

**CITY OF MOAB
RESOLUTION #46-2017**

**A RESOLUTION ADOPTING THE WATER SYSTEM DESIGN CRITERIA MANUAL,
WASTEWATER COLLECTION SYSTEM DESIGN CRITERIA MANUAL, AND APWA
MANUAL OF STANDARD SPECIFICATIONS (UTAH CHAPTER)**

WHEREAS, the City, to maintain the quality of new infrastructure improvements, desired to assess and update its minimum criteria and standards for said improvements; and,

WHEREAS, the Moab City Council (Council) approved Ordinance No. 2017-02, a temporary moratorium on new commercial site plan applications pending the revision of city ordinances relating to said criteria and standards; and,

WHEREAS, with the aid of a consultant, Hansen, Allen & Luce, Inc., appropriate criteria and standards were developed or selected from existing sources.

NOW, THEREFORE, be it Resolved by the Moab City Council, that the *Water System Design Criteria Manual*, *Wastewater Collection System Design Criteria Manual*, and *APWA Manual of Standard Specifications (Utah Chapter)* are adopted.

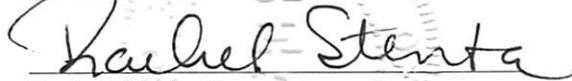
PASSED AND APPROVED in open Council by a majority vote of the Governing Body of Moab City Council on August 8, 2017.

SIGNED:

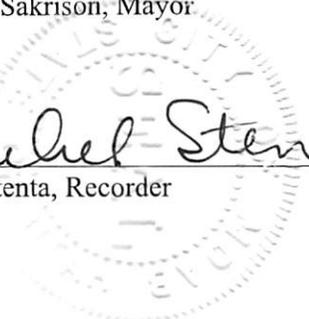


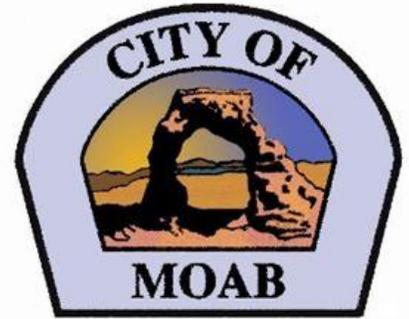
David L. Sakrison, Mayor

ATTEST:



Rachel Stenta, Recorder



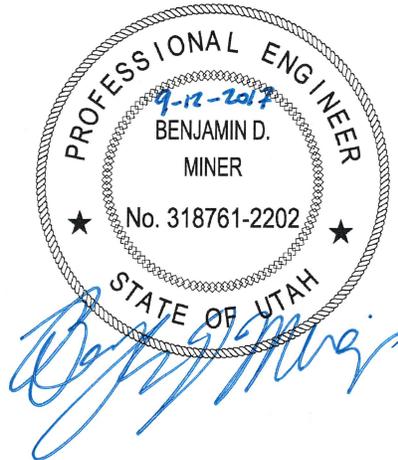


WATER SYSTEM DESIGN CRITERIA MANUAL

Adopted: August 8, 2017

CITY OF MOAB

WATER SYSTEM DESIGN CRITERIA MANUAL



**HANSEN
ALLEN
& LUCE** inc
ENGINEERS

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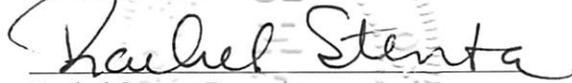
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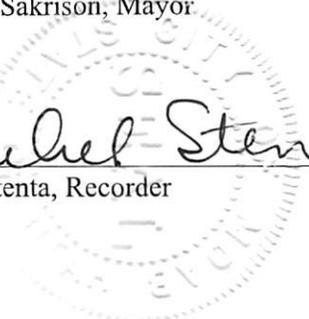


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Chapter 1. General Provisions

1.1 Introduction

These criteria and design standards together with all future amendments shall be known as the City of Moab Water System Design Criteria Manual (hereafter called “Criteria”). All utility reports and plans, analyses, and designs, submitted as a requirement of the City of Moab (hereafter called “City”) ordinances and resolutions (hereafter called “Regulations”), shall comply with these Criteria.

1.2 Jurisdiction

These Criteria shall apply to all land within the incorporated area of the City of Moab, or served by the City, including any public lands. These Criteria shall apply to all systems and facilities constructed in or on City Rights-of-Way, easements dedicated for utilities across public or private property, easements for public use, and to all privately owned and maintained system facilities.

1.3 Purpose

Presented in these Criteria are the policies and minimum technical criteria for the planning, design and construction of drinking water systems within the boundaries of the City of Moab and areas served by the City. All subdivisions, site plans, or any other proposed development submitted for acceptance by the City shall include adequate and appropriate water system planning, analysis, and design. Such planning, analysis, and design shall conform to or exceed the Criteria set forth herein. Water system planning, analysis, and design that require policies and technical expertise not specifically addressed in these Criteria shall follow the requirements outlined in the Utah Code Annotated, Utah Administrative Code (see {R309 U.A.C.}), industry standards and manufacturer’s recommendations. In the event of a conflict, the State of Utah Codes and Administrative Rules will prevail. Interpretation will be provided by the City of Moab and/or the Utah Department of Environmental Quality, Division of Drinking Water.

1.4 Amendments and Revisions

Policies and criteria may be amended as new technology is developed or if experience gained in the use of these Criteria indicates a need for revision. All technical criteria and policy changes must be recommended by the City Engineer or Public Works Director. Minor revisions will require the approval of the City. All major revisions will require adoption, by resolution or ordinance of the City Council. The City Engineer may approve minor revisions and technical changes.

Chapter 1. General Provisions

TABLE 1-1 EXAMPLES OF MINOR AND MAJOR REVISIONS

MINOR	MAJOR
Grammar	Policy Changes
Submittal Requirements	
Clarifications	
Construction Detail Revisions for clarification, minor modification	
Technical Criteria Changes	

1.5 Enforcement Responsibility

The Engineering Department and Public Works Department shall review all water system reports, plans, analyses, and designs submitted as a requirement of the Regulations for compliance with these Criteria. The Regulations are enforced by the City of Moab and authorized representatives.

1.6 Review and Acceptance

The City shall review all submittals for general compliance with these Criteria. An acceptance by the City **does not** relieve the Owner, Engineer, or Designer from the responsibility of ensuring that the design, calculations, plans, specifications, construction, and record drawings are in compliance with these Criteria and in compliance with other applicable State and Federal requirements. The City may refer submittals to other agencies that have an interest or responsibility for water system issues.

1.7 Interpretation

In the interpretation and application of these Criteria by the City, the provisions herein shall be regarded as the minimum requirements for the protection of the public health, safety and welfare of the residents of the City of Moab.

Whenever a provision of these Criteria and any other provision of the Regulations or any provision in any law, ordinance, resolution, rule or regulation of any kind, contains any requirement(s) covering any of the same subject matter, the requirements that are more restrictive or impose higher standards shall govern, as determined by the City.

These Criteria shall not abrogate or annul any binding agreements, Development Improvement Agreements, easements, permits, utility reports or construction drawings accepted by the City prior to the effective date of these Criteria.

Chapter 1. General Provisions

1.8 Relationship to Other Standards

1.8.1 State Public Water System Code and Rules

Public water systems in the State of Utah are governed by the State of Utah Code Annotated and the Utah Administrative Code. These codes and rules apply to policy, planning, criteria and construction of public water system and prevail if a conflict exists with the Criteria. Most water projects require a submittal to the Utah Division of Drinking Water for its review. For land development projects, the Developer/Owner shall provide all information needed to complete the review and pay all review and related fees.

1.8.2 State Construction Code

The State of Utah Construction codes and rules, with amendments, are incorporated by reference. These codes and rules apply to policy, planning, criteria and construction of public water system and prevail if a conflict exists with the Criteria.

1.8.3 NSF International Standards

All pipe, valves, fittings, and other water system components that contact water within the public water system shall comply with the applicable standards of NSF International. These include NSF 60 (Water Treatment Chemicals), NSF 61 Annex G, and NSF 372 (Drinking Water System Components).

1.9 Variances from these Criteria

Modifications to these Criteria shall require a formal variance request. Variances from the provisions of these Criteria may be considered on a case-by-case basis for specific applications only, and shall not establish a precedent for any other project or future development.

1.10 Adoption of the Utah American Public Works Association (APWA) Standard Plans and Specifications

The latest Utah APWA Manual of Standard Plans and Manual of Standard Specifications are hereby adopted as the City of Moab Standard Details and Standard Specifications for water system improvements. Variance from these standards must be approved by the City. In the event that multiple standards apply, the City will determine the applicable standard.

1.11 Acronyms

As used in the City's Water Criteria Manual, the following acronyms shall apply:

ANSI	American National Standards Institute
APWA	American Public Works Association

Chapter 1. General Provisions

ARV	Combination Air Release/Vacuum Valve
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
CD and CDs	Construction Drawing(s)
CFS	Cubic Feet per Second
DIA	Development Improvements Agreement
DIP	Ductile Iron Pipe
DIPRA	Ductile Iron Pipe Research Association
ERC	Equivalent Residential Connections
HP	High Point
Max	Maximum
Min	Minimum
NAVD	North American Vertical Datum
OSHA	Occupational Safety and Health Administration
PE	Professional Engineer
PRV	Pressure Reducing Valve
PSI	Pounds per Square Inch
PVC	Polyvinyl Chloride
RCP	Reinforced Concrete Pipe
ROW	Right-of-Way

1.12 Definitions of Terms

CODE or MUNICIPAL CODE shall mean the City of Moab Municipal Code, as amended.

CONSTRUCTION DRAWING(S) (CD or CDs) shall mean construction drawings prepared by a Professional Engineer licensed in the State of Utah for the Developer and approved by the City depicting public and/or private improvements to be constructed for the Project.

ENGINEER shall mean the Professional Engineer retained by the Developer responsible for the creation and submission of utility reports and construction drawings to the City for approval for the purpose of one-time construction of facilities.

CRITERIA or DESIGN CRITERIA shall mean the design criteria and requirements contained herein for water facilities to be constructed in the City.

DETAILS or STANDARD DETAILS shall mean details issued by the City to be used in Construction Drawings

DEVELOPER shall mean the party or parties desiring to construct public and/or private improvements within City rights-of-way or easements, securing all required approvals and permits from the City and other applicable entities, and assuming full and complete responsibility for the Project.

Chapter 1. General Provisions

DEVELOPMENT IMPROVEMENT AGREEMENT (DIA) shall mean a formal agreement between an annexation applicant or Developer and the City that comprehensively addresses development conditions and obligations.

EASEMENT shall mean the right of the City to use lands owned by another party for the purposes of maintenance, access, utilities, drainage or other use, as specified in an agreement.

MUNICIPAL CODE – See CODE.

OWNER shall mean the person(s) in title to any portion of the Property, according to the records of the Grand County Recorder. The use of the singular “Owner” shall refer to all Owners of the property.

PRIVATE IMPROVEMENTS shall mean those improvements not identified as public improvements, and which are not generally installed within the City rights-of-way, easements, or other City-owned lands.

PROFESSIONAL ENGINEER shall mean an individual currently registered with the Utah Division of Professional and Occupational Licensing as a professional engineer.

PROJECT shall mean the public or private improvements as designated in the approved construction drawings to be constructed in conformance with these Design Criteria and the City standard specification and details. The project is inclusive of any and all public or private improvement projects for or within the City, whether development projects, private utility projects or capital improvement projects.

PROPERTY shall mean the real property located in the City of Moab.

PUBLIC IMPROVEMENTS shall mean those public facilities including, but not limited to, pavement, curb and gutter, sidewalk, pedestrian/bike/equestrian paths, storm drain facilities with related appurtenances, culverts, channels, bridges, water distribution, transmission and storage facilities with related appurtenances, wastewater collection facilities with related appurtenances, water purification facilities, pavement markings/ signage/striping, traffic signals and related appurtenances, and those processes integral to construction of other Public Improvements listed herein, which upon their completion are to be dedicated to the City for operation and maintenance by the City and which are installed within the City rights-of-way, easements, or other City-owned lands.

REGULATIONS shall mean ordinances, resolutions, rules and regulations of the City, including the Code, and other provisions of all zoning, subdivision and building codes or any other applicable design criteria adopted by the City, as the same may be amended periodically and applied uniformly throughout the City.

SHALL mean a mandatory requirement or condition, as approved by the City.

Chapter 1. General Provisions

STANDARD DETAILS – See DETAILS.

CITY shall mean the City of Moab, Utah

CITY COUNCIL shall mean the Moab City Council.

ENGINEERING DEPARTMENT shall mean the City Engineering Department.

CITY ENGINEER shall mean the City of Moab Engineer or other authorized representative of the Engineering Department.

VARIANCE REQUEST shall mean a formal request with adequate documentation and justification for a variance from the standards, provisions, policies or submittal requirements set forth in these Design Criteria.

WATER MASTER PLAN shall mean the City of Moab Water Distribution and Storage Master Plan

Chapter 2. Water System Policies

2.1 Introduction

Provisions for adequate service, water supply, purification, storage, transmission and distribution are necessary to preserve and promote the general health, welfare, and economic well-being of the residents of the City of Moab. The City of Moab must provide coordination, review, and master planning of the system in order that the integration of each component of the system meets the intent and purpose of the system as a whole.

The development of the City's water system is governed by the policies provided below, as facilitated through the implementation of the Criteria contained herein.

2.2 Planning Policy

All land developed within the City that is served by the City's public water system shall provide planning and design for indoor and outdoor water demands. Reports and plans shall be submitted for all new development and redevelopment within the City jurisdiction. These reports shall conform to the requirements set forth herein and the provisions otherwise stipulated by the City during the development process. Redevelopment shall be defined as any land disturbance or reconstruction that results in a reconfiguration of existing water system facilities or an increase in demands.

During the initial planning stages of the development, a pre-application meeting shall be coordinated with the City of Moab Planning Department. One purpose of this meeting is to assist the City and the developer to determine the level of water service that is available and needed by the developer.

2.3 Design Policy

Water system planning and design within the City shall adhere to the Criteria contained herein, the administrative rules promulgated by the Utah Division of Drinking Water, the Utah Division of Water Rights (for wells and water rights), and acceptance procedures of the City of Moab, any applicable watershed protections ordinances, drinking water source protections zones and the applicable water related master plans prepared for the City. Prohibited facilities and connections shall be as described in these criteria.

2.4 Construction of Public Improvements Policy

The construction of improvements for and within the City shall conform to the City's construction permit, standard specifications, standard details and approved plans, and shall adhere to all City, County, State, and Federal regulations applicable to the work. This shall include the acquisition of all necessary permits, which may include but not be limited to, stream alteration permits, discharge permits, road cut permits, flood plain related permits and letters

Chapter 2. Water System Policies

(including FEMA review and approval when applicable), Utah Division of Drinking Water approvals, traffic control permits and all other required permits and approvals. At the completion of construction, all permits and service agreements with power companies and any other private utilities shall be transferred into the Customer's name, and shall under no circumstances be transferred to, or held in the name of the City, unless the City is the customer. Any work proposed to take place within existing City of Moab streets must be reviewed and approved by the City. The type of crossing allowed, traffic control, street repair specifications, etc. shall be as determined by the City.

Prior to placing the facilities into service and initial acceptance by the City, all construction related provisions required by the City shall be satisfied, including startup procedures, inspections and testing of the facilities, and receipt of O&M Manuals and Record Drawings. Additionally, all requirements and responsibilities of the warranty period will be met.

2.5 Ownership of Public Improvements Policy

The delineation between City-owned and privately owned portions of the system and the associated maintenance responsibilities for each, shall be as set forth in the latest editions of the Municipal Code, standard details and previous agreements and policies in effect with the City. Upon execution of final acceptance, the water mains and all appurtenant City-owned facilities, shall become the sole property of the City, and full legal and equitable title thereto shall be vested in the City free and clear of any liens, claims, or rights of any third party in or to the public improvements.

2.6 Operations and Maintenance Policy

The design of all water system facilities within the City must provide for access and long-term operation and maintenance of the facilities by the City. Operation and Maintenance manuals associated with all components to be installed as part of the water system shall be provided to the City with the Record Drawings required in these Criteria, unless otherwise specifically waived by the City.

Utility easements, dedicated tracts and access easements shall be provided for all water system facilities outside of public right-of-way as set forth in these Criteria, or as otherwise required by the City, and shall be adequate for the operation, maintenance and replacement of the facilities.

2.7 Hazard Minimization and Public Safety Policy

Public safety and the protection of City staff shall be an essential objective when planning, designing, constructing, operating and maintaining the City's water system facilities. All such facilities shall be designed with careful consideration of the potential hazards associated with the use and long-term operation and maintenance of the facility. The design phase of all projects

Chapter 2. Water System Policies

shall evaluate the health and safety risks associated with the facilities, and shall include appropriate design features to minimize these risks and to adequately protect the general public and City personnel from the hazards. Equipment for confined space entry in accordance with OSHA and other applicable regulatory agency requirements shall be provided at all City of Moab facilities, as required. Hatches with fall prevention covers, intermediate platforms, handrails, safety lighting, etc. shall be as required by the City, or any applicable code.

2.8 Duty of the Professional Engineer Preparing Development Documents

These standards establish criteria and policies for the design and subsequent construction of the City's public water system. These standards are not intended to substitute for engineering knowledge, judgement or experience. It is the responsibility of the design professional engineer to understand and apply sound engineering principals related to public water systems to the planning, design and construction of water system improvements. It is also the responsibility of the design engineer to understand all federal, state and local regulations related to the public water system.

These criteria should be reviewed by the developer's engineer, who shall evaluate their applicability. If the design engineer identifies criteria that are inapplicable or inappropriate in a specific location or specific situation, the development engineer shall bring the issue to the attention of the City.

Chapter 3. Water System Submittal Requirements

3.1 Introduction

The requirements presented in this chapter shall be used to aid the Engineer or Applicant in the preparation of utility reports, modeling evaluations, and construction drawings for water system facilities. This chapter applies primarily to submittal requirements for water distribution systems and the associated Criteria provided in Chapter 4. The requirements presented herein are the minimum necessary, and will be used to evaluate the adequacy of all submittals made to the City.

3.2 Review Process

3.2.1 Pre-Application Consultation

A pre-application consultation with the City of Moab is required for any type of development or redevelopment. The purpose of this meeting is to discuss general information about the project, pertinent aspects of the Criteria, the required scope of the utility reports, and any special procedures, analyses, and submittal requirements that may be applicable.

3.2.2 Water Utility Report Requirements

Preliminary and final water utility reports shall be provided to the City of Moab. The purpose of the preliminary water utility report is identify existing water infrastructure, provide preliminary estimates of water demand needs, provide an initial plan for water infrastructure and determine the feasibility of providing water service to the development via the public water system. The purpose of the final water utility report, which is to be submitted with the final construction plans, is to identify the final water infrastructure plan.

3.2.2.1 Format

All required reports shall be prepared on 8½" x 11" paper (maps and figures may be on larger paper) and be bound. Supporting drawings, figures, and tables shall be bound into the reports or included in an attached pocket. Reports shall include a narrative presenting the project for review in accordance with the information presented in these Criteria, and the requirements established by the City for the appropriate submittal.

Paper and electronic (PDF) copies of the report shall be provided. Electronic files of computer models and GIS files shall be provided if requested by the City.

3.2.2.2 Stand-Alone Document

The water utility reports shall be stand-alone documents. When references are made or assumptions are based on previously submitted reports, the reports must include the appropriate excerpts, pages, tables, and maps containing the referenced information. Assumptions made in previous reports must be verified and substantiated in subsequent reports. Reports shall be legible, or a resubmittal will be required.

Chapter 3. Water System Submittal Requirements

3.2.2.3 Submittal Adequacy

Any report with incomplete or missing information shall result in the report being returned without review. The City reserves the right to require additional information beyond that specifically required in these Criteria.

3.2.3 Review by Referral Agencies

The review and approval of the project by Federal, State and local agencies other than the City, shall be the responsibility of the Developer. The Developer shall be required to address all referral agency comments, and to have such comments incorporated into the applicable utility report and plans submitted to the City.

3.3 Acceptance

3.3.1 Final Utility Report Required for Construction

The final water utility report shall conform to the construction documents to be used to bid the project, and shall be approved by the City prior to the construction of any water system improvements.

3.3.2 Approval Limitation for Final Utility Report

The approval of the final water utility report shall expire simultaneously with the expiration of the approval of the project approval unless extended in conformance with the provisions of the Municipal Code. At the time the approval of the final utility report expires, the report shall be deemed invalid and a resubmittal will be required. In order to be re-approved, it must be demonstrated that the concepts, designs, and calculations presented in the report are consistent with the City's current Criteria.

3.4 Preliminary Water Utility Report

The Preliminary Water Utility Report shall review and discuss the existing water system infrastructure and the water needs of the development. The report shall also identify the existing infrastructure needed to support the development. The City Engineering Department and Public Works Department will coordinate with the developer to provide needed water system data.

The following outline sets forth the required minimum content to be provided in the Preliminary Water Utility Report that shall be submitted:

- I. TITLE SHEET
 - A. Name of Project, including legal name of development.
 - B. Address.
 - C. Owner.

Chapter 3. Water System Submittal Requirements

- D. Developer.
- E. Engineer.
- D. Submittal date and revision dates as applicable.

II. TABLE OF CONTENTS

III. PROJECT LOCATION AND DESCRIPTION

A. Site Location.

1. Site Vicinity Map.
2. Township, Range, Section, and 1/4 Section.
3. Streets, Roadways, and Highways adjacent to the proposed development.
4. Names of surrounding or adjacent developments.

B. Description of Property and Land Use.

1. Total area in acres.
2. Discussion of project phasing, if applicable.
3. Total number of ERCs proposed for the development at build-out with a breakdown of units by type projected by phase (if applicable) calculated by utilizing the Utah Administrative Code Minimum Sizing Requirements {R309-510 U.A.C.}.
4. Area (acres) and land use for all parcels to be served within the development boundaries (initial and future phases, if applicable) and number of lots if available.
5. Easements/tracts may not be known at this time; however, provide a statement that easements or tracts necessary for utilities will be provided at time of either platting or at time of preliminary site plan, in accordance with City standards regarding location and size of easements and tracts.
6. Major and minor drainage ways and floodplains.
7. Existing irrigation canals or ditches.
8. Significant geologic features and topography.
9. Existing On-Site Wastewater Treatment System (OWTS).
10. Existing Drinking Water Source Projection Zones within the project boundary.

IV. ESTIMATED DEMANDS

A. Average Daily Demands.

Chapter 3. Water System Submittal Requirements

Tabulate the Average Daily Demand for the initial and future phases, if applicable. Average Daily Demand shall be provided in both gallons/minute and gallons/day. Indoor and outdoor demands should be included.

B. Peak Day Demands

1. Tabulate the Peak Day Demands for the initial and future phases, if applicable. Peak Day Demands shall be provided in gallons/minute.
2. Fixture count estimates shall be prepared in accordance with the International Plumbing Code with amendments as adopted.
3. The developer shall evaluate the type of building construction, and building size and shall recommend a fire flow rate to the City. Final determination will be made by the City Fire Official. The developer shall indicate whether fire sprinklers are included in the building plan.

C. Peak Instantaneous Demands

1. Tabulated peak instantaneous demands for the initial and future phases, if applicable, shall be provided.

V. EXISTING WATER SYSTEM

A. Existing Distribution System.

1. Discuss the existing transmission and distribution lines in the vicinity of the development, including sizes and locations, which will need to be extended to serve the proposed development.
2. Discuss any known shortcomings or bottlenecks associated with the existing distribution system that may impact the City's ability to adequately deliver fire flows and meet the required demand conditions.
3. Discuss existing pressures at the proposed connection points to the existing water system.
4. The City will provide information about the existing water system to the developer in order to discuss the indicated issues.

VI. PROPOSED WATER SYSTEM

A. Proposed Distribution System.

1. Provide a general overview of the anticipated distribution system for the development, including the proposed line sizes. Describe the tie-ins to the existing water system and the sizes and lengths of any extensions necessary to serve the development.

Chapter 3. Water System Submittal Requirements

2. Discuss looping as required by the City, particularly as it pertains to each successive phase of development anticipated for the project.

B. Proposed Supply Facilities

1. Discuss any pump stations, wells, PRVs, storage reservoirs, purification facilities, etc., that will likely be required to adequately serve the development. This shall be done in coordination with the City.

VII. POTENTIAL PERMITTING REQUIREMENTS

General discussion of all foreseeable Federal, State, County, and Local permitting requirements associated with the project.

VIII. REFERENCES

Reference all criteria, master plans, reports, or other technical information utilized in the report.

3.4.1 Water System Modeling

The City maintains a water system model. Once the preliminary water system report is received and found to be adequate, the City will determine whether water system modeling is required. If the modeling is required, the City will determine the level of modeling needed for the development and the cost of the modeling. The developer will be responsible for the cost of water system modeling.

3.5. Engineering Department Responsibility

If the Engineering Department determines that the Preliminary Water Utility Report meets the requirements set forth in these Criteria and adequate water rights are conveyed to the City, the City will provide water at the designated tie-in points at available pressures. The City is not responsible or liable for assumptions made by the Developer regarding utility information associated with the proposed development.

3.6 Final Water Utility Report

The Final Water Utility Report shall describe all final water infrastructure, including finalized modeling and calculations.

The following outline sets forth the **required minimum** content to be provided in the Final Water Utility Report that shall be submitted with the Construction Documents:

I. TITLE SHEET

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- A. Name of Project, including legal name of Development.
- B. Address.
- C. Owner.
- D. Developer.
- E. Engineer.
- F. Submittal date and revision dates as applicable.

II. TABLE OF CONTENTS

III. PROJECT LOCATION AND DESCRIPTION

- A. Site Location.
 - 1. Site Vicinity Map.
 - 2. Township, Range, Section, and 1/4 Section.
 - 3. Streets, Roadways, and Highways adjacent to the proposed development.
 - 4. Names of surrounding or adjacent developments.
- B. Description of Property and Land Use.
 - 1. Total area in acres.
 - 2. Discussion of project phasing, if applicable.
 - 3. Total number of ERCs proposed for the development at build-out with a breakdown of units by type projected by phase (if applicable) calculated by utilizing the Utah Administrative Code Minimum Sizing Requirements {R309-510 U.A.C.}.
 - 4. Area (acres), land use for all parcels to be served within the development boundaries (initial and future phases, if applicable) and number of lots.
 - 5. Summary of irrigated area, including open space and park areas (initial and future phases, if applicable).
 - 6. Sizes of schools, commercial and industrial buildings (initial and future phases, if applicable).
 - 7. Major and minor drainage ways and floodplains.
 - 8. Existing irrigation canals or ditches.
 - 9. Significant geologic features and topography.
 - 10. Existing On-Site Wastewater Treatment Systems.
 - 11. Existing Drinking Water Source Projection Zones within the project boundary.

IV. CALCULATED DEMANDS

- A. Average Daily Demands.

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1. Tabulate the Average Daily Demand for the initial and future phases, if applicable. Average Daily Demand shall be provided in both gallons/minute and gallons/day. Indoor and outdoor demands should be included.

B. Peak Day Demands.

1. Tabulate the Peak Day Demands for the initial and future phases, if applicable. Peak Day Demands shall be provided in gallons/minute.
2. Fixture count estimates shall be prepared in accordance with the adopted plumbing code.
3. The developer shall evaluate the type of building construction, and building size and shall recommend a fire flow rate to the City. Final determination will be made by the City Fire Official. The developer shall indicate whether fire sprinklers are included in the building plan.

C. Peak Instantaneous Demands

1. Tabulated peak instantaneous demands for the initial and future phases, if applicable, shall be provided.

V. EXISTING WATER SYSTEM

A. Existing Distribution System.

1. Discuss the existing transmission and distribution lines in the vicinity of the development, including sizes and locations, which will need to be extended to serve the proposed development.
2. Discuss any known shortcomings or bottlenecks associated with the existing distribution system that may impact the City's ability to adequately deliver fire flows and meet the required demand conditions.
3. Discuss existing pressures at the proposed connection points to the existing water system.
4. The City will provide information about the existing water system to the developer in order to discuss the indicated issues.

VI. PROPOSED WATER SYSTEM

A. Proposed Distribution System.

1. Provide a general overview of the anticipated distribution system for the development, including the proposed line sizes. Describe the tie-ins to the

Chapter 3. Water System Submittal Requirements

existing water system and the sizes and lengths of any extensions necessary to serve the development.

2. Discuss looping as required by the Engineering Department, particularly as it pertains to each successive phase of development anticipated for the project.

B. Proposed Supply Facilities

1. Discuss any pump stations, wells, PRVs, storage reservoirs, purification facilities, etc., that will likely be required to adequately serve the development. This shall be done in coordination with the City.

VIII. PROPOSED WATER SYSTEM ANALYSIS AND MODELING

A. Hydraulic Models.

1. The results of the final hydraulic modeling shall be described. The results of the hydraulic modeling shall be attached to the final water utility report.

IX. POTENTIAL DEVELOPMENT AGREEMENT ITEMS

Discuss any potential development agreement items such as needed off-site improvements, improvements necessary for a project or project phase to be independently sustainable, water facilities land dedication requirements, etc.

X. POTENTIAL PERMITTING REQUIREMENTS

General discussion of all foreseeable Federal, State, County, and Local permitting requirements associated with the project.

XI. REFERENCES

Reference all criteria, master plans, reports, or other technical information utilized in the report.

3.6.1 Disclaimer

The City is not responsible or liable for assumptions made by the Developer regarding utility information associated with the proposed development.

Chapter 3. Water System Submittal Requirements

3.7 Construction Drawings

3.7.1 Water System Improvements

Water system Improvements within public rights-of-way or utility easements are required to be designed, approved, and constructed in accordance with the City’s criteria, subdivision requirements of the Municipal Code, the City’s standard specifications and details, sound engineering principles, and the conditions of any variances obtained from the City.

3.7.2 Indemnification Statement

Construction drawings are reviewed by the City for concept only. The review does not imply responsibility by the City of Moab for accuracy and correctness of calculations. Furthermore, the review does not imply that quantities of items on the plans are the final quantities required. The review shall not be construed for any reason as acceptance of financial responsibility by the City for additional quantities of items shown that may be required during the construction phase.

3.7.3 Construction Drawing Requirements

In general, construction drawings shall include plan and profile drawings that convey the horizontal and vertical alignment of the improvements, and all other pertinent plans, sections and detailing necessary to construct the proposed facilities.

All construction drawings submitted to the City for review, comment, and approval of water system improvements shall be prepared by, or under the direct supervision of a Professional Engineer licensed in the State of Utah. Said Professional Engineer shall be responsible for the information contained on the construction drawings, which shall bear the Professional Engineer’s seal prior to final approval for construction.

The Developer, Contractor, and Professional Engineer associated with the construction drawings shall be responsible for the adequacy and satisfactory performance of the designs and the installation of all items therein, and any failure or unsatisfactory performance of the system, so constructed, shall not be a cause for action against the City. Approval of the construction drawings by the City signifies only that the construction drawings meet the minimum stipulations of these design criteria and City requirements based upon the information provided to the City by the Professional Engineer and/or Developer, and makes no finding, representation, or warranty that the system and associated components will perform satisfactorily.

3.7.3.1 Water Utility Construction Drawings

In addition to the general formatting and information to be included on all sheets of a construction drawing set (e.g., north arrow, scale, project boundaries, lot lines, rights-of-way, tracts, approval blocks, etc.), the following information shall be included on the final Water Utility Plans.

1. Legend: Each sheet shall show the symbols pertaining to the sheet.

Chapter 3. Water System Submittal Requirements

2. Vertical Datum: All elevations used for the planning, design and construction of facilities shall be on the NAVD88 Datum.
3. Horizontal Benchmark and Coordinates: The horizontal benchmark shall be specified. In order to facilitate the Engineering Department's GIS mapping efforts, all basemapping provided to the City shall be placed in the State Plane NAD83, Utah Central Zone Coordinate System and include the coordinates of a known property corner on or adjacent to the site.
4. Plan views shall be oriented so that north is up on the sheet or to the right.
5. Water utility construction notes shall be provided for City review.
6. Overall Water System: In plan view, provide all information and dimensions for horizontal layout of proposed water mains including but not limited to valves, thrust blocks, reducers, tees, bends, crosses, fire hydrants, domestic water service taps, lines and meters, irrigation taps, pressure reducing valves (PRVs), combination air release/vacuum valves (ARVs) and vents, blow-off assemblies, and any other appurtenances that are part of the potable water system.
7. Plan views shall show the locations and sizes of all existing and proposed utility lines and appurtenances (water, sanitary sewer, stormwater, gas, electric, telephone, cable, fiber optic, etc.) on and adjacent to the site. Plan views shall show the location of all existing water wells and On-Site Wastewater Treatment System (OWTS) on and adjacent to the site.
8. Plan views shall show existing water mains with sizes; valves; domestic and irrigation water service taps, lines and meters; fire hydrants; pressure reducing valves (PRVs); combination air release/vacuum valves (ARVs); and blow-off assemblies on and adjacent to the site.
9. Plan views shall show existing and proposed curb, gutter, and sidewalks; and all existing and proposed structures, such as vaults, catch basins, traffic islands, street lights, walls or other permanent structures on and adjacent to the site.
10. Plan views and profiles shall show the tie-ins to the existing water distribution system, including sizes of existing mains. In addition, the nearest water main valves on existing mains shall be shown or, at a minimum, the distance to these valves shall be included on the construction drawings.
11. Plan views and profiles shall show all needed off-site improvements, extensions of service or upgrades to the City's water distribution system.
12. Plan views shall show and label the type and width of all existing and proposed easements that are on and adjacent to the site.
13. Profile drawings are required for off-site construction and all water mains outside of streets. All profile drawings shall include existing and final grade lines. In certain instances, water main profiles may be waived if approved by the City. If a water main profile is waived, then the following information shall be included:

Chapter 3. Water System Submittal Requirements

- a. All high points (HP) and low points (LP) along the water mains shall be identified;
 - b. Where required by these Criteria, ARVs, vents and blow-offs shall be shown throughout the water system, with the TOP and BOP elevations provided; and
 - c. All utility crossings shall be identified.
14. Profile views or plan views: Adequate pipe elevation information is required for all utility crossings of water, sanitary sewer, stormwater, gas, electric lines, etc. The following information shall be included:
- a. Types and sizes of the utility lines at the crossing and the stationing of the crossing; and
 - b. If any pipes at crossing are encased, the coordinates at each end of the encasement, and the type and thickness of the encasements shall be specified. In addition, all utility crossing shall include either:
 - (1) A reference to the sheet where the crossing information is shown; or
 - (2) Top of pipe and bottom of pipe elevations and vertical clearance at the crossing with a callout of “(Min. = 1.5’)” wherever the clearance is 2 feet or less.
15. Water System Details: All pertinent details related to water system improvements, such as pipe and fitting restraints, hydrant installations, PRVs, ARVs, blow-off assemblies, utility crossings, trenching, etc., shall be shown on detail sheets on the construction drawings. Where applicable, references to the City standard details may be provided rather than reproducing the City standards in the construction drawings. Specific detail numbers number be referenced with options indicated if applicable.
16. Plan views shall show the boundaries of the City’s pressure zones or a note shall be added stating the pressure zone if the entire site is in only one pressure zone.
17. The construction drawings shall contain the following note: “Contractor shall notify the City of Moab Public Works Department of any work that requires shutdown or interruption of service of existing water mains two weeks prior to the proposed shutdown or interruption unless otherwise approved by the City.”

3.8 Record Drawings

All water system improvements constructed within public rights-of-way and dedicated easements must be formally accepted by the City. The City’s acceptance process will confirm that the improvements have been constructed in accordance with the City’s current Criteria.

Chapter 4. Water System Design Criteria

4.1 Reference Design Documents

Primary standards and reference publications pertinent to the design of drinking water facilities within the City of Moab are listed below. Unless otherwise specified, the latest editions shall apply.

- Utah State Code Annotated
- Utah Administrative Code {R309}
- American National Standards Institute (ANSI)
- Utah Chapter of the American Public Works Association (Utah APWA)
- American Water Works Association (AWWA)
- American Society for Testing and Materials (ASTM)
- Ductile Iron Pipe Research Association (DIPRA)
- City of Moab Municipal Code
- Cross Connection Control Program of Utah (April 2016)

4.2 Prohibited Installations

The following installations are prohibited unless otherwise approved by the City. Certain items listed below reference Sections contained in these Criteria that provide the minimum design requirements to be addressed, should a variance be pursued.

- Private Water Booster Pumps (requires an exception from the Utah Division of Drinking Water)
- Unmetered Service Connections

4.3 Unlawful Connections

No installation of potable water supply piping or part thereof shall be made in such a manner that it will be possible for used, unclean, polluted, or contaminated water, mixtures, or substances to enter any portion of such piping from any tank, receptacle, equipment, or plumbing fixture by reason of back siphonage, suction, back pressure, or any other cause, either during normal use and operation, or when any such tank receptacle, equipment, or plumbing fixture is flooded, or subject to pressure in excess of the main line operating pressure. No person shall make a connection or allow one to exist between pipes or conduits carrying domestic water supplied by the City and any pipes, conduits, or fixtures containing or carrying water, chemicals, liquids, gases, or any other non-potable substance from any other source except as allowed by the Utah Cross Connection Control Program. All connections must be approved by the City.

Chapter 4. Water System Design Criteria

4.4 Minimum Water System Design Criteria

This section presents the minimum technical criteria for the analysis and design of water systems within the boundaries of the City of Moab, including distribution and transmission mains, water service lines, and the applicable appurtenances associated with these installations. Any special criteria beyond those contained herein, and as determined necessary by the City, shall be discussed at the pre-application consultation.

4.4.1. Design Demands

Average daily demands, peak day demands and average annual demands shall be based on the criteria included in the current Utah Administrative Code. This information is currently located at {R309-510-7 U.A.C.}. The City Engineer may adjust the demand values based on the evaluation of actual use data, a current master plan or other conditions determined to affect the safety and welfare of the public.

4.4.1.1 Fire Flows

The developer shall develop recommended fire flows based on the currently adopted fire code, the type of construction and the size of construction. This information is currently located in Appendix E of the 2012 International Fire Code. Based on this information, the City Fire Official will determine the fire flow required for each development.

4.4.2 Storage Requirements

Storage requirements shall be based on the criteria included in the current Utah Administrative Code. This information is currently located at {R309-510-8 U.A.C.}. The City Engineer may adjust the storage values based on the evaluation of actual use data, a current master plan or other conditions determined to affect the safety and welfare of the public.

4.4.3 Minimum Hydraulic Performance Criteria

All mains shall be sized to provide for municipal, irrigation and fire protection demands to all points in the City without violating the pressure criteria set forth herein. The maximum average velocity must be a maximum of 6 feet/second, unless otherwise approved by the City.

The minimum and maximum pressures shall be as provided in the following table:

Hydraulic Condition	Pressure*
Peak Day Demand Plus Fire Flow	20 psi min.
Peak Instantaneous Demand	30 psi min.
Peak Day Demand	40 psi min.
No Demand (static)	120 psi max.
Exception: Areas of the water system approved before January 1, 2007 must maintain water pressures at the point of connection of 20 psi min.	

Chapter 4. Water System Design Criteria

4.4.3.1 Operating Pressures and Pressure Zone Characteristics

The City of Moab water system included several pressure zones. The developer should consult with the City to determine the range of pressures expected under normal operating conditions.

4.4.3.2 Location of Pressure Reducing Valves

If the water pressures within the development are expected to exceed the maximum pressure or if it is anticipated that the development will cause pressures to increase in other areas of the water system, the developer shall install a pressure reducing valve station to reduce pressures. Pressure reducing valves are also required at pressure zone boundaries. The cost of the pressure reducing valve stations for areas of new development will be borne by the developer.

4.4.4 Minimum Distribution Main Sizing and Valve Spacing

Water distribution mains shall have a minimum diameter of 8 inches. Isolation valves at locations other than intersections shall be located with a distance between valves of not more than 500 feet, except in residential zones spacing between valves may be 800 feet. The City may approve exceptions in areas of widely scattered customers with no future anticipated development.

Isolation valves are required in all directions at junctions, except for branches to fire hydrants. For example, all tees shall have three valves. All crosses shall have four valves. Valves for fire hydrants shall be in accordance with the City standard details.

4.4.5 General Water System Layout Criteria

4.4.5.1 Location

All water mains and appurtenances shall be installed in public right-of-way or dedicated utility easements. Water mains shall not be installed parallel to and directly below, any concrete such as sidewalks, trails, curbs, or gutters, and no water manholes or appurtenances shall be located in multi-use trails and sidewalks. Mains shall be located in accordance with the City's standard details, unless otherwise approved by variance from the City. In public streets, water mains shall be located near the shoulder of the road when possible. Otherwise the location should be coordinated with the City Water Department. Under no circumstances shall the edge of a main be closer than 5 feet from a gutter pan. Water system layouts in cul-de-sacs shall be in accordance with the City's Standard Details.

4.4.5.2 Horizontal Layout

Horizontal separation from potable water mains to storm sewers and sanitary sewers shall be ten feet, edge-to-edge. Horizontal separation from raw (untreated) water lines to storm sewers and sanitary sewers shall be five feet, edge-to-edge. The City must specifically approve any variance from this requirement in the event that it has been determined that it is impossible to maintain the specified horizontal separation distance.

Chapter 4. Water System Design Criteria

Water mains adjacent to developments shall be designed to extend along the entire frontage of the property to be served, from property line to property line, in order that service will thereupon be available to adjacent Developers or Builders to subsequently extend from in the future. Any off-site water mains necessary to serve the development property shall be extended at the sole expense and obligation of the Developer.

Water main alignments in utility easements or tracts between structures (residences, businesses, etc.) shall only be allowed for the purpose of looping a water main at the end of a cul-de-sac, and shall include provisions for a Main-Break Swale as set forth in these Criteria. Under no circumstances shall water mains be installed directly below any concrete such as sidewalks, curbs, or gutters, except at 90-degree angles where crossings beneath the concrete features are required.

4.4.5.3 Vertical Layout

The minimum depth of cover for water mains from final grade to the top of the water main shall be 4 feet. The maximum depth of cover for water mains shall be 6 feet from top of pipe to final grade unless associated with a water main lowering in accordance with the City's Standard Details, or as otherwise approved by the City. Under circumstances where a deeper main would eliminate the need for an air valve, mains may be constructed with a cover up to 7.5 feet, and the plans shall note that high points are to be avoided over such a reach.

In the event that the water line crosses a sewer line or storm drain line, the water line must be above the sewer line and have a minimum separation of 18 inches.

4.4.6 Pipe Joint Deflection

Design of DIP deflections shall be in accordance with the latest edition of AWWA C600 entitled "Installation of Ductile Iron Water Main and their Appurtenances". Design of PVC pipe deflections shall be in accordance with the latest edition of AWWA Manual M23 entitled "PVC Pipe – Design and Installation".

Water main joint deflection for DIP and PVC shall not exceed one half of the manufacturer's maximum allowable deflection for the specified pipe diameter and lay length, or one half of the maximum deflection allowed by AWWA, whichever is less. Fittings, bends, or couplings that allow additional angular offset shall be used to achieve gradual alignment changes that exceed the axial joint deflection limits stated herein.

4.4.7 Distribution Main Looping

All water systems shall be effectively looped. No dead-end lines will be permitted except lines extending into cul-de-sacs serving no more than 12 single-family residential units or equivalent residential connections (ERCs) and with a length of no more than 400 feet. A fire hydrant shall be placed at the deepest point of any cul-de-sac.

Chapter 4. Water System Design Criteria

Water quality is a design consideration for any system, and an aging analysis and/or model may be required at the discretion of the City to insure that water quality concerns will not be created as a result of any proposed distribution system layout. Water quality sampling stations may be required by the City at specific locations within new developments to continue to adequately monitor the overall quality of the City's expanding system.

Distribution mains shall be PVC pipe in accordance with AWWA C-900 DR 18 or Ductile Iron Pipe Class 350 in accordance with applicable AWWA standards. Other types of pipe material may be approved by the City.

4.4.8 Transmission Mains

All water mains 16 inches and larger in diameter shall be classified as "transmission mains", and shall correspond to the sizes established in the latest edition of the City's water distribution and storage master plan. Raw water lines that run between wells and points of disinfection or purification, regardless of size, shall also be considered transmission mains. Air and vacuum release valves shall be installed along transmission mains at all high points and pumping manholes may be required at low points. Temporary blow-off assemblies shall be installed in accordance with the City's Standard Details at all temporary dead-ends along transmission mains. No service connections, including irrigation taps, shall be permitted on a transmission main.

Transmission main valves shall be butterfly valves, and shall be required on every branch where two transmission mains connect. Valves shall be installed in accordance with the City's Standard Details and shall be located 10 feet from the connection wherever possible, but shall in no case be less than 5 feet. Maximum valve spacing along transmission mains shall be no more than 1,200 feet, provided there are no intersecting distribution mains.

Where distribution mains connect to transmission mains, a gate valve is required on the distribution main, and the goal shall be to locate butterfly valves along the transmission main so that no more than 16 residential units and one fire hydrant will be out of service at any given time, whether for maintenance, or in the event of a water main break. It is the responsibility of the developer to verify compliance with this requirement by considering effective looping, as well as other applicable requirements.

Transmission mains shall be PVC pipe in accordance with AWWA C-900 DR 18 or C-905 DR 18 or Ductile Iron Pipe (Cement Mortar Lined) Class 350 or Class 250 in accordance with applicable AWWA standards. Other types of pipe material may be approved by the City.

4.4.9 Bored Crossings

When a water main passes under a State roadway, an arterial or collector roadway as defined by the City, railroad, drainage way or irrigation ditch, the main shall be located within bored steel casing pipe, unless otherwise allowed to be open cut by the jurisdictional entity being crossed.

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The carrier pipe shall be sleeved and sealed within the casing pipe and shall have a minimum of 4 feet of cover to top of casing. The casing pipe shall extend the entire width of the right-of-way or easement of the crossing structure, or as directed by the City or other jurisdictional entity. Valves with appropriate restrained lengths shall be located near each right-of-way or easement line, just beyond the ends of the casing pipe, to provide for the isolation of the main during maintenance or inspection.

Crossings at ditches shall include cutoff walls at each side of the crossing, either as required by the jurisdictional entity, or as analyzed and designed by the Engineer at the direction of the City and shall comply with {R309-550-8(8) U.A.C.}.

Casing pipe shall be smooth-walled, non-coated pipe of welded steel construction conforming to ANSI/AWWA C200, and shall be seamless or straight seam steel pipe with minimum yield strength of 35,000 psi. The casing pipe shall be constructed of new material and have a minimum wall thickness as follows unless specified otherwise.

Carrier Pipe Nominal Diameter	Min. Casing Pipe O.D.	Min. Wall Thickness*
4"	12"	0.250"
6"	14"	0.250"
8"	16"	0.322"
12"	20"	0.375"

*The boring contractor shall determine the necessary casing wall thickness and provided a wall thickness that is greater than included in the above table if needed. Other diameter pipes sizes shall be designed by a professional engineer and submitted to the City of Moab for review.

Casing pipe shall be cathodically protected by burying a pair of sacrificial anodes 10 feet from each end of the casing. Anode wires shall pass from the casing pipe to terminal boards inside surface-mounted cast iron lids at each casing end, and then on to the anodes themselves. All anodes shall be buried vertically or horizontally with the top of the anodes set at a depth equal to the casing spring line. Anode pairs shall be offset perpendicularly 5 feet away from the casing pipe, and shall be placed in native soils, not imported backfills. The cathodic protection system shall be designed by competent technical personnel experienced with these types of systems, and shall be submitted to the City for review and approval. Long-term maintenance of the system, including anode assessment and replacement, shall be addressed in the submittal.

4.4.10 Appurtenances

4.4.10.1 Valves

All water distribution systems shall have valves to ensure that no more than 500 feet of main will be out of service in the event of a single water main break, except for residential area where 800

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feet of main may be out of service. Valve placement at water main intersections shall be such that three valves are required at every tee and four valves at every cross. Existing valves may be utilized to satisfy these requirements. Valves shall be the same nominal size as the adjacent pipe.

Post indicator valves shall be placed on private fire lines, unless this requirement is waived by the fire official. Valves shall be placed on the branch serving a fire hydrant.

Valves shall be located to provide for the extension, pressure testing, and chlorination of new water mains without the disruption of the existing system. Additional valves shall be considered by the developer to minimize inconveniences and safety hazards during repairs at critical locations within the system, and to provide for the ability to conduct water quality monitoring and alleviate water quality concerns that may be reasonably anticipated.

Valves up to 12 inches shall be resilient seated gate valves which meet requirements of AWWA C-509.

Valves 14 inches and larger shall be butterfly valves, with valve operators located on the north and east sides of the mains. Under no circumstances shall a valve be located in concrete, such as sidewalks, cross pans, aprons, curbs, or gutters. Valves shall meet requirements of AWWA C-504.

Valve boxes shall be in accordance with City Standard Details and shall be brought up to grade at the time of pavement placement or overlay. Any valve located in an unpaved area shall have a reinforced concrete collar around the valve box and the accompanying marker.

Temporary dead-ends on any water main shall include a temporary blow-off. Dead-ends on lines that will not be extended shall be provided with permanent hydrants at the terminus of the dead end.

4.4.10.2 Pressure Reducing Valves

Pressure-reducing valve (PRV) installations are used to control and maintain pressure between distribution pressure zones, and shall be installed at locations determined by the City. Downsizing of the main shall not be allowed at the valve, unless approved by the City. The City shall determine the PRV pressure settings necessary to maintain the City's pressure zones, shall be present when PRVs are put into service, and shall inspect these facilities.

4.4.10.3 Fire Hydrants

Fire hydrant spacing and proximity to structures shall be as required by the latest version of the State of Utah adopted fire code, however spacing between hydrants at and adjacent to the project shall not exceed 500-feet. The distance between fire hydrants shall be measured along an unobstructed path. All hydrants shall be installed to conform to the grade and alignment shown on the plans.

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All fire hydrant locations will ultimately be subject to the approval of the City Fire Chief. Hydrants shall be placed as shown in the City's Standard Details within the right-of-way or in a utility easement. Wherever possible, hydrants shall be located on the same side of the street as the water main, unless otherwise directed by the City. Preference shall be given to locating hydrants near street corners, rather than to locations near streetlights. Hydrants shall be located at the end of every cul-de-sac.

When hydrants are to be installed at locations other than street intersections, they shall be located at the extension of property side lot lines. In no case shall a hydrant be located closer than 5 feet to obstructions, driveways, etc., and no closer than 10 feet from a curb inlet. Fences, landscaping, etc., shall in no way hinder the operation of the fire hydrant.

Fire hydrant lateral lines shall be set at 90 degrees to mains and shall be no more than 70 feet in length between the hydrant and the main. Tap shall not be made on a hydrant lateral.

The make and model of the installed fire hydrants must be approved by the Public Works Department.

4.4.10.4 Thrust Restraint

All bends, tees, crosses, wyes, plugs, dead-ends, wet taps (in certain cases), hydrants, blow-offs and other fittings with unbalanced thrust forces shall be designed and constructed with concrete thrust blocks in accordance with the City's Standard Details. If the soil-bearing capacity is unknown, it shall be assumed to be 2,000-pounds/square foot in determining the appropriate size of the thrust block. In addition to thrust blocks, joints shall be mechanically restrained for the required distances from valves and fittings. The entire length of fire hydrant lines and fire service lines, as well as pipe in fill areas, shall be restrained.

4.4.10.5 Meters and Service Connections

All service connections shall be metered. In general, residential and commercial meters shall be installed within the public right of way and shall conform to the City Standard Drawings. Fire lines are not considered service connections for this requirement and don't require a meter.

All meters connected to the City's water distribution system shall be the property of the City. Under no circumstances shall anyone other than City personnel remove a water meter once the pit, vault, or authorized inside installation has been inspected and approved. No connections shall be made in the meter pit other than those directly related to the meter and bypass. Single-family residential irrigation system connections shall be made downstream from the meter and double check backflow prevention assembly. All other uses require irrigation service connections separate from the domestic service connection.

Maximum design flows through meter shall be limited to 80% of the maximum rate flow. The continuous flow shall be limited to 50% of the maximum rated flow. In all cases, the maximum

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and minimum flows shall be within the flow range and performance requirements of the meter manufacturer.

For all water meter installations, detailed drawings of the proposed installation, indoor and outdoor water use volumes and flowrates and water fixture unit counts shall be included as an integral part of the plans submitted to the City for review. There shall be no electrical wiring allowed in any water meter pit or vault unless authorized in writing by the City. Fixture unit counts for residential, commercial or industrial use shall be determined by a Professional Engineer in accordance with the procedures set forth in plumbing code, and as approved by the City.

4.4.10.6 Fire Protection Service Lines

Fire service lines shall be ductile iron (3-inch diameter and larger) or type K copper (2 inch diameter and smaller) from the main to the backflow prevention assembly unless approved by the City Fire Department. All fire service lines shall be fully restrained in their entirety.

The customer/owner shall own and maintain all private fire service lines from the tap on the main to the building. All fire sprinkler taps shall be installed with a backflow prevention assembly approved by the City and as required by the latest edition of the Utah Cross-Connection Control Manual. A flow switch shall be provided on the riser that indicates whether or not water has flowed through the line. Tapping these lines for fire hydrants, domestic water, and/or any other purpose shall not be permitted. Commercial properties requiring a domestic service line and a fire protection service line shall have separate taps for each.

Fire protection service lines and fire department connection (FDC) locations shall be included on the Construction Drawings. FDCs are to be freestanding in a location approved by the Fire Official and shall be constructed as required by the Fire Official.

4.4.10.7 Manholes

Manholes shall be installed in conjunction with all air release vaults in accordance with the City's Standard Details. Manhole lids shall not be aligned with vehicle wheel paths, or within 2 feet either direction of the street crown.

4.4.10.8 Backflow Prevention Assemblies

To prevent backflow contamination of the City's potable water mains, a backflow prevention assembly shall be installed where pressures downstream of the water meter could exceed those in the main, and where any unsafe water or contaminated materials could be discharged, or drawn into the potable water system under a condition of back-siphonage. The assembly shall be placed downstream of the water meter and shall be installed and tested in accordance with City's Cross Connection Control Program. The assemblies shall meet the most restrictive requirements set forth in the latest editions of the City of Moab and State of Utah Cross-Connection Control Programs, and shall further meet the requirements of the adopted plumbing codes. Backflow

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prevention assemblies shall be installed and located to provide for proper operation of the device, and easy access for annual testing and maintenance.

Determination of the particular device shall be at the discretion of the Public Works Department. All service connections, including irrigation and fire line connections, shall require backflow prevention.

4.4.10.9 Combination Air Release and Vacuum Valves

Combination air relief valves and vaults shall be located at all high points in the transmission and distribution system in accordance with the City's Standard Details.

4.4.10.10 Blow-off Pumping Manholes

In accordance with the City's Standard Details, a pumping manhole shall be installed at all low points on transmission mains.

4.4.10.11 Tracer Wire and Warning Tape

Tracer wire shall be affixed to the top of all water mains regardless of pipe material and terminated in test stations located behind each fire hydrant or in valve boxes. The maximum distance between test stations or tracer wire boxes shall be 500 feet. Warning tape shall be installed one foot above the top of pipe on all water mains, regardless of pipe material.

4.4.11 Fill Areas

Where water mains will be constructed in fill areas, all fill materials shall be placed and compacted to final grade prior to the installation of the water main and appurtenances. All fill material shall meet the City's standards and be approved by the City. Water mains within fill areas shall have restrained joints in accordance with these Criteria.

4.4.12 Trail Access

Where water mains cannot be located in public right-of-way, the facilities shall be located in areas that allow direct access by maintenance vehicles. Proposed trails to be used to access water mains and appurtenances must meet the following requirements, and shall be submitted for review and approval by the City:

1. The longitudinal slope must not exceed 10% and the cross slope must not exceed 4% unless approved by the City.
2. The Parks Department must approve this use.
3. The width of the drivable surface shall be a minimum of 10 feet for a straight portion of trail and at least 12 feet wide for curved portions, depending on the curve radii. A shoulder may be required.
4. The trail shall be designed to support an AASHTO HS-20 load.
5. The trail must be in a utility, public access or trail easement a minimum of 20 feet wide.

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Information regarding the width, type and depth of material specified for trails to be used to access water system facilities shall be submitted for review by the City, and shall include acknowledgement from the Parks Department that utility access is approved for the particular trail.

4.4.13 Main-Break Swale Design

All water mains to be constructed between structures (residences, businesses, etc.) must have a “main-break” swale or channel that provides adequate capacity in the event of a water main break. The swale must be located in a dedicated open space or utility tract maintained by the Owner.

4.4.14 Future Connections

A temporary blow-off assembly, is required at the terminal end of any water main that is to be extended in the future. Such discontinued mains shall have valves located such that only a single valve will need to be closed when the main is extended. Joints shall be restrained an adequate distance from the valve per the City’s Standard Details to ensure that the valve will not blow off when the line is exposed for extension. No service taps shall be allowed between the isolation valve and the dead end on any main that may be extended in the future.

4.4.15 Water Service Lines

All single family residential dwellings, each individual unit in multi-family complexes, including duplexes, and each commercial business, industrial, and irrigation customer shall be served by a separate, independent water service line and meter. The City will consider the use of a single water meter for multi-family complexes if requested by the Developer and if sub-metering of individual units is provided.

4.4.15.1 Layout

The Developer shall install a service line stub-out from the water main to each individual lot, including the corporation stop valve and meter box. Where sidewalks are proposed, the stub-out shall be constructed to five feet beyond the back of the sidewalk. Where sidewalks will not be constructed, the stub-out shall be constructed a minimum of one foot beyond the property line. The stub-outs shall be plugged and the end marked with a blue painted T-post installed in the ground directly above the location of the plugged end.

All service line sizes and locations shall be shown on the water system Construction Drawings to be approved by the City. The services shall be constructed as shown on the construction drawings unless otherwise approved in writing by the City. The stationing, length, size and direction of the service line shall be shown in plan view on the construction drawings.

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4.5 Easements

Where mains cannot be installed in right-of-way, they shall be located within utility easements approved by the City and shall be centered in the easement. The minimum easement width shall be 20 feet for one utility. The width of easements which include more than one utility will be determined by the City. Site-specific circumstances may dictate the need for wider easements. Utility easements and dedicated utility tracts shall be defined by bearings and distances around the perimeter of the easement. Centerline legal descriptions are not acceptable.

The main shall be located a minimum of 10 feet from and parallel to the edge of the utility easement. All meters and fire hydrants not installed within the right-of-way will require an easement dedication 10 feet wide and extending 3 feet behind the meter or hydrant. If the meter or hydrant easement is longer than 10 feet, the width of the easement shall be a minimum of 20 feet. Fire hydrants and meters shall be centered in all such easements.

All utility easements shall be for the exclusive use of the City. No permanent structures, (e.g., retaining walls, trees, light pedestals, sign foundations, power poles, mailboxes, sheds, buildings, etc.), shall be placed in the easement.

Where it is necessary to locate a water main along back lot lines, the main shall be offset a minimum of 10 feet from the lot line, and the alignment shall be specifically approved by the City to provide reasonable access for maintenance crews.

4.6 Testing and Disinfection

All distribution and transmission lines, and all other piping and fittings shall be flushed, pressure and leak tested and disinfected. After disinfection, bacteriological samples shall be taken from the lines. Pressure testing shall be in accordance with AWWA Standard C600-10. Disinfection and bacteriological testing of facilities shall be in accordance with AWWA Standard C651-05. Water lines and facilities shall not be connected to the public water system until the bacteriological tests indicate that the water is free from contamination.

Chapter 5. Accessory Facilities Design

5.1 General

5.1.1 Scope

It is not anticipated that developers will typically be involved in the design or construction of wells, pump stations, storage tanks or water treatment systems which are part of the City's public water system. The City asserts the right to assume the lead design and construction roles for these facilities. However, at the City's option, the City may allow or require the developer to design and construct these facilities related to the development. Design of these facilities will be in accordance with the State of Utah Administrative Rules {R309 U.A.C} and the applicable building codes.