driveways, roadways or pedestrian traffic on sidewalks.
- 3.17.4 Filter fabric shall be wrapped around the drain holes of the boot. Prior to backfilling and compaction, one cubic yard of 1/2" to 1" crushed stone shall be packed around the boot and hydrant valve up to the base of the valve box. Stone shall be wrapped in filter fabric, hole backfilled and compacted.
- 3.17.5 Hydrant isolation valves shall be connected directly to the swivel or anchor tee. An approved restrained gland style fitting shall be utilized on the hydrant boot side for restraint. Rodding of hydrants is strictly forbidden and the use of positive mechanical restraints, such as an approved restrained gland style fitting, is the only restraint system authorized. A thrust block shall be installed on the backside of the anchor tee. The manufacturer shall permanently coat all mechanical restraints against corrosion. The installer, prior to backfilling, shall repair any damage to the hydrant coating system.
- 3.17.6 Any proposer installing one (1) or more hydrants shall provide to Kent County Water Authority at time of installation a set of spare parts to include the following: one traffic repair kit, one full set of "O" rings and gaskets, one set of drain valve facings, one hydrant valve removal wrench and one hydrant operating wrench straight bar style adjustable. For every multiple of 3 hydrants an additional set of spare parts (minus wrenches) are required. All parts are to be properly labeled and housed in a carton with part numbers clearly indicated. All parts shall be original equipment replacement parts manufactured by the hydrant manufacturer.
- 3.17.7 Private hydrants shall have backflow prevention and metering included in the installation design specification. Approval by the General Manager/Chief Engineer shall be required prior to commencing work on any hydrant installation.

3.18 SERVICES:

- 3.18.1 All single-family residential units and condominium units shall be equipped with a standard of 3/4" service. Units over 200 feet from the water main shall be equipped with a water tight meter chamber and minimum of 1" service. Influent and effluent valves shall be provided inside the chamber before and after the meter. Service sizes

are to be determined by the owner's engineer based on pressure, supply and demand. A residential backflow device must be installed either directly after the meter or just inside the building foundation before the first tap to any appliance or pumping arrangement.

- 3.18.2 Commercial and multi family apartment services shall be sized appropriately to the demand application. Isolation valves shall be provided on the inlet and outlet side of the meter. A reduced pressure zone backflow device shall be installed directly after the outlet valve on the meter before the first tap to any appliance or pumping equipment.
- 3.18.3 Water services shall be located along the frontage of the property that borders the roadway of the recorded street address for the property. In situations where a water main does not currently exist across the frontage of the property the water service applicant shall be responsible to extend a full size water main to the property and along the entire frontage of the property. In order to avoid dead end conditions, the main may be required to be extended to complete an interconnection. This determination will be made by the General Manager/Chief Engineer of the Authority.
- 3.18.4 Each tap to the main shall be by an approved method and equipped with a bronze corporation stop "CTS" compression service side end. Each service shall be equipped with a curb stop, which shall be installed two (2) feet behind the face of curb or edge of pavement. Curb stop shall be bronze compression fitted and of no drip configuration. Direction of opening shall be open left. Curb box shall be installed directly over the curb stop and brought to finished grade. Box shall be "Buffalo" style 2-1/2 inch and sufficient length for full coverage. A 1' x 6" concrete ring or slab shall be installed to support the upper box in areas where the installation of the curb box does not occur within a paved or concrete sidewalk area.
- 3.18.5 Depth of services shall be at a minimum of five feet to finished grade throughout installation.
- 3.18.6 All fittings and pipe shall be swabbed with approved chlorine solution and cleaned of all foreign material prior to installation. The service pipe shall be disinfected and pressure tested prior to meter installation.
- 3.18.7 Identification tape as specified in the material fact sheet shall be utilized for the full length of services and set to a depth from finished grade of no more than 1'-0".
- 3.18.8 All services 1 1/2" or 2" require a saddle unless direct tapping equipment is available. Any service being installed on AC or plastic P.V.C. mains require a service saddle regardless of size.

- 3.18.9 A ball valve rated for the service pressure, shall be installed just prior to the location of the meter coupling, and one ball valve and residential backflow device installed immediately after the outlet side of the second meter coupling.
- 3.18.10 Services 4" and above shall be ductile iron and conform to the requirements for main and valve installation.
- 3.18.11 Service size shall remain consistent with the service tap size up to the point before the meter where service enters the building or meter pit.
- 3.18.12 In no instance shall two separate buildings or premises occupied by different owners be supplied by one service unless such service meets the requirements of master metering. Each building or premises shall have a separate outside shut off curb stop.

3.19 METER CHAMBER/PITS:

- 3.19.1 Chambers shall be hydrostatically tested and set so that the entrance manhole is at least 2" above the surrounding grade. Each pre-cast chamber shall be placed on 12" (min) compacted (95% Standard Proctor) structural gravel base. Depending on the size of the meter to be installed, an additional access point may have to be installed in the roof of the chamber over the meter mounting position. Small chambers (2" meters and below) shall be constructed with a similar type of frost proof gasketed manhole frame and solid cover, except for the size. Man size chambers shall be equipped with a Bilco type hatch, power lighting, heat, ventilation and automatic pumps.
- 3.19.2 Influent valve and effluent valves shall be provided inside the pit before and after the meter couplings. A backflow device shall be installed per plumbing code directly after the effluent valve and before the first appliance tap. Reduce pressure zone type backflow preventers must be installed in above grade enclosures not subject to flooding.
- 3.19.3 All meter pit chambers for services ¾" to 2" service pipe shall be configured so the meter can be accessed for installation or repair without reaching more than 12 inches into the pit. The pit shall be equipped with 12' copper whips of the same diameter as the service pipe, entering and leaving the meter pit.
- 3.19.4 Radio frequency reading devices are standardized. Each water chamber shall allow for the mounting of the radio frequency device as required by the manufacturer.

3.20 THRUST RESTRAINT:

- 3.20.1 Restraining devices shall be utilized on all mains under the following conditions:

- Pipeline direction changes (tees, bends), vertical and horizontal
 - Dead end lines (caps or plugs)
 - Transition pieces (reducers)
 - Valves on dead end lines
 - Hydrants
 - Tapping sleeves
- 3.20.2 Thrust blocks shall be designed to withstand the force imparted by the hydraulic influence encountered within the main. Minimum 1-1/2 times the anticipated working pressure of the main, but not less than 150 PSI. Maximum lateral bearing capacity shall be 1500 lb/sf.
- 3.20.3 All thrust blocks shall be constructed from concrete 3000 PSI. at 28 days, sized according to the size of pipeline, type of fitting, water pressure and the characteristics of the soil. Bearing surface shall be against undisturbed solid earth for the required bearing area. The concrete shall be properly formed as to slope for the given application and bearing width. The concrete shall be in contact only with the fitting, not with the pipe itself, fasteners or the joint. Curing time shall be a minimum of 7 days.
- 3.20.4 Stone, timber, concrete block or any materials that deteriorate are strictly forbidden to use as a permanent thrust block or restraint.
- 3.20.5 Optional thrust restraint shall be via restrained joint, ductile iron pipe meeting ANSI/AWWA C151/A21.51 and ANSI/AWWA C11/A21.11 and approved by the General Manager/Chief Engineer. Restrained joint pipe lengths (restrained length) shall be sufficient to restrain thrust imparted by 1-1/2 times the anticipated working pressure, but not less than 150 psi with a 1.5 factor of safety.
- 3.20.6 The use of tie rods may be allowed by written permission of the General Manager/Chief Engineer. This type of restraint configuration will only be considered in situations where approved types of restraint systems cannot be used. If allowed, they shall be of sufficient strength to withstand forces imparted to them. A factor of safety shall be 2.0 for all rod thickness calculations. All rods shall be stainless steel or protected from corrosion with two coats of epoxy paint.
- 3.20.7 Approved thrust restraint shall be by an approved restraining gland system utilizing in combination with mechanical joint pipe and fittings. All calculations must be contained in the application submission and shall be in conformance with the manufacturing requirements for length, fitting and type of restraint.

3.21 INSTALLATION METHODS:

- 3.21.1 Installation of all water conveyances, mains, pipes or lines shall be in accordance with the Ductile Iron Pipe Research Association's installation manual and ANSI/AWWA C600 and all other requirements of the Kent County Water Authority.
- 3.21.2 Water main and services shall be installed with a minimum cover of 5 feet to the crown of the pipe in an American Water Works Association "Type 5 Trench". Where unsuitable material is found at or below the grade of the placement of the pipe or fitting, the undesirable material shall be removed to the required width and depth and replaced with thoroughly compacted bank run gravel above the crown of the pipe.
Material shall be deposited across the full width and length of the trench in layers of not more than 12" in depth before compaction. Each layer, to within 12" of sub-grade of the permanent patch, shall be compacted to 95% Standard Proctor. The final 12" shall be processed gravel compacted in two (2) equal courses to 95% Standard Proctor
- 3.21.3 Each length of pipe and or fitting shall be inspected for cracks, defects in coating on lining, cleanliness or any other evidence of unsuitability.
- 3.21.4 Piping shall be laid straight true to line.
- 3.21.5 Air release manholes shall be installed at all high points throughout the proposed installation and shall be equipped with automatic air release valves. Manholes shall be located at roadway crowns or areas where it is free draining away from manhole covers.
- 3.21.6 Manholes shall be watertight pre-cast concrete constructed with watertight cast iron manhole frame (28" clear opening) and diamond check pattern cover. Outer cover shall have the word "WATER" cast upon it in 4" capital letters. The inner cover shall be gasketed with adjustable locking bar design. The chamber, frame, cover, and structural components shall be designed to withstand an H-20 wheel loading.
- 3.21.7 Manhole steps shall be of safety type, 12" on center and shall be cast into the units during the manufacturing process. The distance from the rim of the cover frame to the top step shall be no greater than 12".
- 3.21.8 The manhole chamber shall be fitted with leak tight mechanical pipe connections properly sized to fit the proposed water main. Manholes shall be vacuum or hydrostatically tested for watertight integrity of the manhole installation.
- 3.21.9 Horizontal joints between all barrels, top slab, bases, and entrances slab joints shall be sealed using a flexible butyl resin sealant conforming to Federal Specifications

SS-S-210A and AASHTO-M-198B or equal. The exterior of the manhole shall be completely coated and void filled with an asphaltic, waterproofing compound.

3.21.10 Line valves shall be installed at all intersections in a configuration that allows for isolation in all directions. On long lengths of main, valves shall be installed at a minimum of 800 feet intervals and at all dead end sections.

3.21.11 Pipe may be deflected in order to make MINOR adjustments in the alignment. All deflections shall be a maximum of 75% of the manufacturer's safe allowable deflection per pipe length as indicated in the following tables. It is required that bends in the pipe be accomplished by fittings wherever possible.

Allowable Deflection For
18-Foot Lengths Pipe

SIZE OF PIPE (In.)	PUSH-ON JOINT (In.)	MECH. JOINT (In.)
4	14	23
6	14	20
8 – 12	14	15
14 – 16	8	10
18 – 20	8	8
24 – 30	8	7

Allowable Deflection For
20-Foot Lengths Pipe

SIZE OF PIPE (In.)	PUSH-ON JOINT (In.)	MECH. JOINT (In.)
4	16	26
6	16	23
8 – 12	16	17
14 – 16	9	11
18 – 20	9	9
24 – 30	9	8

3.21.12 Whenever pipe requires cutting to fit the line, the work shall be done only by experienced (State of Rhode Island, licensed contractor) or plumber, and in such a manner as to leave a smooth end at right angles to the axis of the pipe and on pipe that is center rounded designed specifically for field cutting. The cut ends shall be beveled to conform to the manufactured spigot end. Particular care shall be exercised to prevent damaging the lining when cutting cement-lined cast or ductile iron pipe. Jointing of pipe or fittings shall be made only by persons thoroughly

skilled in this work. For pipe diameters 16" and larger, pipe cutting shall be done by machine.

3.21.13 Blocking under the pipe shall not be permitted except where a concrete cradle is proposed.

3.21.14 Metalized detectable identification tape 2" in width or greater, blue in color and printed with "CAUTION WATER LINE BURIED BELOW" shall be utilized over all mains. Set to a depth from finished grade of no more than 1' - 0".

3.21.15 A temporary patch shall be installed over the freshly backfilled trench in an existing street or sidewalk using hot bituminous concrete. It shall be at least 3" thick consisting of equal thickness layers of Modified Binder and Type I-1 Wearing Course. After 60 days, the temporary patch shall be removed and replaced with a permanent patch.

3.21.16 At all temporary cul-de-sacs and future streets, the main shall end with a full size line valve followed by a full length of pipe with an additional 3-foot section of pipe and end with a (MJ) cap, thrust block and 2-inch style blow off assembly.

3.21.17 Water Distribution mains shall be designed in a grid or loop type system to prevent the occurrence of dead end lines. When the potential for dead end lines exist, the contractor shall make every effort to pass the main through the development to the next existing distribution line.

3.21.17.1 In all cases where a dead end main is to be installed on a dead end street or cul-de-sac the Kent County Water Authority reserves the right to have the main extended to another existing main or looped back to the feeder main with proper valving to prevent a dead end main condition.

3.21.18 Water mains shall be laid with a minimum of ten-foot horizontal clearance from any existing sewer facilities. The distance shall be measured edge to edge. Water mains crossing under sewers shall be forbidden. Water mains crossing over sewers shall be laid to provide a minimum, vertical separation of eighteen-inches between the invert of the water main and the crown of the sewer. Re-alignment of an existing water main or relocation of the sewer may be necessary to achieve this vertical separation. The General Manager/Chief Engineer must approve any deviation from these requirements. Concrete encasement shall not be allowed in the design for sewer and water main crossings.

3.21.19 At all times, during construction, all piping and fittings shall be kept from becoming contaminated from construction materials, dirt, non potable water, yard waste or substances produced as a result of animals, rodents, and insects. Without exception, all stored piping shall be timber cribbed above grade, and shall be fitted with watertight plugs or plastic sheet securely fastened to the pipe. All valves, fittings,

and appurtenances shall be fitted with caps, plugs or plastic sheet securely fastened to the fitting. The implementation of these protective measures is required to reduce the significant loss of water and labor hours expended during multiple attempts to sufficiently clean the new mains to meet the water quality standard set by the US EPA Primary Drinking Water Regulations.

- 3.21.20 Adequate, temporary provisions shall be made to care for the flow from sewers or drains interfered with by the work. All necessary measures shall be taken to prevent sewage or other contaminating matter from entering the water main. Any broken or damaged utility connection or services (water, sewer, gas, telephone, electric, etc.) shall be fully repaired at the expense of the party responsible for the damage. Underground structures shall be thoroughly supported or otherwise protected to maintain uninterrupted service.
- 3.21.21 Pipe that is removed shall remain the property of the party whose responsibility it shall be to properly dispose of it. For example, if a private contractor is authorized to do this work, the contractor is the responsible party and must dispose of the pipe.
- 3.21.22 No person, except an authorized representative of the Kent County Water Authority or under their observation, will be allowed under any circumstances to tap the mains or distribution pipes, insert corporation stops therein, set or remove meters on service pipes, or interfere with water gates or curb stops.
- 3.21.23 No new piping system shall be permanently connected to an existing Kent County Water Authority main until after obtaining successful results from water quality tests from a State of Rhode Island certified laboratory meeting the standards set by RI Department of Health, and water quality test indicate that the samples are consistent with the quality of water in the Kent County Water Authority system, including heterotrophic plate count results.
- 3.21.24 Temporary fittings for flushing, pressure testing and chlorination are required for all newly installed mains. New mains shall be capped at each end. Each end shall be fitted with a temporary riser of sufficient length to reach finished grade and an isolation valve. The live main tap shall be fitted with an isolation valve, two feet of main that is restrained, restrained cap and temporary riser of sufficient length to reach finished grade and an isolation valve. Risers and isolation valves shall be sized to provide a flushing water velocity of at least 2.5 feet per second based on the installed main size. A meter and testable backflow preventer is required to be placed in the jumper line between the existing and new main prior to obtaining water for any process. Depending on the size of the main, multiple taps and backflow preventers may be required to provide the required velocities within the new main.

3.22 PRESSURE TEST:

- 3.22.1 All services, water mains, bypass piping and appurtenances must be installed prior to commencement of any test. A pressure test shall be conducted on all completed water lines prior to acceptance. The proposer, at no cost to the Kent County Water Authority, shall accomplish the pressure test. An authorized representative of the Kent County Water Authority shall witness the test.
- 3.22.2 Each valve section of the main shall be filled slowly with water at a rate no greater than one foot of pipe section per second. All air shall be released via corporation stops, hydrants, and installed automatic air release fittings. All air must be removed and the full pipe shall sit idle for a period of 24 hours prior to commencement of the pressure test. Piping installations greater than 1,000 feet shall be accomplished in sections no greater than 1,000 feet.
- 3.22.3 The test pressure shall be brought up to at least 50% higher than the normal anticipated working pressure, or 150 PSI, whichever is greater, and maintained for a continuous two (2) hour period. An authorized representative of the Kent County Water Authority shall witness the test. Any loss of pressure indicates a leak, and no pipe installation will be accepted with any leakage.
- 3.22.4 Proper thrusting of all pipefitting, caps, hydrants, and appurtenances shall be provided to resist the imposed test pressure.

3.23 CHLORINATION/DISINFECTION:

- 3.23.1 All new or repaired potable water system distribution mains, service pipe and the necessary connecting pipes, fittings, control valves, and all appurtenances in or adjacent to any residence, building or premises shall be purged of deleterious matter and shall be disinfected prior to utilization or permanent connection to the Kent County Water Authority system. That portion of the customer's service pipe after the curb stop shall be disinfected under the supervision of the local plumbing official. The owner must provide written laboratory certified documentation of the disinfection test results to the Kent County Water Authority before making any permanent connection to the Kent County Water Authority system or before reactivation of any existing water service can be authorized. Please refer to appendices for program requirements of the Customer Water Service Disinfection Policy.
- 3.23.2 The proposer or the contractor for the proposer, in accordance with Chapter 5, Distribution System Chlorination, American Water Works Association manual #20, shall perform chlorination. Tablet chlorination shall not be allowed.
- 3.23.3 The owner or customer is responsible for all costs associated with the disinfection process or procedure.

- 3.23.4 The disinfection must result in eliminating from the various parts of the new pipe line any evidence of the existence, therein, of bacteria indicative of any contamination, as determined by tests of the bacterial content of samples of water taken from the new water main. The disinfection may be accomplished by introducing into all the various parts of the new water mains, a liquid solution containing 1% available chlorine in such volume that the rate of dosage to the water mains shall be at least 50 parts per million of available chlorine. Tablet chlorination is not allowed. The contact period for this disinfection shall be at least 24 hours, and a longer period will be required if tests of residual chlorine show it to be necessary for proper disinfection.
- 3.23.5 The new water system shall be flushed out after disinfection and refilled with fresh water. All chlorinated water used in the disinfection process shall be de-chlorinated prior to discharge to the surrounding area.
- 3.23.6 Water must sit in the main for at least 24 hours prior to taking a test sample. Water utilized for this purpose, flushing or pressure testing, which is obtained directly from the Kent County Water Authority system, must flow through an isolated connection to the Kent County Water Authority system via an approved meter, testable backflow prevention device and jumper line. The contractor shall make all necessary arrangements for securing the water for test purposes and shall bear the expense of these arrangements. The installer shall furnish and install suitable temporary testing plugs, caps, pumps, pipe connections and other appurtenances, as necessary, to obtain samples at points no further than 1,000 feet apart.
- 3.23.7 After final flushing and before the new water main is connected to the distribution system, two consecutive sets of acceptable samples for coliform bacteria and heterotrophic plate count (HPC), taken 24 hours apart, shall be collected from the termination of the new main. At least one sample shall be collected every 1000 ft. of new main, plus one set of two samples from the end of the line. At least one set of two samples shall be taken from each branch. Samples shall be collected by Kent County Water Authority employees, given a two-day notice, and tested by a laboratory approved by Kent County Water Authority. A fee shall be imposed for the sampling testing for each test. The fee shall be at the current rate schedule in effect at the time of testing. Payment shall be prior to sample collection by the Kent County Water Authority. The water sample test results must indicate that the water quality in the new main is consistent in quality with the Kent County Water Authority system water.