Appendix P

Cheney Design Standards for Water

City of Cheney Engineering Design Standards

Section 7
Water

7.0 WATER

A. The City provides a public water system to the Cheney community and surrounding areas within the Critical Water Planning Service Area. Connection to City water is required when mains are within 200' of a facility. All water improvements must be inspected before covering. Privately constructed improvements (e.g., in a new subdivision) do not become property of the City until officially accepted by City Council. All water system improvements and meter vault locations must be approved in advance by the Public Works Department. Application for service is made at the Utility Building.

B. Unless noted otherwise, these policies do not apply to improvements in the Eastern Washington University water system.

C. Extension outside city limits. Municipal water service will be available as determined in the City Comprehensive Plan, Coordinated Water Service Plan, City Water Plan and policy of the city

D. Annexation covenants. Owner requesting water service for property outside the City limits may be required to execute a Utility Connection Annexation Covenant with the City, to provide for annexation at a later time. The covenant will be in a form approved by the Public Works Director and City Attorney.

7.1 Definitions

A. ***Air/Vacuum Relief Valve*:** An air valve placed at the high points in a pipeline to release air automatically and prevent the pipeline from becoming air-bound with a resultant increase of pressure and also permits inlet of air into an empty pipe to relieve a vacuum.

B. ***Backflow:*** A flow condition, induced by a differential in pressure, that causes the flow of water or other liquid into the distribution pipes of a potable water supply from any source or sources other than its intended source.

C. ***Check Valve:*** A valve provided with a hinged disk that opens in the direction of normal flow and closes with reversal of flow.

D. ***Distribution Main:*** A public water pipe comprising part of the distribution system used to deliver potable water, for customer needs which, in many cases, includes irrigation and fire protection, to the customer's individual service line(s); and to deliver water to fire hydrant leads for fire protection.

E. ***Distribution System:*** That portion of a public water system which conveys water from the transmission facilities to consumers.

F. ***Fire Flow:*** A water demand calculated by the fire or building official for a specific development to be used in the design of the water system for the project. The system must be designed to deliver this flow, on top of the maximum day demand, without dropping the pressure below 20 PSI, and without exceeding a velocity of 15 feet per second, in any portion of the system, whether new or existing.

G. ***Gate Valve:*** A valve in which the closing element consists of a disk which slides over the opening or cross-sectional area through which water passes, and fits tightly against it.

H. ***IFC:*** International Fire Code

I. ***Pressure Reducing Valve (PRV):*** An automatic control valve designed to reduce a higher inlet pressure to a lower constant outlet pressure regardless of fluctuating flow rates and/or varying inlet pressure.

J. ***Transmission Main:*** A large diameter public water pipe comprising part of the distribution system used to deliver large quantities of potable water over long distances from the source to a reservoir, booster pumping facility, and/or to a networked system of distribution mains. Typically, services and fire hydrants are not connected to transmission mains.

K. ***Water Service Tap & Service Line:*** The water service tap is the connection to the distribution main of a service line. The service line is the pipe which extends from the service tap into the customer's property used to deliver potable water, for domestic needs as well as, in some cases, irrigation and fire protection.

7.2 Water Demands

A. Average Day and Maximum Day Demands

1. The Maximum Day Demands shall be estimated in accordance with the most current edition of the City of Cheney's Comprehensive Water System Plan.
2. Use the gross developable acreage when calculating the demands. This demand is used for designing most systems within a well established water grid.

B. Peak Hour Demands

1. The Peak Hour Demands shall be estimated as stated above. Use the gross developable acreage when calculating the demands. This demand is used for sizing remote systems, single feed systems, or newly developing areas.

C. Fire Flow Demands

1. A minimum fire flow of 1,500 gallons per minute for a two-hour duration is required for residential areas. In all cases water facilities shall be provided to supply fire flows commensurate with the fire code.
2. Where areas are served by pre-existing or older developments, fire flow requirement may be reduced when approved by the Fire Marshall and the Director of Public Works. In considering such a reduction, factors such as home size, density, topography, landscaping and traffic flow will be evaluated.
3. Fire flow requirements for commercial and industrial areas are determined on a case-by-case basis
4. In sizing piping and other public water system components, the required fire flows are added to Maximum Day Demands for determining total consumptive use.

D. Hydraulic Modeling

1. On some projects, the Public Works Department will require that a hydraulic model be performed to prove that the design meets minimum standards. The determination of whether a project must be modeled is at the sole discretion of the Public Works Department.
2. Steady-state hydraulic models are allowed, provided the following conditions are met:
   a. The system reservoirs shall be modeled at the lowest elevation in their operating range.
   b. Fire-flow scenarios shall be evaluated under max-day demand conditions.
   c. The existing water system must be included in the model back to the reservoir, or to a main determined by the Water Department to be large enough that the project's demands would be hydraulically insignificant.
   d. Demands shall be calculated only in accordance with the method contained in the City of Cheney Water Department's Comprehensive Plan. This calculation shall be included in the model submission.
   e. The datum used for elevations within the model shall be clearly referenced.
   f. The model submission shall include a map with pipe and node numbers legibly marked, and reservoirs identified as actual or representative of a tie-in to the existing water system. The map shall also include references to existing streets and features to help orient the map properly.

7.3 Water Pressure

A. Water pressures during maximum day demand conditions, with reservoirs at average water level, should be designed between 45 and 80 psi at every point in the system with few exceptions. Noted exceptions, upon approval of the Water Department Director, are near the intake of booster stations where pressures may be lower and in rough topography where pressures may be allowed to exceed the 80 psi limit.

B. Residual water pressures during fire flow demand conditions shall be designed to be no less than 20 psi at every point in the system.

C. Pressures over 80 psi: If static pressures exceed 80 psi then each service line shall be required to have an individual pressure reducing valve set to reduce pressures to a maximum of 80 psi. Refer to regulations pertaining to water service taps and meters.

D. Where the water system is expanded in such a way as to be delivering water in excess of 80 psi of static pressure, a PRV station shall be installed on the distribution line at the location necessary to reduce delivered pressures to below 80 psi.

E. Areas Served by Pressure Reducing Valves: Some areas may be supplied through pressure reducing valves in the main supply system. In areas where this is allowed, no matter what the local service pressure is, an individual pressure reducing valve is also required for each service connection.

7.4 Size of Pipe

A. Standard Sizes

B. Only City of Cheney standard sizes of pipes shall be allowed. Standard sizes are 6", 8", 10", 12", 18" and increments of every 6" above 18".

C. Exceptions to the above sizes are as follows:

1. In cases of a bridge crossing (existing bridge) or other conditions where a standard size would be infeasible or would limit the capacity below that needed, special consideration may be given to using non-standard sizes.
2. 6" piping shall only be allowed on hydrant lines which are less than 50 feet in length. All other lines shall be 8" or larger.

D. Service line sizes shall be coordinated with the Water Department.

E. Sizing Based on Velocity

1. The following criteria shall be used to determine the sizes of the pipes to be used:
   a. At maximum day demand, 5 fps maximum design velocity.
   b. At fire flow demand, 15 fps maximum at required fire flow.

7.5 Type of Pipe

A. All pipes shall be clearly marked with the manufacturer's name, type, class and thickness as applicable.

1. Mains
   a. PVC Pipe: 4-inch through 12-inch pipe shall meet the requirements of ANSI/AWWA C-900. Pipe greater than 12-in shall meet the requirements of ANSI/AWWA C-905. PVC pipe shall have the same outside dimensions as ductile iron pipe and shall be a minimum of SDR 18.
   b. Ductile Iron Pipe: Shall meet the requirements of AWWA C-151, Class 50, with a cement mortar lining meeting the requirements of AWWA C104
2. Service Lines
   a. Service lines shall be high density polyethylene tubing (copper tube size) meeting the requirements of AWWA C901, SDR 9, with a minimum pressure rating of 200 psi.

7.6 Fittings

A. All fittings for ductile iron pipe or PVC pipe shall be ductile iron compact fittings conforming to AWWA C-153 or Class 250 Gray Iron conforming to AWWA C-110 and C-111.

B. Bends are required where a change of direction of the water main occurs which cannot be accommodated by pipe joint deflection as provided in Section 7.15 below. Tees and crosses are required where lateral mains are needed as part of the project and

where future needs dictate. Tees are required where fire hydrant leads are needed as part of the project and where future fire hydrant needs dictate. Reducers are needed where a change of pipe size is required. All fittings shall be mechanical joint type unless otherwise specified.

C. Thrust blocks shall be required on all bends, sized according to the soil bearing capacity.

7.7 Valves

A. Gate Valves, 4-inch to 12-inch: Gate valves shall be used on all 4-inch to 12-inch lines. The design, materials, and workmanship of all gate valves shall conform to AWWA C-509. Gate valves shall be resilient wedge non-rising stems (NRS) with two internal O-ring stem seals.

B. Butterfly Valves, Greater than 12-inch: Butterfly Valves shall be used on all lines greater than 12-inch in size. Butterfly Valves shall conform to AWWA C-504, Class 150B, with cast iron short body and O-ring stem seals.

C. Air/Vacuum Relief Valves: Air/vacuum relief valves are needed at high points to allow release of air during filling the pipe with water as well as to allow accumulated air to be expelled under normal operation. Further, air valves are needed to prevent a vacuum from occurring and to allow air into the main when draining the pipe.

D. Blow-Off Valves/Assembly: If a fire hydrant is not located at the end of a dead end main, a blowoff assembly shall be required. The pressure rating for blowoff assemblies shall be 200 psi.

E. Valve Box: Valve boxes shall be installed on all buried valves. The box shall be of cast iron, two piece slip type standard design with a base corresponding to the size of the valve. The box shall be coal tar painted by the manufacturer using its standard. The cover shall have the word “WATER” cast in it.

7.8 Thrust Blocking

A. Location of all thrust blocks shall be shown on the plans. Thrust block concrete shall be Class 3000 poured against undisturbed earth. A plastic barrier shall be placed between all thrust blocks and fittings. See the Standard Plans for thrust block location and sizing requirements/calculations. Where approved by the Public Works Director, Ecology Blocks may be used in lieu of cast in place concrete thrust blocks.

7.9 Tracer Tape / Wire

A. All pipe and services shall be installed with continuous tracer tape installed 12” to 18” below the final ground surface. The marker shall be plastic non-biodegradable, metal core or backing marked “water” which can be detected by a standard metal detector. Tape shall be Terra Tape “D” or approved equal. In addition to tracer tape, install 12 gauge copper insulated single strand tracer wire. The tracer wire shall be taped to the top of the pipe at 10-foot intervals, brought up the outside of the lower portion of a valve box and then inside the upper section.

7.10 Depth of Pipes

A. Water mains shall be installed with a depth to crown of 4 feet. The following exceptions may apply:

1. 6 feet to the invert is maximum and will be allowed only in special cases.
2. 3 1/2 feet to the crown for short distances will be permitted on a case by case basis to allow for adjustment to other previously existing utilities. This is not allowed for lines with little or no flow (i.e. fire hydrant lines, building fire lines, lines feeding irrigation systems).
3. Consideration shall be given to the vertical alignment of future or proposed roadways whenever known.

7.11 Connections

A. Water Main Extensions

1. It is the policy of the City to require any developer or owner making a main extension to bring the main to the further edge or line of the property to be served and used. (CMC 16.12.030)

B. Water Main Connections

1. When connecting a new water main to an existing water main restrained joints on all fittings shall be required.
2. Prior to connecting a new water main to an existing water main all pressure testing and bacteria testing shall pass before the connection is made.
3. A representative for the City Water Department has to be present during the connection. Contact the Water Department 48 hours prior to making the connection.
4. City Water Department representative may require additional thrust blocking or any pipe deflection.

C. Service Connections Smaller than 3”

1. No connection to the water system shall be made until all applicable fees are paid. Once the applicable fees are paid the water department shall furnish a meter, a concrete or PVC frostproof meter box with lid; service box with curb stops and such valves as may be required, supplied by the applicant. All service taps to live water mains and installations of meter vaults, meters and valving shall be made by the Water Department. The expense of trenching, backfill and additional costs shall be borne by the applicant.

D. Service Connections 3” and Larger

1. No connection to the water system shall be made until all applicable fees are paid. Once the applicable fees are paid the water department shall furnish a meter, a concrete vault; service box with curb stops and such valves as may be required, supplied by the applicant. All service taps to live water mains shall be

made by the Contractor. All other work associated with the vault and meter installation shall be performed by the Contractor and be monitored by the City.

E. Water meters

1. All water use and service shall be through a meter, unless approved by the Director of Public Works. Making connection with the domestic water system, each residential, commercial or industrial building shall be considered and individual consumer and shall be supplied through a separate meter and service connection; provided that "future connection" includes any and all connections hereafter made, or modification of existing connections, such as the installation of water meters onto domestic supply lines in those instances where such meters have not been installed. Separate metering for individual units within a building is permitted, when the individual meters are supplied from a separate service connection to the City main.

F. Backflow Prevention Device

1. Furnishing of any service shall be contingent upon the installation of a backflow prevention device of a type approved by the Washington State Department of Health for the protection of the City water supply from backflow. All backflow devices shall be installed, tested and monitored per the City of Cheney's Backflow Protection Program. (CMC 16.08) (WAC 246-290-490)

G. Shut-off Valves

1. Every water installation shall have installed a shut-off valve between the water main and meter. The same shall be installed at the point designated by the Director. All meters and meter boxes shall be installed inside of and adjacent to the sidewalk, at such point on applicant's property as designated by the Director or within the dwelling with readout accessible to the exterior of lthe building.

7.12 Fire Hydrants

A. Location

1. Within the City limits, fire hydrant locations will be reviewed by the City Fire Department. Hydrants inside the City limits should ordinarily be located within 250 unobstructed feet along a path of travel to the property line. Hydrants located on the opposite side of four-lane, or larger, arterials shall not be considered in calculating service to a property. Consideration shall be given to placing hydrants at intersections or other access points that allow service in multiple directions. Based on these considerations the maximum distance may be extended to 300 feet.
2. All supply valves serving hydrants must meet the City of Cheney standards as provided in the Specifications.
3. Hydrants shall be located at the ER's (end of radius) at intersections, 2 feet inside of the right-of-way line. The hydrant flange shall be installed 3 inches above the top of curb elevation. Where curbs and sidewalks do not exist, hydrants shall be installed at the intersection of right-of-way lines with the hydrant flange 3 inches above finish grade elevation.

4. Hydrants shall not be located within 5 feet of wheelchair drops or within 3 feet of driveway drops.
5. Hydrants shall be installed in locations that provide clear and unobstructed access for operations and maintenance. A 3' clear space shall be maintained around the circumference of fire hydrants. If a hydrant must be located in areas subject to heavy traffic protection against damage from collision is needed.
6. Hydrants on a 6" line must be installed within 50' of the main.
7. Hydrant locations shall be determined per the International Fire Code (IFC) based on the fire flow demand established on the basis of the type, size, occupancy, and density of structures.

B. Requirements

1. Hydrants installed in the City's water system must meet the following requirements:
   a. The bottom foot valve must have a minimal opening of 5 ¼".
   b. The net area of the hydrant barrel must be not less than 120 percent of the valve opening.
   c. A liberal-sized waterway and small friction loss are required. With the hydrant discharging 250 gpm through each 2 ½" hose outlet, the total friction loss of the hydrant must not exceed 2 psi.
   d. Hydrant must have a drop valve of noncorrosive construction.
   e. Hydrant must have a uniform-sized pentagonal operating nut measuring 1 ½" from point of flat at the base and 1 7/16" at the top.
   f. Hydrant bonnets, barrels, and foot pieces shall be cast iron with internal working parts of bronze. Valve facings vary and may be leather, rubber or a composition material.
   g. Hydrant shall have a minimum of two 2 ½" openings and one steamer port.
   h. A Storz adapter shall be installed on all fire hydrants.
   i. Direction of opening shall be to the right (CLOCKWISE).
2. Hydrants shall be a base valve (dry barrel) type where the valve controlling the water is located below the frost line between the foot piece and the barrel of the hydrant. The barrel of this type hydrant is normally dry with water being admitted only when there is a need. A drain valve at the base of the barrel is open when the main valve is closed, allowing residual water in the barrel to drain out.
3. Hydrant location is usually determined by the fire flow demand established on the basis of the type, size, occupancy, and density of structures. The following table gives the average area per hydrant for each fire flow determined by the Insurance Services Office. This table exemplifies one method of establishing hydrant distribution. Hydrants should be located as close to a street intersection as possible with intermediate hydrants along the street to meet area requirements.
4. Thrust blocks shall be installed behind the hydrant.

C. Ownership of Hydrant

1. Fire hydrants installed in order to comply with the City's fire code (section 19.06.020(3)), except for those installed within the EWU water system, shall be dedicated to the City subject to inspection of the improvements by the Director of Public Works ad acceptance by City Council.

7.13 Distance from Other Utilities

A. Water line locations and distances from other utilities shall meet the criteria outilined by the Washington State Department of Ecology and the Washington State Department of Health. No new utility pole shall be located within 8 feet of an existing hydrant or water line.

7.14 Pressure Systems

A. A pressure system consists of its own pumps, reservoirs and distribution mains. In some limited instances, a system consists of pressure reducing valves to maintain water pressure.

B. As development continues and the water system is expanded, areas will be encountered which are at elevations that will require the establishment of additional pressure zones in order provide water service within appropriate water pressures. Generally this will require the construction of additional booster pumping stations and reservoirs. In some cases the use of pressure reducing valves will be the means of establishing the pressure zone. However, when considering the use of pressure reducing valves, an examination of the potential and feasibility of extending service from an established pressure zone which will provide the area within appropriate water pressures and which is supported by reservoir(s) storage will be required. If such an established pressure zone can be extended and utilized, preference in this regard will be generally the required approach. The creation of a new pressure zone will be allowed only on approval by the Public Works Director.

7.15 Laying Pipe on a Radius

A. Pipe may be laid on a radius provided the radius is a minimum of 1.33 times the minimum radius allowed by the manufacturer (75% of the manufacturer's allowable joint deflection). If pipe cannot be laid on a radius then it shall be laid on tangent sections with appropriate bends placed at approximately equal intervals around the curve.

7.16 Easements

A. Water easements shall be a minimum of fifteen (15) feet wide. Additional width may be required by the Director. Easements are required for all public water lines outside the public right-of-way easements must be recorded with Spokane County Auditor's Office on a final plat or a separate recorded document prior to approval of a final plat.

7.17 Special Regulations for P.U.D.'s and Private Water Systems

A. "Wheeling" water through a P.U.D. or any other private water system shall not be permitted. Water from the City's distribution system entering a P.U.D., must not be allowed to return to the public system. A meter and a double check valve assembly must be provided at each connection to the City Water System to prevent water from re-entering the City water system from the P.U.D.

B. All meter vaults shall be constructed immediately behind the property line of the P.U.D. and all pressure reducing valves and double check valve assemblies shall be placed downstream of the meter. The City's water system and responsibility for maintenance terminates at the meter.

C. Connections to P.U.Ds are similar to service connections and are subject to City tap and meter regulations.

7.18 Testing and Disinfection

A. The water main pipes shall be disinfected and tested before being placed in service or being tied into the existing system. All tests shall be performed by the Contractor and shall be coordinated with the Public Works Department and be witnessed by a City representative. Notify the Water Department 48 hours prior to testing. Water for testing and disinfecting shall be obtained by the Developer by arrangement with the City. All pumps, gauges, plugs, saddles, corporation stops, miscellaneous hose and piping, and measuring equipment necessary for performing the test shall be furnished, installed and operated by the Contractor. Feed for the pump shall be from a barrel or other container, wherein the actual amount of “makeup” water can be measured periodically during the test period. The section to be disinfected shall be thoroughly flushed at maximum flow prior to chlorination.

B. The pipeline shall be backfilled sufficiently to prevent movement of the pipe under pressure. All thrust blocks shall be in place and time allowed for the concrete to cure before testing. Where permanent blocking is not required, the developer shall furnish and install all temporary blocking and remove it after testing. The mains shall be filled with water and allowed to stand under pressure a sufficient length of time to allow the escape of air and allow the lining of the pipe to absorb water.

C. The pipeline shall be subjected to a hydrostatic pressure test of 150 pounds per square inch (psi) for a period of not less than one (1) hour for all lines. All tests shall be made with the fire hydrant auxiliary gate valves open and pressure against the hydrant valve. The allowable pressure loss during the one hour test period shall be three (3) psi.

D. Defective materials and workmanship, discovered as a result of the tests, shall be replaced. Whenever it is necessary to replace defective materials or correct the workmanship, the tests shall be re-run at the Developer’s own expense, until a satisfactory test is obtained.

E. The pipe shall also be disinfected when being tested. As each length of pipe is laid, calcium hypochlorite or other disinfecting agent, having a available chlorine content of about sixty-five (65) percent shall be placed in the pipe in sufficient quantities to give a dosage of about fifty (50) parts per million available chlorine, calculated on the volume of water which the pipe will contain. Only powdered disinfecting agents will be allowed. Use of disinfecting tablets will not be accepted. The calcium hypochlorite or other disinfecting agent used for this purpose shall be furnished by the Developer.

F. When the line is complete and ready to disinfect, water shall be allowed to flow in slowly so not to displace the chlorine agent, until it appears at the far end of the line. The system shall then be flushed through the fire hydrants or into the next section, until a test shows no more than 0.2 parts per million of free chlorine. If any of the materials need to be replaced, the line shall again be disinfected and tested. The line may be pressure tested at the same time it is disinfected.

G. Water sampling shall be performed by City of Cheney personnel. The water system will not be acceptable to the City until receipt of a satisfactory report from the County, State Health Department or certified lab on water samples submitted to that office for bacteriological analysis. Should the initial treatment result in an unsatisfactory bacteriological test, the original chlorination procedure shall be repeated by the Contractor until satisfactory results are obtained. Testing and sampling shall take place after all underground utilities are installed and compaction of the roadway section is complete.

H. All service stubs must be tested for flow of water after pressure test and bacteria test . City Representative must be on-site to observe the flow test. Contact Public Works 48 hours in advance.

7.19 General Notes (Water)

A. The following General Notes shall be included on any plans dealing with the construction of water systems.

1. All workmanship and materials shall be in accordance with City of Cheney standards and the most current edition of the Washington State Standard Specifications for Road, Bridge and Municipal Construction.
2. Water mains shall be constructed of AWWA C-900 or C905 Class 150 PVC or AWWA C-151, Class 50 Ductile Iron with AWWA C-104 cement mortar lining.
3. Gate valves shall be resilient wedge, Non Rising Stem (NRS) with two internal O-ring stem seals. Valve ends shall be mechanical joint or ANSI flanges. Valves shall conform to AWWA C-509.
4. All fittings for PVC or Ductile Iron piping shall be ductile iron compact fittings conforming to AWWA C-153 or Class 250 Gray Iron conforming to AWWA C-110 and C-111.
5. All lines shall be disinfected and tested in conformance with City of Cheney Standards.
6. All water lines shall be installed with a minimum depth of 4 feet to top of pipe.
7. Connections to existing water mains shall be coordinated with the City of Cheney Public Works Department.
8. All service stubs must be tested for flow of water after pressure test and bacteria test. City Representative must be on-site to observe the flow test. Contact Public Works 48 hours in advance.

7.20 Booster Stations

A. General:

1. Design of water booster pump stations shall be performed by a professional engineer licensed in the State of Washington. The design of water booster pump stations is an engineering matter and is not subject to detailed recommendations or requirements other than as required by these Standards. The applicant's engineer shall submit all supporting documentation, in report form, including all relevant design information needed for the City to review for adequacy of the proposed design. The design report shall be submitted with each water booster pump station and shall demonstrate its conformance with the standards as outlined herein.
2. General construction of public and private water booster pump stations and appurtenances is required to conform to International Building Code, Uniform Plumbing Code and National Electrical Code. Further, during design and procurement of components that go into the system, many national standards are specified for minimum conformance.
3. They are as follows:
   a. ANSI - American National Standards Institute
   b. ASTM - American Society for Testing and Materials
   c. AWWA - American Water Works Association
   d. CFR - Code of Federal Regulations
   e. FSS - Federal Specifications and Standards, General Services Administration
   f. HIPS - Hydraulic Institute Pump Standards
   g. IEEE - Institute of Electrical and Electronics Engineers
   h. NEC National Electrical Code
   i. NEMA - National Electrical Manufacturers' Association
   j. NEPA - National Environmental Policy Act
   k. NFPA - National Fire Protection association
   l. OSHA - Occupational Safety and Health Administration
   m. RCW - Revised Code of Washington (Laws of the State)
   n. SEPA - State Environmental Policy Act
   o. SSPC - Steel structures Painting Council
   p. UL - Underwriter Laboratory listing
   q. WAC - Washington Administrative Code
   r. WISHA - Washington Industrial Safety and Health Administration

B. Pump Station:

1. Public or private booster pump stations shall be incorporated whenever a development needs higher pressure than is available from the existing source. Public booster pump stations shall be above ground, cement block construction, with good insulation and sound barrier unless otherwise approved by the City of Cheney. The roofing shall be long lasting (50- year life), low maintenance type with good insulation for energy conservation. Private underground water booster pump stations may be allowed if approved by the City of Cheney.

2. The pump station shall be designed and located such that it pumps from a storage source on the suction side to a storage facility on the discharge side. There shall be suction and discharge headers with easy accessibility. On the discharge side, there shall be a sufficient straight run of transmission pipe in order to incorporate a flow meter. For maintenance, the flow meter may require installation inside a vault. A flow meter is required on either the suction line or discharge line.
3. The pump station shall be built to minimize vandalism and break-in. The station shall be equipped with intrusion alarms wired to communicate to the water system operators through the SCADA system.
4. The pump station shall have provisions for communication and connection to the City of Cheney's SCADA system via wireless signals.
5. The pump station site shall be landscaped and irrigated with timed automatic sprinklers. Preference shall be given to shrub patches rather than grass to provide screening and decrease maintenance.
6. A wireless service to the station is required in order to operate the station with the City's SCADA system.
7. Ventilation and/or a cooling system is required in or to protect pump motors from high temperatures.
8. A heating system is required for heating during cold weather.
9. The station shall be designed so as to ease removal of existing pumps and motors for maintenance as well as to allow installation of future pumps and motors. Easy access to the station must be provided for maintenance as well as for daily status inspection.

C. Pumps and Motors:

1. The pump stations shall have at least TWO pumps to provide redundancy. The number of pumps required will generally be dictated by the capacity size of the station keeping with prudent modern design for efficiency and flexibility of operation to meet varying demands considering summer to winter average daily demand varies over a factor of two. The station shall be so designed that required maximum day demand can be met with the largest pump out of service. As the electrical tariff uses a demand factor, it is important to size the pumps so that pump run times are maximized, rather than larger size pumps running for repeated short periods.
2. The pumps selected shall conform to hydraulic standards and the manufacturer shall conform to applicable NEMA and ANSI standards. Pump performance curve shall have smooth drooping characteristic from the cut-off head to the lowest operating head. The pumps chosen shall operate with high efficiency (75% or more) in the operating range.
3. Pump motor shall always be directly coupled and sized to meet the power required by the pump through the designed range of total pumping heads and pumping volumes. Motors shall have copper windings and operate at efficiency of 92% or above in the operating range. Motors 10 hp or above shall be three phase squirrel cage induction motors.
4. Pumps shall not be set directly on the floor. Rather, pumps shall be mounted on concrete pedestals to a height for ease of maintenance.
5. Pumps shall be provided with mechanical seals.

6. Pump selection shall meet the following criteria:
   a. The pump performance curve shall support proper pump performance through the designed range of total pumping heads and pumping volumes while operating within the most efficient portion of the pump curve. The proper operation includes performing without cavitation and within suction heads designed for the pump. The performance curve shall always be positive from shutoff head throughout the range of the curve. No pump shall be selected which has the potential of reaching shutoff head through possible adverse system pressure ranges.
   b. Pump motor shall be sized so as not to exceed maximum rated horsepower through the designed range of the pump.
   c. Wire-to-water pump/motor efficiency through the designed range of the pump shall be an important consideration when selecting such equipment.
   d. Pumps with discharge pressures exceeding 100 psi shall be furnished with mechanical seals.
   e. Generally greased lubricated bearings are preferred.
7. Each pump shall be equipped with isolation valves in the suction and discharge lines and a check valve in the discharge line.
8. A flow meter shall be provided on the discharge side on the pumps.

D. Electrical:

1. Electrical service from the utility shall be 3 – phase, 480 volt standard. If a transformer is provided, the primary shall be connected delta and the distribution side wye with neutral grounded. A separate 240 / 120 volt station service shall be provided by the electric utility or derived from a station service transformer.
2. All station electrical shall conform to the latest National Electrical Code. All electrical components and wirings shall be UL listed as applicable, and be industrial grade.
3. Protection systems are required on electrical equipment to protect against phase-to-phase and phase-to-ground faults as well as to protect against single phasing. The booster station shall have a well designed grounding system to which all the equipment grounds need to be connected.
4. The short circuit ratings of electrical switchgear shall be the calculated available or the industry standard, whichever is higher.
5. Above grade water booster pump stations shall have receptacles conveniently placed to ease maintenance equipments to be plugged in without extension cords. All the receptacles shall be GFI or distributed from a GFI circuit breaker installed in the station service panel. One of the duplex receptacles shall be an isolated ground type installed near the enclosure containing the SCADA Remote Terminal Unit (RTU)
6. Booster pump stations shall have good interior lighting and dusk to dawn motion sensor, tamper proof exterior lighting.
7. All the controllers and the associated protection equipment shall be centrally located in a free standing motor control center (MCC) with copper incoming bus sized adequately in order to allow future expansion. NEMA 12 enclosures are preferred. The control shall be soft-start/soft-stop with pump control and running bypass circuitry.
8. Each motor drive shall have a motor circuit protector. Further, each motor shall have an integrated protection module to detect and isolate the motor for overload, phase loss, phase reversal and ground faults, as a minimum. There

shall be push button switches to turn the pump on and off locally and a selector switch (Local – Off – Remote) to switch from local to remote control. Also, there shall be LED indicator lights – red to indicate running, green as stand-by.

9. The MCC shall have indicator instrumentation for station voltage, current, power factor, and kW / kWh. Additionally, each of those meters shall incorporate an output signal 4 – 20 mA and / or pulse in order to communicate over the RTU.

E. Auxiliary Generating Equipment

1. All booster pump stations shall have auxiliary generators or, an alternate power source.
2. The following general requirements shall apply to all internal combustion engines used to drive auxiliary electrical generating equipment.
3. The engine must be protected from operating conditions that would result in damage to equipment. Unless continuous manual supervision is planned, protective equipment shall be capable of shutting down the engine and activating an alarm on site. Protective equipment shall monitor for conditions of low oil pressure and overheating. Emergency equipment shall be protected from damage at the restoration of regular electrical power
4. Engine block heaters are required.
5. The engine shall have adequate rated power to start and continuously operate all connected loads.
6. Only diesel fuel generators shall be provided. Fuel storage is required to supply a minimum of 12 hours of operation at maximum design load. No buried tanks will be allowed.
7. The engine shall be located above grade with adequate ventilation of fuel vapors and exhaust gases.
8. All emergency power generating equipment shall be provided with instructions indicating the need for regular starting and running of such units at full loads. Engines shall be automatically exercised every 7 days.
9. Generating unit size shall be adequate to provide power for pump motor starting current and for lighting, ventilation, and other auxiliary equipment necessary for safety and proper operation of the lift station. Provisions shall be made for automatic and manual start-up and load transfer. The generator must be protected from operating conditions that would result in damage to equipment. Provisions should be considered to allow the engine to start and stabilize at operating speed before assuming the load.

7.21 Reservoirs

A. Reservoirs shall be above ground, steel, and of “standpipe” design or either “hydropillar” or “spheroid” in design unless otherwise approved by the Director of Public Works.

B. All reservoirs constructed and added to the City’s water system shall incorporate an internal passive water mixing system. Water mixing systems shall have no external piping and no mechanical or motorized elements. Water mixing systems shall be the Tideflex Mixing System manufactured by The Red Valve Company of Carnegie, Pennsylvania, or approved equal.