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**PADUCAH WATER  
STANDARD SPECIFICATIONS AND PROCEDURES**

**SECTION 1: PROCEDURAL REQUIREMENTS**

**1.0 General**

1.0.1 All developers must request and obtain approval of plans for proposed water mains to be installed within the Paducah Water (PW) system by the developer. The request must be in writing and addressed to the PW in care of the general manager.

1.0.2 All work performed on any water mains and/or appurtenances that are owned or anticipated to be owned by Paducah Water shall be completed under the direction of PW adhering to an acceptable plan approved by PW.

**1.1 Design (Plans, Specifications and Support Documentation)**

1.1.1 Water Main design must be submitted to PW by a professional engineer licensed in the state of Kentucky who shall be designated as the engineer of record. The plans are to be submitted in duplicate in care of the General Manager at 401 Washington Street for preliminary review and approval by PW personnel. This project may be eligible for approval under PW's general permit, which allows PW to approve the project without its being submitted to the Division of Water. Section 2 gives project qualifications for consideration under the general permit. Copies of Section 2 signed and sealed by the engineer of record shall accompany the submittal for qualification under the general permit.

1.1.2 All corrected design submittals must be dated, stamped, and signed by a licensed Kentucky professional engineer. They shall be submitted in advance of the proposed beginning construction period and prior to submittal to the Kentucky Division of Water.

1.1.3 Unless modified, deleted, replaced, or otherwise changed the latest published edition of the following documents shall be accepted standard procedures and/or materials specifications for the construction of water main installation and appurtenance:

- a. Paducah Water Standard Specifications and Procedures;
- b. Natural Resource and Environmental Protection Cabinet, Division of Water - Kentucky Drinking Water Regulations latest revision; and

c. American Water Works Association's Standards (AWWA).

1.1.4 Plans submitted to PW for approval shall be on a minimum plan scale of **1" = 50 feet**. The plan sheets shall be **24" x 36" size** sheet unless otherwise approved by PW. It is strongly recommended that the design engineer meet with PW prior to submittals for review of the overall project. It is required that the design engineer meet with PW prior to submittals if approval is sought under the general permit.

1.1.5 All improvement plans shall consist of street layout, lot or building layout and number, and existing and finished grade contours if available. Locations of other utilities that may be in conflict with the proposed water main location and notation of the utility easement shall be shown on the plan view. All pipe installation depth shall be a minimum of forty-two (42) inches below the adjacent street/road sub-grade or the adjacent finished contour if known. The lowest elevation shall prevail unless otherwise approved by PW. A material quantity sheet is to be placed on the plan sheet for the total materials to be used for construction.

1.1.6 All commercial, and/or industrial development shall be constructed of class 51 ductile iron pipe, shall be unless otherwise approved by Paducah Water during the project review. All residential pipe shall be class 51 ductile, class 350 ductile or AWWA C900 for pipe  $\geq 4"$ . No pipe will be allowed  $<4"$  in diameter.

1.1.7 To allow for future extensions of the water system in an orderly manner, the water system shall be constructed entirely across the developer's property LIMITS, which have a potential for future development, unless otherwise approved by PW at the time of preliminary review.

1.1.8 For projects not being eligible under the general permit, drawings and specifications must be approved and stamped by PW prior to submittal to the Kentucky Division of Water. PW will return one copy of the approved drawings and specifications to the owner, along with a letter of approval within two (2) weeks of submittal or two (2) weeks from submittal of corrected drawings and/or specifications. A total of five (5) completed drawings, together with the same number of specifications, shall be sent with the approval letter to the Kentucky Division of Water for their approval. **The letter of approval from the Division of Water must be received by PW prior to commencing of any construction per KY regulation 401 K.A.R. 8:100.**

1.1.9 One (1) copy of the final subdivision plat shall be submitted to PW, along with two (2) copies of the approved design plans prior to construction.

1.1.10 Three (3) sets of the material shop drawings shall be submitted to PW by the general contractor prior to the commencement of any construction.

1.1.11 All new water mains shall be installed in a fifteen (15) foot minimum dedicated easement and adjacent to front property lines unless otherwise approved by PW upon the preliminary plan review. The location and notation shall be shown on the plan view drawing.

**1.2 Deposit** - A deposit of Five Hundred Dollars (\$500.) per lot for single housing subdivision, a maximum of Ten Thousand Dollars (\$10,000.), or Two Thousand Five Hundred Dollars (\$2,500.) per lot for commercial subdivisions, a maximum of Twenty-five Thousand Dollars (\$25,000.), **must be paid to PW prior to beginning construction.** Simple interest shall be paid on deposits for the total number of days the deposit is held. The interest will be based on the average rate of a six (6) month certificate of deposit from The Paducah Bank and Trust Company, Firststar Bank, and Union Planters Bank on the day PW accepts the money for deposit. In lieu of a cash deposit, a twelve-month non-revocable Letter of Credit may be issued to PW.

**1.3 Agreement and Waiver** - An Agreement and Waiver must be signed by the developer and submitted to PW **prior to beginning construction.** The Agreement and Waiver shall be in the form of "Agreement and Waiver Residential" or "Agreement and Waiver Commercial" as applicable, see Exhibits 1 and 2.

**1.4 Permits** - The developer shall obtain all permits for roadway and railway encroachments. This will include The Corps of Engineers, City of Paducah, McCracken County Government, Kentucky Division of Water Flood Plain Management Section, and the Kentucky Department of Transportation.

## **1.5 Construction**

1.5.1 **No construction of water mains shall begin until approvals are received by PW from all necessary agencies.** Approvals shall expire in 12 months if construction does not begin during that time.

1.5.2 **No construction of water mains shall begin until all deposits and the Waiver and Agreement form have been received by PW.**

1.5.3 PW must approve all persons and/or companies involved in the construction of public water supplies. PW must have past references of projects completed for any contractors or superintendents submitted for approval prior to construction. This is to be submitted to PW by the Engineer.

1.5.4 Kentucky Underground Protection, Inc. must be notified forty-eight (48) hours prior to excavations for construction. All nonmember utilities shall also be notified forty-eight (48) hours in advance of excavations.

1.5.5 Prior to commencement of the work, the contractor shall do the following:

- a. Attend a preconstruction meeting with the engineer of record and Paducah Water;
- b. Notify the Engineer and PW, of the project Superintendent's name and telephone number for any messages and/or after hour emergencies during the construction period; and
- c. Notify the Engineer and PW three (3) days in advance of when construction will commence.
- d. Notify PW where materials can be inspected 24 hours prior to construction.

1.5.6 The contractor shall be responsible for maintaining a set of record plans which will reference all bends (horizontal and vertical), valves, etc. to three (3) major features. The installed water line shall be referenced to edge of pavement every 100 feet with the exception of cross-country lines installed. In addition, the contractor shall give a depth of main at each reference point along the alignment. Also the type of material used and manufacturer's name and model or casting number shall be listed. This information shall be released to the Engineer at the end of the project to be placed onto the as-built record drawings. A set of PW approved drawings and specifications shall be available at the job site at all times.

1.5.7 The contractor shall be responsible for all trench settlement for one (1) year after the warranty inspection has been completed by the Engineer and PW.

## **1.6 Inspection**

1.6.1. PW will periodically inspect any or all aspects of construction. PW reserves the right to stop construction due to faulty construction procedures. The representative for PW will also be the contact person for all construction aspects to include chlorinating, disinfecting, pressure testing, coliform samples, main taps, tie-ins and any field changes during the construction project. PW will inspect all mechanical joint fittings, valves, and hydrant assemblies prior to backfilling. Any of these backfilled before inspection shall be exposed at the contractor's expense.

1.6.2 PW requires that all private development projects be inspected by the project design engineer. The level of inspection may vary from project to project dependent upon the project's complexity. Some projects will require periodic inspection while others may require full-time inspection to assure all work has been completed in accordance with state and local specifications. **The level of inspection required will be determined by Paducah Water prior to construction based upon the complexity level.** During the inspection, the inspector is required to keep a set of as-built drawings, meeting standards that are specified on Section 1.5.6.

1.6.3 Construction inspection reports shall be completed by the design engineer's inspector on a daily basis and copy forwarded to PW on a bi-weekly time period throughout the project.

1.6.4 Paducah Water project inspector must be given proper notification for testing, sampling, taps, tie-ins and public notification (at PW discretion) to insure proper inspection of these procedures. Notification shall not be less than a 24-hour advance notice for these procedures.

## **1.7 Working Hours**

1.7.1 PW representative shall be available for inspection Monday through Friday between the hours of 7:00 a.m. and 3:30 p.m. To avoid overtime and additional expense, no work shall be done in excess of the forty (40) hours per week and on Saturdays, Sundays, or legal holidays, unless otherwise authorized by PW.

## **1.8 Clean-up and Restoration**

1.8.1 The contractor shall maintain clean-up operations along the line of work and near any structures. Clean-up shall include the removal of all deleterious materials, i.e. refuse, rubbish, scrap material, and debris. The finish dressing of all areas shall be done to the satisfaction of the Engineer and PW. Restoration shall include maintenance of any settled trenches and landscaping if required. No item of work shall be completed until the clean-up and restorations are accomplished.

## **1.9 Potable Water Taps**

1.9.1 All taps of PW mains shall be made by PW personnel only or other agencies who have received a written authorization to do so by PW.

1.9.2 PW will schedule the main taps in conjunction with the project superintendent upon approval of prior testing and after all tap fees have been paid in full at the PW business office.

1.9.3 No connections shall be made to potable water mains without the express approval of PW.

1.9.4 Paducah Water inspector shall be on site at time of taps and tie-ins and placement of thrust restraints by the contractor. The contractor shall give a two working day notice prior to tap prep and tie-in.

1.9.5 The main shall be properly flushed upon completion of all tie-ins.

## **1.10 Tap Fees**

1.10.1 All connection fees must be paid in full prior to tapping of existing potable water mains.

1.10.2 All specifications must be satisfied prior to field connections to potable water mains.

## **1.11 Project Certification**

1.11.1 **As-Built Drawings** - After all tests are completed and tie-ins are made and prior to deposit refund or release of Letter of Credit, the owner or engineer shall submit to PW one (1) copy of the conformance (as-built) drawings as recorded by the on-site engineer, technician, inspector, or contractor. The copy submitted shall be a **reproducible mylar**. If the firm has the capacity, the as-built shall also be submitted on a CD in AutoCAD **dwg** file or a Microstation **dgn** file. After completion of this item, a request should be submitted for return of all deposits.

1.11.2 **Engineer's Project Certification Letter** - In addition to the submittal of the as-built drawings as specified above, a letter of certification shall be submitted to the PW that the proposed installation has been constructed and tested in accordance with plan specification for the project. Certification shall be in writing with a licensed Kentucky professional engineer's signature and seal on the face of the certification documents.

## 1.12 Final Inspection

1.12.1 After the project is completed, PW will call for an inspection with all interested parties included. After the inspection, a punch list of items to be completed will be given to the developer and/or contractor.

## 1.13 Warranty Period

1.13.1 After the water main is tied-in, it is considered substantially complete. A one (1) year warranty will become effective per a written notice to the developer. The developer (owner) will maintain the new water main until the one (1) year warranty is completed.

1.13.2 After the one year warranty has lapsed, PW will accept full ownership for inclusion into the system, providing no additional repair is necessary and no outstanding complaints or debts are held against the new section. There shall be no compensation to the developer/owner by PW.

## 1.14 Maintenance Period

1.14.1 The developer shall be responsible for the maintenance of the installed water main and appurtenances to Paducah Water Standards for a period of not less than one (1) year from the date the new main is placed in service. Approximately ten (10) months after the main has been placed in service, an inspection will be conducted by PW and the design engineer to ensure that the water main and appurtenances were installed and maintained to PW standards. If the ten (10) month inspection reveals that the installation does not meet the standards, the developer and contractor shall be notified in writing to correct all discrepancies and/or problems within sixty (60) days after notification. If the problems are not corrected within the sixty (60) day time period, PW shall make the corrections at the expense of the Developer.

## 1.15 Fire Protection

Definition – Any pipe from the valve at the city supply main to the double check detector riser location inside of the building shall be tested by the contractor and witnessed by PW.

1.15.1 All water for fire protection in public buildings shall be supplied by fire lines installed as a **separate line** independent of all **domestic water** lines.

1.15.2 All design submittals must be submitted to PW for review and approval by PW personnel. They shall be submitted in duplicate in care of the

General Manager at 401 Washington Street. A hydraulic calculation sheet **shall be submitted prior** to final design of new public or private buildings to be sprinkled or otherwise protected by using the public water supply. See Section 1.15.1.

1.15.3 Water Works personnel shall make all fire line taps and provide a tapping valve at the nearest water main. **The developer shall expose the water main providing adequate area to allow a safe and correct method to complete the tap.** PW shall be given a minimum of forty-eight (48) hours notice to complete the tap. The developer shall be responsible to **obtain all permits from other agencies** necessary to allow final connection to the fire line at the tapping valve. The developer shall place the concrete thrust restraint (kicker) behind the valve sleeve prior to activation of the line by PW. The smallest fire line valve provided shall be two (2) inch.

1.15.4 All fees shall be paid at the business office of Paducah Water, 401 Washington Street, Paducah. The necessary fees shall be paid to the PW **prior** to any work by the Water Works.

1.15.5 All fire lines shall be of **ductile iron pipe** class 51. All material necessary to complete the connection to the valve supplied shall be the responsibility of the developer.

1.15.6 All fire lines shall be connected to potable water mains only after disinfection and pressure testing has been certified and approved by PW. See testing and disinfection procedures, sections 3.13 and 3.14.

1.15.7 All fire lines shall be tested separate of any potable water main.

1.15.8 All fire lines shall have a double detector check valve backflow preventer or reduced pressure principle detector check backflow preventer located at the building prior to any connections to potable mains. The type of backflow preventer will be determined by PW at the preliminary plan review step. Each installation shall be in accordance with the requirements specified in the Kentucky Building Code, latest revision. See Detail No. 13. The property owner shall be responsible for maintenance and operation of the backflow assembly and compliance with reporting and testing requirements as required by state and local enforcement agencies. The property owner shall be responsible for the maintenance of the underground piping from the supply main up to and within the building.

## 1.16 Meter Settings

1.16.1 All meter settings and meters will be set by PW, see PW Standard Detail No. 01, unless otherwise approved in writing by PW.

1.16.2 **Meter Boxes** - All meters will be located as close to the main as possible. They will be placed on or near the water user's front property line if it is adjacent to the main.

1.16.2 **Cross Connections** - Paducah Water is required by law, KRS Statute 8:020, Section 2(2), to take every precaution to protect the public water system from any and all cross-connections originating from the customer's system, that may allow the backflow of pollutants and/or contaminants. If at any time a cross-connection is discovered, Paducah Water reserves the right to discontinue the affected meter setting until such time as a separation can be constructed with all testing and verification procedures necessary to satisfy all standards.

1.16.3 **Irrigation Meters** - All underground irrigation systems shall be installed separate from all house service lines and shall have their own separate meter with no relation whatsoever to domestic services. All irrigation meters shall be protected from contamination by adequate and approved backflow prevention devices, see PW Standard Detail No. 01.

## **1.17 Mobile Home Parks**

1.17.1 Mobile home park developments that wish to have individually metered lots shall conform to PW Standard Detail No. 16. They will adhere to the same requirements as apply to residential subdivision developments or Detail No. 16A which will allow the developer to have a minimum two (2) inch main to serve the proposed mobile home park and placement of flush hydrants at each dead end.

1.17.2 Mobile home park developments that adhere to Detail No. 16A installation shall have a master meter placed at the city's supply main. The developer shall be responsible for maintenance of the supply line, meter settings, flush hydrants, and service lines to the mobile home.

1.17.3 All meter settings shall be installed per PW Standard Detail No. 17.

## **1.18 Retail Business Plaza Development**

1.18.1 All retail business development requesting individual unit metering shall adhere to PW Standard Detail No. 22A. Ductile iron pipe shall be used within this type of development, and the development shall be constructed

entirely across the property limits to allow for future extensions of the public water supply main. PW shall require this main to be a looped system, prohibiting the water main to terminate with a dead end, unless otherwise approved by PW (see Section 3.8.)

1.18.2 The unit meters shall be installed by PW upon completion of the water main construction and testing. The meters are to be located within a raised median area as indicated on Detail No. 22.

## SECTION 2: PW GENERAL PERMIT WATER LINE CONSTRUCTION

PW may, at the request of the entity submitting drawings and specifications, and subject to the project qualifications listed below, approve the project without the project being submitted to the Division of Water.

### **Project Qualifications:**

The water mains are  $\geq 4$  inches or  $\leq 12$  inches The project does not exceed 10,000 contiguous feet of pipe.

The water demand for the project does not cause the water system to exceed 85% of water available. (Contact PW to determine whether this project meets these criteria.) The project does not require any variance or deviations from the PW standard specifications.

The project meets or exceeds the appropriate PW standard specifications. The project includes no pump stations, storage tanks, or water treatment facilities. There are no funding or regulatory requirements for the project to be reviewed and approved by the Kentucky Division of Water.

The project includes no "Special Use Waters" for stream crossings, as defined by the Kentucky Division of Water.

The project is designed with appropriate measures to aid the utility in maintaining water quality standards. This includes appropriate looping, proper line sizing for reducing water age and adequate capability for main flushing. There are no cross connections on the project.

The undersigned (the Owner or the Owner's authorized representative) hereby certifies that the project qualifications have been met and requests approval of this project under the General Permit.

---

Owner or authorized representative

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Date

## **SECTION 3: TECHNICAL DESIGN AND CONSTRUCTION STANDARDS**

**3.1** PW has established and maintains Technical Design and Construction Standards for all water main projects constructed under the General Permit.

**3.2** PW has established procedures to assure water mains are constructed in accordance with the Technical Design and Construction Standards.

**3.3** The Professional Engineer of record shall insure the plans and specifications meet or exceed the Technical Design and Construction Standards.

### **3.4 Hydraulics**

3.4.1 Water mains shall be sized to meet the demand anticipated for the total development being designed. The design engineer and/or developer is responsible for properly sizing the water mains to meet the required demands of the development, both peak domestic and peak fire demands. Commercial, industrial, and residential developments (including subdivisions) are to submit along with the design plan a hydraulic analysis study report of the expected maximum water demand usage for fire protection and for domestic use.

3.4.2 Residential developments shall use a peak demand of 10 times square root of the potential number of customers. Peak demands for the existing area shall be obtained from PW. The hydraulic analysis shall demonstrate that any mains where hydrants are proposed are capable of carrying fire flows.

3.4.3 The hydraulics analysis shall demonstrate the proposed water main extension can be flushed at least 2.5 fps, while keeping system pressure above 20 psig within the pressure zone of the proposed project.

3.4.4 The hydraulics analysis shall demonstrate the proposed water main extension maintains 45 psig under peak demand.

3.4.5 The hydraulic analysis shall demonstrate the proposed water main extension does not drop ground level pressure in any part of the pressure zone below 20 psig under all conditions of flow.

3.4.6 Pressure greater than or equal to 45 psig shall be available on the discharge side of all meters, unless otherwise approved by PW.

3.4.7 PW may require the construction of a larger main than proposed by the developer's engineer, if it is determined that a larger main is necessary to

serve domestic and fire demands projected in areas tributary to the proposed installation. Note: this would generally only occur in areas where PW has determined the need for a transmission main. When this occurs, PW may consider to share the cost differential of construction with the developer to construct the larger size main.

### 3.5 Water Main Diameter(s)

3.5.1 Water mains under the general permit shall have a diameter equal to or greater than 4 inches and less than or equal to 12 inches

3.5.2 Water mains with a diameter less than 6 inches shall not have fire hydrants.

### 3.6 Hydrants (See Drawing 3 and Drawing 21 for details.)

3.6.1 Fire hydrants shall be connected only to water mains adequately sized to carry fire flows and in no case to lines smaller than six (6) inch. Fire hydrants shall be located on or as close to side property lot lines as possible in residential and industrial subdivisions, with the **fire hydrant pumper nozzle to face the roadway.**

3.6.2 For each fire or flush hydrant, auxiliary valves shall be installed in the hydrant supply pipe.

3.6.3 Hydrant drains shall not be connected to or located within 10 feet of sanitary sewers, storm sewers, or storm drains.

3.6.4 Fire hydrants for all commercial and residential subdivisions shall be installed throughout the development at approximately 450 to 500 foot intervals as recommended by Paducah Water. The contractor or developer shall be responsible for the cost of the fire hydrant(s) and hydrant accessories.

3.6.5 At the contractor/developer's option, hydrants required by PW may be purchased from PW at its cost plus 10% if not available locally. PW shall bill the responsible party for the materials purchased. The billing shall be paid within thirty (30) days of the invoice date.

3.6.6 All hydrants, including new and/or relocated hydrants, shall be field painted by contractor or owner after installation. The color is to be specified by Paducah Water.

3.6.7 All fire hydrants located in a high traffic commercial development area shall be placed at a 6-inch raised concrete median with four (4) – six (6) inch steel bollard posts filled with concrete placed adjacent to the hydrant, according to PW Standard Detail No. 10.

3.6.8 All hydrants shall be connected to the main on a hydrant anchoring tee – **no exceptions** – see the Materials Specification and PW Standard Detail No. 03.

3.6.9 All hydrant valves shall have the specified valve box and shall be installed as close to adjacent contours as possible. All valve boxes shall have the standard concrete pad poured in place around the top of valve box according to Standard Detail No. 04. All concrete shall be Class “B” minimum.

3.6.10 All hydrants shall be placed at a maximum distance of 500 feet apart along the main alignment within the urban limits and at a maximum distance of 1,000 feet apart within the rural limits.

3.6.11 All hydrants shall be standard four (4) foot bury (see Materials Specifications) or adjusted to achieve the proper bury depth. The depth to be noted on the approved construction plans.

### **3.7 Valves**

3.7.1 Water mains shall have a sufficient quantity of valves so that customer inconvenience and sanitary hazards will be minimized during repairs.

3.7.2 All valves shall be placed at a maximum distance of 500 feet apart along the main alignment within a 5-foot distance of fire hydrant if available. All valves shall be placed at each road intersection on each side of a tee or cross on the same side of the road unless otherwise approved by PW.

3.7.3 Rural water systems (low density) should include valve spacing distance as designated by PW. Valves should be located at roadway intersections unless otherwise approved by PW.

3.7.4 All valve boxes shall be adjusted to match final contours, and the standard 4" x 18" x 18" concrete pad shall be placed around the top of the valve box, see PW Standard Detail No. 04.

3.7.5 PW personnel only shall operate all system valves. The developer shall request PW to operate valves when necessary.

### **3.8 Flushing Connections**

3.8.1 Dead ends to water mains shall be prohibited unless approved by PW. Dead ends may be approved if one or more of the following conditions exist:

- a. The distance between the dead end and other tie-in points is greater than 400 feet.
- b. Physical features exist between the dead end and the other tie-in point that, in the opinion of PW, make it impractical to tie them together.
- c. The overall project is staged in more than one (1) design stage. In that instance, a hydrant and plug shall be placed at the ending station of that particular stage.

PW reserves the right to require certain dead ends to be connected even though they meet the above conditions. A fire hydrant shall be required at the end of each 6-inch or larger diameter water main and a flush hydrant shall be required at the end of each water main that is less than 6 inches in diameter. See Detail 21. Dead ends will not be allowed.

3.8.2 Each fire hydrant or flush hydrant shall be sized so that velocity of greater than or equal to 2.5 feet per second can be achieved in the water main served by the hydrant during flushing.

3.8.3 No flushing device or air relief valve shall be directly connected to any sanitary sewer, storm sewer, or storm drain. Chambers, pits, or manholes containing valves, meters, or other such appurtenances shall not be directly connected to any sewer. Such chambers, pits, or manholes shall be drained to absorption pits underground or to the surface of the ground where they are not subject to flooding by surface water.

3.8.4 All fire lines shall be constructed with a two (2) inch flushing outlet with a 2 ½ inch hose connection and valve assembly at the building wall. See PW Standard Detail No. 13.

### **3.9 Air Relief Valves**

3.9.1 At high points in water mains, where air can accumulate, provisions shall be made to remove the air by means of hydrants or air relief valves. Automatic air relief valves shall not be used in situations where manhole or chamber flooding may occur.

3.9.2 Where practical, the open end of an air relief pipe from automatic valves shall be extended a distance of greater than or equal to 1 foot above grade and provided with a screened, downward facing elbow. The pipe from a manually operated valve shall be extended to the top of the pit. Use of manual air relief valves is recommended wherever possible.

### **3.10 Bedding, Backfill, and Other Pipe Laying Requirements**

3.10.1 A continuous and uniform bedding shall be provided in the trench for all buried pipe. Backfill material shall be tamped in layers around the pipe and to a sufficient height above the pipe to adequately support and protect the pipe. Stones found in the trench shall be removed for a depth equal to or greater than 6 inches below the bottom of the pipe. See Detail 15.

3.10.2 The underground work shall not be covered until it has been inspected by the Engineer's inspector and/or PW representative.

3.10.3 All piping installed in a commercial area and all road crossings shall be minimum Class 51 ductile iron pipe. When placed at the road crossing, ductile iron shall be extended five (5) feet beyond the existing road right-of-way.

3.10.4 Defective or otherwise rejected piping shall be removed from the trench and/or workplace immediately.

3.10.5 Laying of pipe end on supports for extended period will not be permitted.

3.10.6 All existing road or street crossings shall be bored and encased ductile iron pipe, no exceptions. See PW Standard Detail No. 09.

3.10.7 Paducah Water requires an adequate point for flushing and sampling of all new potable and fire mains. A temporary two (2) inch blow-off with a hose bib shall be located at the end of each leg along the proposed potable water main. See PW Standard Detail No. 20.

3.10.8 Pipe shall be plugged at any time construction work is not taking place.

### **3.11 Minimum Depth**

3.11.1 All piping shall have 42-inch minimum cover below the adjacent road subgrade crown elevation or the finished grade contour adjacent to the road/street if known. The lowest elevation shall prevail unless otherwise approved by PW.

### **3.12 Thrust Blocks**

3.12.1 All pipe fittings and hydrants shall be securely blocked against movement with concrete thrust blocks placed against undisturbed earth in accordance with PW Standard Details No. 03 and 06. Thrust blocks shall be approved by PW prior to backfilling. Thrust blocking shall be a minimum class "B" type concrete. Hydrants shall be restrained as shown on PW Standard Detail No.03.

3.12.2 Water mains shall have concrete thrust block at all pipe intersections and changes of direction to resist forces acting on the pipeline. All concrete thrust blocks shall be poured in such a manner that the bolts can be replaced without disturbing the blocking.

3.12.3 All caps or plugs used in mains to undergo hydrostatic tests shall be properly installed and blocked in advance of testing mains. All caps or plug installation shall be approved by Paducah Water before the main is subject to the pressure test.

3.12.4 Paducah Water requires all fittings to be restrained with an approved restraint gland and proper concrete blocking (Section 3.12). These areas will be inspected by PW prior to backfilling.

3.12.5 Paducah Water will require, when necessary, that any installation of mechanical joint camps and/or plugs shall be installed with a blocking jack. The jack is to be a permanent fixture entrenched within the concrete blocking according to Standard Detail No. 23.

### **3.13 Disinfection and Coliform Monitoring**

3.13.1. Mains designed to carry water for domestic consumption and fire protection shall be thoroughly cleaned, flushed, and disinfected before being put in service and before acceptance by PW. Disinfection shall be done by the addition of suitable amounts of chlorine in such amounts to produce a concentration of at least fifty (50) ppm and a residual of at least twenty-five (25) ppm at the end of twenty-four (24) hours and followed with thorough flushing. The application shall be as approved by PW in accordance with AWWA C651 and 401 KAR 8:150, Section 4(1), which states that a sample shall be taken in the newly-constructed line at each of the following points: within 1,200 feet downstream of each connection point between the existing and new lines; one mile intervals; and each dead end, without omitting any branch.

**Disinfection (Granules Method)** The granules should be placed at the upstream end of the first pipe, at the upstream end of each branch main, and at 500 foot intervals. The quantity of granules should be as shown in the following table adapted taken from ANSI/AWWA C651-05:

<u>Pipe Diameter</u>	<u>Calcium Hypochlorite Granules (ounces)</u>
6"	7.6
8"	13.4
12"	30.2
14" and larger	$D^2 \times 30.2$

Where D is the inside pipe diameter in feet

No other methods will be permitted.

The contractor is responsible for all tools, materials, accessories, etc. required to perform the standard testing procedures. PW will not supply any material unless otherwise arranged by the contractor.

### **Flushing**

All underground mains shall be flushed thoroughly before connection is made to the supply system piping in order to remove foreign materials that may have entered the pipe during the course of installation. The minimum rate of flow shall be not less than that necessary to provide a velocity of 2.5 feet per second. The flushing operations shall be continued for a sufficient time to ensure a thorough cleaning.

<u>Pipe In Size</u>	<u>Flow Required to Produce</u>
<u>Inches</u>	<u>2.5 FPS Velocity</u>
	<u>GPM</u>
4	100
6	220
8	390
10	610
12	880
16	1,565

All mains shall be flushed following tie-ins to remove any foreign materials that may have entered during the tie-in process.

### **3.13.2 Sampling**

- a. All coliform samples will be taken by and tested by PW personnel.

- b. PW will take the field samples at the locations detailed in 401 KAR 8:150, Section 4(1)(f), and return them to the PW lab for testing by lab personnel.
- c. PW will notify the construction superintendent of results of the coliform samples.
- d. No coliform sampling will be taken after 2:30 p.m. Monday through Thursday.
- e. If coliform is detected, Contractor shall repeat flushing of the main and coliform testing.
- f. If coliform is still detected, Contractor shall repeat disinfection and flushing as if the water main had never been disinfected.

3.13.3 PW will retain coliform test results for every project.

3.13.4 The Contractor shall be responsible for dechlorination. Chlorinated water resulting from disinfection of project components shall be disposed in a manner which will not violate 401 KAR 5:031, i.e., in stream total chlorine residuals shall not exceed an acute criteria value of 19 ug/l (micrograms per liter) or a chronic criteria value of 11 ug/l.

### **3.14 Pressure Testing and Leak Detection**

3.14.1 The Contractor shall be responsible for furnishing all water required for pressure testing, disinfecting, and final flushing of the main prior to the tap and the tie-in by PW. Test procedures shall be performed during the hours of 7:00 a.m. and 1:30 p.m. Monday through Thursday. **No pressure testing shall begin after 1:30 p.m. or on Friday. Contractor's superintendent will give PW a two (2) day notice prior to testing of the new system.** PW inspector and job superintendent shall insure all valves are in the open position prior to testing the new system.

3.14.2 All water mains shall be properly tested according to PW standards prior to connection to potable water supplies. All **potable mains** shall be tested at a minimum of 150 psi for a period of not less than two (2) hours. All **fire mains** shall be tested at a minimum of 200 psi for a period of not less than two (2) hours. All mains must maintain the test pressure to be approved.

3.14.3. Contractors shall pressure test all new mains prior to chlorination sampling. Fire hydrants shall not be used as a source of water for testing without the express approval of PW. If approval is given to place a fire hydrant out of service for testing, the developer, contractor, or agent must sign for a construction meter (meter placed on fire hydrant), pay the current deposit and connection fee, and allow forty (48) hours for installation.

3.14.4. On commercial developments that include both fire lines and potable water mains, the fire main shall be left disconnected from the potable main. Both the potable and fire mains shall be tested separate and not as one unit. The fire lines shall be installed from the tie-in point to the building at the riser with blind flange at the building.

### **3.15 Water Main Construction and Material Standards**

3.15.1 Installation of water mains and appurtenances shall meet or exceed AWWA Standards or manufacturer recommendations, as well as the standards included in these specifications. The most stringent standard shall apply.

3.15.2 Encasement specifications for carrier pipe and skids are in the materials specifications section. The annular space between the casing and the carrier pipe shall be sealed, at both ends of the casing, with an approved grout or other material to prevent entrance of backfill material into the casing. A non-shrink, non-metallic type grout shall be used. See Detail 09. Field loc gaskets will be used as thrust restraints for all piping that shall be encased and one (1) additional pipe length placed on each side of the encasement pipe.

3.15.3 Polyethylene encasement material shall be considered by PW when ductile iron pipe and fittings are to be installed in a corrosive soil environment such as landfill areas, marshes, alkaline soils, and cinder beds which are considered potentially corrosive to iron pipe. The encasement shall be installed in accordance with ANSI/AWWA C105/A21.5.

3.15.4 Buried water main location signs will be supplied and placed by PW along the water main alignment at a minimum distance of 500 feet and maximum of 800 feet. They shall be placed on all large transmission projects at the discretion of PW. Placement of signs shall be established by PW and the engineer prior to completion of the project.

3.15.5 All fittings, valves, and fire hydrant anchoring tees and connection pieces shall be polyethylene wrapped. They shall be installed according to the current edition of the AWWA C105. Polyethylene wrap shall be a minimum of eight (8) mil thickness. See PW Standard Detail No. 24.

3.15.6 All C900 and ductile iron pipe shall be installed with caution tape, and a number 12-gauge solid copper (PVC coated) tracing wire shall be placed along the bottom roadside of the trench. Maximum tracing wire length shall be 500 feet without terminating at line valve or fire hydrant valve. Splices in

the tracing wire shall be kept to a minimum and approved by PW. If splices are required, they shall be made with copper split bolt wire connector and inserted into a direct bury gel-filled insulator tube. Installation shall be according to PW Standard Detail No. 07.

3.15.7 A stainless steel all threaded rod is to be used with mechanical joint fittings as a thrust restraint when deemed necessary by PW.

3.15.8 All mechanical joints (valves, hydrants, and fittings) shall be installed with a thrust restraint gland device that shall have a torque twist off nut. The torque ranges shall meet the requirements of AWWA Standard C600 for ductile iron pipe and manufacturer's recommendations for AWWA Standard C900 PVC water mains.

3.15.9 Pipes, fittings, valves, fire hydrants, and appurtenances shall meet or exceed the latest standards issued by the AWWA, ASTM, or NSF (if such standards exist). PVC piping used must be certified by ANSI/NSF Standard 61. Detailed material specifications are in the appendix and must be strictly adhered to unless a variance is granted by PW. Relevant standards are as follows:

Ductile Iron Pipe	AWWA C151
Resilient Seated Gate Valves	AWWA C509
Resilient Seated Butterfly Valves	AWWA C504
Epoxy Coating (for Valves and Hydrants)	AWWA C550
Ductile Iron Compact Fittings`	AWWA C153
Rubber Gasket Joints for Ductile Iron Pipe and Fittings	AWWA C111
Cement Mortar Lining for Ductile Iron Pipe and Fittings	AWWA C104
Underground Service Line and Fittings	AWWA C800
Dry Barrel Fire Hydrants	AWWA C502
Polyethylene (PE) Pressure Pipe	AWWAC906

Air Release, Air/Vacuum and Combination Air Valves	AWWA C512
Polyvinyl Chloride (PVC) Pressure Pipe	AWWA C900
Polyethylene Encasement for Ductile Iron Pipe Systems	AWWA C105
Double Check Valve Backflow Preventer Assembly	AWWA C510
Reduced-Pressure Principle Backflow Preventer Assembly	AWWA C511

### 3.16 Non-Storm Sewer Crossings and Separation

3.16.1 For the purpose of this standard, “non-storm sewer” is defined as any of the following: sanitary sewer, combined sewer, septic tank, or subsoil treatment system. The following does not apply to a storm sewer.

3.16.2 Except when not practical, water mains shall be laid a horizontal distance of greater than or equal to 10 feet from any existing or proposed non-storm sewer. The horizontal distance shall be measured from outside diameter of the water main to outside diameter of the non-storm sewer line. In cases where it is not practical to maintain a 10-foot separation, water mains may be installed closer to a non-storm sewer provided that a variance is obtained from the Kentucky Division of Water and maintained with the project records.

3.16.3 No deviation from the 10-foot separation is allowed if the non-storm sewer is a force main (non-storm sewer under pressure).

3.16.4 When water mains and non-storm sewers cross (Detail No. 18):

- a. Water mains shall be laid such that there shall be a vertical distance of greater than or equal to 18 inches between the water main and non-storm sewer line. The vertical distance shall be measured from the outside diameter of the water main to the outside diameter of the non-storm sewer line.
- b. One full length of the water pipe shall be located so that both joints of the water pipe will be as far from the non-storm sewer line as practical.
- c. Special structural support for the water and non-storm sewer pipes may be required.

3.16.5 No water pipe shall pass through or come in contact with any part of a non-storm sewer manhole.

### **3.17 Water Mains near Areas with Organic Contamination**

3.17.1 Water mains within a 200-foot radius of oil or gasoline lines, underground storage tanks, petroleum storage tanks, or pumping station shall be constructed of ductile iron pipe, per KAR 8:100, Section 1(5)(d)6. Pipe joint materials which are resistant to permeation of petroleum products shall be used within the 200-foot radius.

### **3.18 Asbestos-Cement Pipe (Transite Pipe)**

3.18.1 If the existing water main to be tapped is asbestos-cement pipe, then the Contractor shall conform to OSHA regulations governing the handling of hazardous waste during the process of tapping the asbestos-cement pipe. Pieces of asbestos-cement pipe resulting from the tap shall be double bagged, placed in a rigid container, and disposed of in an approved landfill.

### **3.19 Subfluvial Pipe Crossings**

3.19.1 Streams crossed by water mains shall not be designated as "Special Waters" for stream crossings, as defined by the Kentucky Division of Water.

3.19.2 For subfluvial pipe crossings, a floodplain construction permit will not be required pursuant to KRS 151.250 if the following requirements of 401 KAR 4:050 Section 2 are met:

- a. No material may be placed in the stream or in the floodplain of the stream to form construction pads, coffer dams, access roads, etc., during construction of pipe crossings.
- b. Crossing trenches shall be backfilled as closely as possible to the original contour.
- c. All excess material resulting from construction displacement in a crossing trench shall be disposed of outside the floodplain.
- d. For erodible channels, there shall be at least 42 inches of backfill on top of all pipe or conduit points in the crossing. (See Detail No. 11)
- e. For non-erodible channels, pipes or conduits in the crossing shall be encased on all sides by at least 6 inches of concrete with all pipe or conduit points in the crossing at least 6 inches below the original contour of the channel (401 KAR 8:100 Section 1(7)).

3.19.3 For subfluvial pipe crossings greater than 15 feet in width:

- a. The pipe shall be of special construction having flexible, restrained, or welded watertight joints.
- b. Valves shall be provided at both ends of water crossings so that the section can be isolated for testing or repair. Valves shall be easily accessible and not be subject to flooding.
- c. Permanent taps or other provisions to allow insertion of a small meter to determine leakage and obtain water samples shall be made on each side of the valve closest to the supply source.

### **3.20 Cross Connections**

3.20.1 Cross connections shall not be allowed in accordance with 40 KAR 8:020.