



# City of Cheney Engineering Design Standards

Adopted by the City of Cheney City Council  
by Resolution D – 913 on February 8<sup>th</sup>, 2011



## Acknowledgements

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## Table of Contents

### Section 1 - Overview

1.1 Purpose and Scope .....	1-1
1.2 Definitions .....	1-1
1.3 References.....	1-3
1.4 Design Variance Requests .....	1-4
1.5 Pre-Development Conference.....	1-4
1.6 Intake Meeting .....	1-5
1.7 Permits and Licenses.....	1-5
1.8 Additional Requirements.....	1-5
1.9 Material Acceptance .....	1-5
1.10 Amendments; Process and Authority.....	1-6
1.11 Environmental Checklist .....	1-6
1.12 Transportation Analysis .....	1-6
1.13 Land Use Compliance.....	1.6
Attachment 1.1 Request for Design Variance .....	1.7

### Section 2 – Project Application & Certification

2.1 Design Review Submittals .....	2-1
2.2 Infrastructure Project Submittal Requirements.....	2-2
2.3 Construction Certification .....	2-5
2.4 Penalties .....	2-9
Attachment 2.1 – Agreement to Pay Fees .....	2-10
Attachment 2.2 – Construction Phase Services.....	2-11
Attachment 2.3 – Project Acceptance Flow Chart.....	2-12
Attachment 2.4 – Minimum Testing Frequencies.....	2-13
Attachment 2.5 – TV Inspection Protocol.....	2-14
Attachment 2.6 – Final Certification Checklist (Sample) .....	2-15

### Section 3 – Streets, Alleys, & Bikeways

3.1 Right of Way .....	3-1
3.2 Roadways and Alleys.....	3-1
3.3 Curbs, Gutters, Pedestrian Buffer Strips, Driveways and Sidewalks .....	3-9
3.4 Signing and Illumination .....	3-13
3.5 Clearances / Clear Zones .....	3-14
3.6 Bikeways and Off-Road Pathways.....	3-14
3.7 Pavement Cuts and Patches.....	3.15

### Section 4 – Sanitary Sewers

4.1 Definitions .....	4-1
4.2 Public Sewers .....	4-4
4.3 Side Sewers.....	4-7
4.4 Private Sewers.....	4-8
4.5 Marking Tape .....	4-8
4.6 Testing and Inspections .....	4-8
4.7 General Notes (Sanitary Sewer) .....	4-9
4.8 Tables and Figures .....	4-10



## Section 5 – Wastewater Pump Stations

5.1 Definitions .....	5-1
5.2 General Requirements .....	5-2
5.3 Minimal Pump Station Design Requirements .....	5-3
5.4 System Head and Pump Curves .....	5-4
5.5 Site Selection and Plan .....	5-4
5.6 Security / Equipment Protection .....	5-4
5.7 Temporary Public Lift Stations .....	5-5
5.8 Design Standards .....	5-5
5.9 Submersible Lift Stations .....	5-9
5.10 Reliability and Power Supply .....	5-11
5.11 Emergency Power Supply .....	5-12
5.12 Auxiliary Generating Equipment .....	5-12
5.13 Force Mains .....	5-13
5.14 Private Grinder Pump Stations .....	5-14
5.15 Grease Interceptors .....	5-14

## Section 6 – Stormwater Management

6.1 Methods of Stormwater Conveyance and Disposal .....	6-1
6.2 Stormwater Drainage in the Public Right of Way .....	6-1

## Section 7 – Water

7.1 Definitions .....	7-1
7.2 Water Demands .....	7-2
7.3 Water Pressure .....	7-3
7.4 Size of Pipe .....	7-4
7.5 Type of Pipe .....	7-4
7.6 Fittings .....	7-4
7.7 Valves .....	7-5
7.8 Thrust Blocking .....	7-5
7.9 Tracer Tape / Wire .....	7-5
7.10 Depth of Pipes .....	7-5
7.11 Connections .....	7-6
7.12 Fire Hydrants .....	7-7
7.13 Distance from Other Utilities .....	7-9
7.14 Pressure Systems .....	7-9
7.15 Laying Pipe on a Radius .....	7-9
7.16 Easements .....	7-9
7.17 Special Regulations for P.U.D.'s and Private Water Systems .....	7-9
7.18 Testing and Disinfection .....	7-10
7.19 General Notes (Water) .....	7-11
7.20 Booster Stations .....	7-12
7.21 Reservoirs .....	7-15



**Standard Detail Index**

**A. Streets, Alleys, & Bikeways**

Roadway Section - Curbed .....	A-1
Curbs and Gutters.....	A-2
Urban Driveways – Separated Sidewalks .....	A-3
Curb Ramp.....	A-4
Traffic Island.....	A-5
Cement and Concrete Approaches.....	A-6
Rural Road Approaches.....	A-7
Rural Driveway Approaches.....	A-8
Bike Ways & Pedestrian Paths .....	A-9
Cul-De-Sacs – Public Roads.....	A-10
Cul-De-Sacs – Private Roads .....	A-11
Sidewalk Retaining Wall.....	A-12
Retaining Wall.....	A-13
Monument Case & Cover.....	A-14
Street Name Signs.....	A-15

**B. Stormwater System**

Precast Drywells .....	B-1
Precast Drywell Details .....	B-2
Precast Drywell and Inlet Details .....	B-3
Catch Basin Type 1.....	B-4
Concrete Inlet Type 1.....	B-5
Concrete Inlet Type 2.....	B-6
Catch Basin and Inlet Installation.....	B-7
Curb Inlet Type 1.....	B-8
Curb Inlet Type 2.....	B-9
Metal Frame Type 1 .....	B-10
Metal Frame Type 2 .....	B-11
Metal Grate Type 1 .....	B-12
Metal Grate Type 2 .....	B-13
Metal Grate Type 3 .....	B-14
Metal Frame, Grate & Solid Cover – Type 4.....	B-15
Concrete Gutters.....	B-16
High Volume Driveway Approach .....	B-17
Swale Section with Modular Block Wall .....	B-18
Storm Drain Manhole Cover.....	B-19

**C. Sanitary Sewer System**

Manhole Type I-48 .....	C-1
Manhole Type I-60 .....	C-2
Manhole Type II-72, II-96 .....	C-3
Manhole Type III-48 .....	C-4
Manhole Type III-60, III-72, III-96.....	C-5
Manhole Type IV.....	C-6
Reducing Slabs & Manhole Step .....	C-7
Typical Channel Detail .....	C-8
Interior Drop Channels.....	C-9
Sewer Clean-Out With Cast Iron Ring & Cover .....	C-10



Manhole Ring and Cover .....	C-11
Service Connection .....	C-12
Side Service Connection Record Drawings .....	C-13
Typical Pipe Casing Detail .....	C-14
Typical Pipe Casing Detail (Concrete) .....	C-15
Pressure Service Stub from Gravity Sewer Main.....	C-16
Pressure Service Stub from Force Main .....	C-17
Flushing Connection Low Pressure Sewer System .....	C-18

**D. Water System**

Typical Water Service Locations .....	D-1
Trenching and Bedding .....	D-2
Valve and Tracer Wire Installation .....	D-3
Water Crossings.....	D-4
Typical Hydrant Setting .....	D-5
2-Inch Blow-Off Assembly .....	D-6
1-Inch & 2-Inch Water Service .....	D-7
3-Inch & Larger Water Service Meter Vault .....	D-8
2-Inch Air Valve (For Ductile Iron Pipe).....	D-9
Cast Iron Valve Box .....	D-10
Water Meter and Frame – 3” and Larger .....	D-11
Thrust Block Requirements.....	D-12

# **City of Cheney Engineering Design Standards**



## **Section 1 Overview**



## 1.0 OVERVIEW

### 1.1 Purpose and Scope

- A. These Standards establish uniform requirements to promote the public safety, welfare, convenience, aesthetics and economical maintenance of public and private improvements.
- B. These Standards are minimum design standards. It is expected that land surveyors, engineers, architects, and landscape architects will exercise best efforts to ensure that the project is designed in a manner consistent with the intent of the Standards.
- C. These Standards do not prohibit innovative efforts which could achieve the intent and purpose of these Design Standards through an alternative solution. Accordingly, the design deviation process allows variance from these Standards; provided such design variance produces a compensating or comparable result.
- D. These Standards shall govern the design of new construction and improvements to all streets, sewers, water lines and other utilities installed in the City of Cheney.
- E. If any part of these Standards is found to be invalid, all other non-conflicting parts shall remain in effect.
- F. For items not addressed in these Standards, design and construction shall conform to the most current edition of the Washington State Department of Transportation's Standard Specifications for Road, Bridge and Municipal Construction.

### 1.2 Definitions

- A. The following definitions apply to terms and abbreviations used throughout this manual. Additional terms applicable to specific aspects of design are defined at the beginning of other sections.
  - 1. **AASHTO** The American Association of State Highway Transportation Officials. The abbreviation may also be used throughout these Standards to reference AASHTO's publication, "A Policy on Geometric Design of Highways and Streets".
  - 2. **ADA** Americans with Disabilities Act.
  - 3. **ADAAG** Americans with Disabilities Act Accessibility Guidelines.
  - 4. **Alley** A public or private way designed or intended to provide rear access to properties having frontage on a public street. Alleys are generally not intended for through vehicle movements.
  - 5. **Applicant** An individual or firm applying for design approval from the City for a project.
  - 6. **APWA** The American Public Works Association.
  - 7. **AWWA** The American Water Works Association.
  - 8. **Center Crown** A street cross-section with the highest point of the traveled way located at the center of the street.
  - 9. **Clear Sight Triangle** The corner area at an intersection or driveway which must be free of sight obstructions over 36 inches in height to provide adequate sight distance.





10. **Clear Street Width** The width of a street from curb to curb (or other obstruction) minus the width of on-street parking lanes.
11. **Clear Zone** The unobstructed, relatively flat area provided beyond the edge of the traveled way for the recovery of errant vehicles.
12. **CMC** Cheney Municipal Code.
13. **Collector Arterial** A relatively low speed street serving an individual neighborhood. Collector arterials are typically low speed, two-lane roads with on-street parking; their function is to collect and distribute traffic from local access streets to minor arterials.
14. **Cross Slope** A slope that is perpendicular to the direction of travel.
15. **Crown (Street Crown)** The term used to define the highest point of the traveled way on a street cross-section. The City recognizes three types of street sections to facilitate drainage: center crown, quarter crown and curb crown, which are defined herein.
16. **Curb Crown** A street cross-section with the highest point of the traveled way located at one curb.
17. **Curb Ramp** A ramp constructed in the sidewalk to allow wheelchair access from the sidewalk to the street.
18. **Designer** The project engineer or architect.
19. **Design Variance** A grant of relief from the requirements of this section that permits construction in a manner that would otherwise be prohibited by these design standards.
20. **Developer** Refers to the owner (or financial sponsor) of a privately funded project. May also be taken to mean the owner's consulting architect, engineer or other agent.
21. **Driveway** A cement concrete driveway structure as shown in the Standard Plans.
22. **Engineer** The City of Cheney Public Works Director or Designee.
23. **Integral Curb and Gutter Concrete curb and gutter** which is formed and placed as one unit.
24. **Local Access Street** A street that provides access from individual properties to collector and minor arterials. Refer to the Arterial Street Plan portion of the City's Comprehensive Plan for additional discussion.
25. **Median** A painted or raised traffic island used to channel, separate and otherwise control vehicular traffic.
26. **Minor Arterial** A two to four lane facility which collects and distributes traffic between arterials. Refer to the Arterial Street Plan portion of the City's Comprehensive Plan for additional discussion.
27. **Monument** A physical survey monument.
28. **MUTCD** The U.S. Department of Transportation Manual on Uniform Traffic Control Devices.
29. **Owner** The legal owner of the property on which a project is to be constructed.
30. **On-Site Project** A private project. The term "on-site" is used to describe an area outside the public right of way.
31. **Pedestrian Buffer Strips** Hard surfaced or landscaped areas between travel or parking lanes and sidewalks, also called Planting Strips. Pedestrian Buffer Strips improve safety by separating vehicles and pedestrians and provide space for drainage and snow storage.
32. **Private Project** A project which is to be constructed on privately-owned property.



33. **Private Streets** Streets which are not controlled or maintained by a public authority, and which serve two or more properties.
34. **Public Project** A project which is to be constructed within the public right-of-way or public property. Public projects may be designed by either private consultants or the City's in-house engineering staff.
35. **P.U.D or PUD** "Planned Unit Development". A privately developed project conforming to PUD requirements outlined in Chapter 21.39 of the City of Cheney Municipal Code.
36. **Quarter Crown** A street cross-section with the highest point of the traveled way located at a distance from one curb of one-fourth the street width (as measured from face of curb to face of curb).
37. **Queuing Area** A length of public or private street on the public side of an entrance gate that allows vehicles to exit the connecting street prior to the gate.
38. **RCW** Revised Code of Washington.
39. **SEPA** State Environmental Policy Act.
40. **Specifications** Defined as the most current versions of the following documents:
  - a. City of Cheney Development Manual
  - b. WSDOT Standard Specifications for Road, Bridge and Municipal Construction and the amendments thereto.
  - c. Washington State MUTCD
  - d. Spokane Regional Stormwater Manual
  - e. AWWA
41. **STA** Spokane Transit Authority..
42. **Standard Plans** The City of Cheney Standard Plans set forth herein.
43. **Street Classification** Arterial and local access streets, as classified in the Transportation portion of the City's Comprehensive plan as follows:
  - a. Minor Arterial
  - b. Collector Arterial
  - c. Local Access StreetDefinitions of all of the above classifications are included herein. Private streets are not classified.
44. **Structural Sidewalks** Structural sidewalks shall be defined as all elevated slabs, grates, and panels located within a sidewalk or driveway not supported on grade. Typical examples of elevated structural sidewalks are concrete slabs, steel grates, and steel plates for utility vault lids, service elevator covers, and utility covers.
45. **Traveled Way** The area of street which is intended to carry vehicular traffic, including any shoulders.
46. **Washington Administrative Code (WAC)** Current administrative regulations created by the State of Washington to carry out the laws passed by the State Legislature.
47. **WSDOT** Washington State Department of Transportation.

### 1.3 References

- A. Except where these Standards provide otherwise, design, detail, workmanship, and materials shall be in accordance with the current editions of the following publications:
  1. Standard Specifications for Road, Bridge, and Municipal Construction as amended. (Published by WSDOT).



2. Spokane Regional Stormwater Manual.
3. WSDOT Standard Plans for Road and Bridge Construction..
4. WSDOT Design Manual.
5. WSDOT Hydraulics Manual.
6. NRCS Urban Hydrology for Small Water Sheds TR-55.
7. AWWA Standards.
8. WSDOH Water System Design Manual.
9. Department of Transportation Manual on Uniform Traffic Control Devices, as amended (MUTCD).
10. A Policy on Geometric Design of Highways and Streets (AASHTO).
11. Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG). (Published by the U.S. Architectural and Transportation Barriers Compliance Board).
12. Spokane Transit Authority Design Guidelines.
13. Washington State Department of Ecology Criteria for Sewage Works Design.
14. City and County Design Standards for the Construction of Urban and Rural Arterials and Collectors, Washington State. (Published by WSDOT.)

#### **1.4 Design Variance Requests**

- A. To gain approval for a variance from these Design Standards, the Applicant shall submit a "Request for Design Variance" to the Public Works Department. The Design Variance shall state the standard(s) to be varied, including the proposed variance(s) and the reason(s) for the request. Additional supporting information, plans or design data prepared by a professional engineer, licensed in the State of Washington should be included as needed or requested.
- B. Design variances may be granted by the Public Works Director, in the exercise of reasonable judgment, upon evidence that such design variance is in the public's best interest to include satisfying requirements for safety, function, appearance, maintenance, uniform code compliance in conformance with the intent of these Standards.
- C. Design variances should be approved prior to construction. To the extent known, the variance should be proposed at the preliminary design stage and included for consideration during plan review and public hearing.
- D. Attachment 1 contains the Design Variance Application.

#### **1.5 Pre-Development Conference (See CMC Chapter 23.070)**

- A. A pre-development conference is an opportunity for the Applicant to present the project and receive comment from various departments on adopted codes, policies, or laws of the State, or the City of Cheney. No development approvals are granted at the conference.
- B. Pre-development conferences must be scheduled with the City of Cheney Permit Center.
- C. The following items are required for a conference:



1. Completed pre-development conference application
2. Six copies of the proposed site plan, to scale, depicting the following, as applicable:
  - a. Property lines
  - b. Existing and proposed buildings, parking areas and other site improvements
  - c. Proposed driveways
  - d. Proposed connections to public sewer and water
3. Six copies of the proposed building plans showing reasonable detail to assist city staff in making recommendations to the Applicant.
4. For additional information regarding the Pre-Development Conference contact Cheney's Permit Center.

- D. There is no charge for the first Pre-Development Conference. Additional Pre-Development Conferences for the same parcel(s) and the same applicant(s) will be subject to a fee.

### **1.6 Intake Meeting**

- A. Certain projects may require an Intake Meeting. The purpose of this meeting is to allow City departments to review the application and all of the submittal requirements. An Intake Checklist may be obtained at the City of Cheney Permit Center.

### **1.7 Permits and Licenses**

- A. Applicants are responsible to acquire all permits and licenses necessary for the completion of the project. The City of Cheney will not be held responsible, financially or otherwise, for any delay or additional expenses the Applicant may incur due to City requests for, and review of, information necessary to issue permits and licenses.
- B. The City makes no warranty or representation concerning review of the information, plans and documents submitted by Applicant with Applicant solely responsible, as a condition of permit issuance, to ensure that all design and construction is: (a) based upon reasonably acceptable engineering practices; (b) performed with due care and caution and (c) suitable for its intended purpose. Through review of information, plans and documents, the City does not intend to create a special duty or relationship with the Applicant, Owner or others concerning the project.

### **1.8 Additional Requirements**

- A. If public utilities or infrastructure will be constructed, the City may require the applicant to arrange for a "Pre-Construction Conference" through the Public Works Department, to include the Contractor, Applicant, Engineer and City staff.

### **1.9 Material Acceptance**

- A. For public utilities or infrastructure construction, the Applicant shall provide the City with a list of all materials used on the project. The materials shall meet City specifications through supplier's verification, materials testing reports or reports stamped and signed by a professional engineer.



- B. All reports, materials verifications and other documents submitted to the City for acceptance shall be stamped and signed by a Professional Engineer licensed in the State of Washington.

#### **1.10 Amendments; Process and Authority**

- A. The City Council has the authority to approve all amendments to these Design Standards. Noted errors or suggested revisions to these Standards should be addressed to the City's Public Works Department.

#### **1.11 Environmental Checklist (See CMC Chapter 23.090)**

- A. The State Environmental Policy Act (SEPA) chapter 43.21C RCW, requires all governmental agencies consider the environmental impacts of a proposal before making decisions. The SEPA environmental checklist, together with the SEPA rules contained in chapter 197-11 WAC are used as guidelines to assess the probable environmental impact of any development which is not otherwise exempt from the review. Use of the SEPA checklist provides information to help the developer reduce or avoid impacts from the proposal and to help the agency determine whether mitigation or an environmental impact statement (EIS) is required. Mitigation is based upon project information, comments, studies, governmental policies and these Standards. An EIS may be required for proposals with probable significant adverse impacts on the environment.

#### **1.12 Transportation Analysis (See CMC Chapter 23.110)**

- A. For all projects anticipated to generate more than 200 trips per day or peak traffic of 50 trips or more, a Traffic Distribution Letter, certified by a Washington State licensed engineer will be required in the project submittal. For projects that generate more than 1000 vehicle trips per day, a traffic analysis report, certified by a Washington State licensed engineer, will be required in the application. The Public Works Director may also require a traffic analysis on any project that has the potential to cause a decline in the adopted level of service standards for the affected transportation facilities. Specific scoping for the traffic analysis shall be determined by the Public Works Director either at the predevelopment conference or during project review.
- B. The applicant shall be responsible for the cost of the traffic study and any mitigation required to maintain the level of service of the affected transportation facilities.
- C. Based on the transportation analysis, the Director may require additional street improvements or facilities as a condition of project approval.

#### **1.13 Land Use Compliance**

Project review shall include an analysis of the proposed project to determine compliance with the Cheney Municipal Code.



**Attachment 1.1 - Request for Design Variance**

**Project Name:** \_\_\_\_\_

**Address:** \_\_\_\_\_

List below the deviations from the City of Cheney Design Standards you are proposing. For each variance requested, explain the reasons why City Standards cannot be met, and describe how the proposed variance will satisfy requirements for safety, function, fire protection, appearance and maintainability. Attach additional supporting information as needed.

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Submitted by:  
Name (please print) \_\_\_\_\_

Company \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_/\_\_\_\_/\_\_\_\_

**FOR CITY USE ONLY**

\_\_\_\_\_Approved \_\_\_\_\_ Denied

# **City of Cheney Engineering Design Standards**



## **Section 2 Project Application & Certification**



## 2.0 PROJECT APPLICATION AND CERTIFICATION

The review process outlined below must be followed for all privately-developed sewer, water, street and storm drainage projects.

### 2.1 Design Review Submittals

- A. Construction may not begin prior to City approval of all building permits, utility and infrastructure plans.
- B. Plan review fees are established by City Council Resolution.
- C. The following summarizes the design review process for private development that includes the construction of public or private infrastructure:
  1. All civil design plans shall be submitted and approved prior to the review of any construction documents, with the exception of Final Plats. Final Plat and construction documents may be submitted concurrently for review.
  2. A transmittal letter shall be submitted to the Department of Public Works from the design Engineer/ Architect/Applicant. The transmittal letter must contain the following information:
    - a. The name of the project
    - b. The type(s) of facilities included for project review
    - c. The design plan sheets which are being included for review
    - d. The name, address and phone number of the owner, agent or Applicant of the project
    - e. A signed Agreement to Pay Fees (see attachment 2.1)
  3. For any plan review submittal, or re-submittal, the City shall be provided with three complete sets of construction plans and two copies of the drainage report. Partial submittal of the design and/ or plans will be returned to the Designer without review comments. After receiving the transmittal and plan sets, Public Works will respond in writing and include the plan review fee being charged for the project. Applicant is responsible to pay for all plan review fees and by signing the agreement to pay fees, the applicant accepts the plan review fees.
  4. Following review of the plans, the City will return a plan review comment letter, to include a red line check of plans. The redline must be returned to the City along with a set of corrected plans. A letter indicating how each of the review comments was addressed or a reason for not making the changes must be included with the re-submittal. If the red lines are not returned, or changes are not properly addressed, the review plans will be delayed and/ or additional plan review fees may be charged.
  5. Once the project design plans are complete, and all other City requirements relating to the project have been completed, Public Works will return a set of plans with the City's approval stamp. Applicant will be responsible to distribute copies of the stamped plans. A set of stamped plans are required to be on the project site during construction. A letter authorizing construction will be delivered by Public Works to Applicant. Acceptance of the plans shall not relieve the Owner or Applicant from any liability related to portions of the design which are not in conformance with these Standards or do not follow good engineering practice. Following a letter of design acceptance is signed the final plat may be recorded.





6. Upon request, prior to construction, the Applicant shall provide the Public Works Department with a copy of the Engineers Estimate or Bid Tabs for the construction activities associated with the project.
7. The acceptance of the plans shall expire one year from the acceptance date shown on the plans. Upon expiration, the approvals may be extended for an additional year. The City has the right to require the Applicant to revise the plans to reflect any current updated standards prior to issuance of any extensions.

**Note: City Public Works provides review services only, and it does not design the project for the Applicant. The City reserves the right to: increase plan review fees and/or refuse to review any project which is not designed in accordance with the City of Cheney's design standards.**

## 2.2 Infrastructure Project Submittal Requirements

### A. Required for all projects

1. Vicinity Map
2. An index of plan sheets.
3. Title Blocks including project name, street name, sheet limits (station numbers), type of improvement and whether improvements are public or private.
4. All design plans shall be prepared, stamped, and signed by a professional engineer licensed in the State of Washington. Plans shall include the engineer's address and phone number.
5. Drafting standards shall follow lines and symbols adopted by Spokane County/City County and City of Spokane Standards (CCSS) conventions. All used symbols and linetypes shall be described in a legend to be located on a separate sheet at the beginning of the plan set or on each individual sheet.
6. Font and lettering shall be legible to be easily read and understood by the reviewer. Submitted plans not meeting these criteria will be returned to the Designer to correct before the review process is started.
7. Road alignments with 100' stationing. Stationing at each points of curve, tangent and intersection with appropriate ties to existing road surveys and stationing, section corners, quarter corners, and horizontal control.
8. All existing utilities.
9. North Arrow.
10. Section, township, and range.
11. Right of way lines, width of proposed road, intersecting roads, and existing road improvements with dimensions.
12. All topographic features within right of way or future right of way limits and sufficient area beyond to resolve questions of setback, slope, drainage, access onto abutting property, and road continuations.
13. Identification of all roads and adjoining subdivisions.
14. Utility sheets shall be a minimum scale of 1"=50'. A scale of 1"=20' may be required for urban arterial streets where detail is sufficiently dense to cause a "cluttered" drawing at a smaller scale.
15. Section and lot lines.
16. Easements – Provide dimensions and purpose for any proposed easements. Show recording information, purpose and width for any existing easements.
17. Other data necessary for the specific project.



- B. Profile Elements (For drawings where a “profile” design is required).
1. Profile elements shall include the following:
    - a. Original ground line at 100’ stations and at significant ground breaks and topographic features based on field measurement accurate within 0.1’ on unpaved surface and 0.01’ on paved surface.
    - b. A final road and storm drain profile. The stationing shall be the same as the horizontal plan, reading from left to right. It shall include stationing of points of curve, tangent, length and point of intersection of vertical curves, with elevations to 0.01’.
    - c. On a grid of numbered lines, a continuous profile shall be shown for both existing and proposed improvements.
    - d. Grade and vertical curve data, all profiles.
    - e. The datum used and all benchmarks, which must refer to established control when available.
- C. Sewer
1. Required for all projects
    - a. Plan/ profile and detail sheet(s) for design using design and drafting standards detailed in these specification.
    - b. Show service connection lines from public or private sewer lines to the property line of the lot to be serviced.
  2. May be required
    - a. Sewer study showing adequate capacity in line for project flow.
    - b. Easements with recording numbers.
- D. Water
1. Required for all projects
    - a. Plan / profile and detail sheet(s) for design using design and drafting standards detailed in these Standards.
    - b. Show service connection lines from public or private water main.
    - c. Fire Department approval.
  2. May be required
    - a. Easements with recording numbers.
    - b. Hydraulic study showing adequate fire flows and domestic service.
- E. Street
1. Required for all projects
    - a. Details including typical cross sections for all street plans and a detail for all street patches.
    - b. Profiles for curbed roads shall show the tops of both curbs and the centerline clearly labeled.
    - c. Signing and striping/ channelization plan. Street sign type and placement must be clearly located on the plan. Both existing and proposed signs shall be included.
    - d. Monuments are to be placed at every intersection, the beginning and end of every horizontal curve, on the roadway centerline at the end of every plat and at the center point of each cul-de-sac. The location of the monuments shall be clearly marked on the plan and plat.



- e. Bearings on the road centerline, keyed to an associated plat map.
  - f. Curve data including radius, delta, arc length, and semi-tangent length, on all road centerlines and curb returns.
  - g. All found and referenced survey monuments.
  - h. Beginning, middle, and ending elevations of curb returns.
  - i. Pavement section design by a Washington State Licensed Engineer.
2. May be required
    - a. A traffic distribution letter shall be required for projects that generate more than 200 trips per day or peak traffic of 50 trips or more. The letter must be certified by a Washington State licensed engineer.
    - b. A traffic analysis shall be required for projects that generate more than 1,000 trips per day. A traffic analysis shall also be required for projects that have the potential to cause a decline in the level of service for the affected transportation facilities. The analysis shall be certified by a Washington State licensed engineer. Scoping shall be determined by the Public Works Director.

#### F. Storm Water Drainage

1. Required for all projects
  - a. Plan/ profile and detail sheet(s) for design using design and drafting standards detailed in these specification.
  - b. Grading and drainage plan showing finished contour elevations.
  - c. Drainage study and report with calculated flows, stamped by a Washington State licensed engineer. The drainage study shall be prepared in accordance with the Spokane Regional Stormwater Manual.
  - d. Show all existing and proposed drainage features, showing direction of flow, size, and kind of each drainage channel, pipe, and structure and other requirements as specified in the Spokane Regional Stormwater Manual.
  - e. Erosion and sediment control plan (ESC) with BMPs identified for stormwater control during and after construction. The erosion and sediment control plan is required for any project prior to issuance of any permits for the project. The ESC plan shall meet the thresholds in Chapter 2 of the Spokane Regional Stormwater Manual (SRSM). See Chapter 9 of the SRSM for required elements.
  - f. A Geotechnical Site Characterization Report shall be prepared in accordance with Chapter 4 of the Spokane Regional Stormwater Manual.

#### G. Sanitary Sewer Pump Stations

1. Required for all projects
  - a. Plan/ profile and detail sheet(s) for design including:
    - 1) Site layout
    - 2) A cut-away section of the station and wet well with design elevations
    - 3) General site location
    - 4) Service Area
    - 5) Point of connection to the existing line
  - b. Three copies of complete design calculations (including design assumptions and parameters, pump performance curves, force main performance curves and conclusive data showing the impact of discharge on the existing system.



2. Based on the location and scope of the project, Public Works Director may require additional studies. In most cases where stormwater facilities are proposed, a geotechnical report will be required. An erosion and sediment control plan is required for all ground disturbing projects.

#### H. Traffic Control

1. Prior to construction a project traffic control plan may be requested by Public Works. The approved plans are subject to change by the Public Work Director as needed to accommodate traffic conditions in the field. During an emergency situation the Contractor may change the traffic control plan but if not in an emergency any changes proposed by the Contractor must be submitted to Public Works for re-review. Any traffic control plan within SR 904 must follow WSDOT's standard K-plans applicable for the situation. The Project Coordinator will be responsible to ensure the approved traffic control plan is setup prior to construction, the traffic control is implemented as per the plan approved by Public Works, and is maintained during the course of the project.

### 2.3 Construction Certification

Construction for all private projects is initiated and coordinated through the City's Public Works Department. Construction drawings shall be turned into final record drawings.

#### A. Introduction

1. The procedures for construction certification are to foster consistent high quality projects and to facilitate the subsequent transfer of ownership of the finished improvement to the City of Cheney.

#### B. Project Coordination

1. Prior to the start of construction the Applicant will identify a Project Coordinator. The Project Coordinator shall be responsible for managing the day-to-day operations of the project including traffic control, City requests, project safety, and overall coordination. The Project Coordinator shall be the contact for City personnel.

#### C. Project Inspection / Certification

1. Prior to the start of construction the Applicant will identify the Project Engineer. The Project Engineer shall be a licensed Professional Engineer in the State of Washington. This Engineer or his/her representative shall be responsible to verify the project was constructed according to the City accepted plans and specifications and the construction methods resulted in a high quality product. An outline of Construction Phase Services is presented in Attachment 2.2 within this document.
2. City staff will make site visits intermittently during the construction of the project to verify progress and will periodically discuss inspection activities with the Project Coordinator.
3. The Project Engineer may be the Project Coordinator.



D. Project Reporting

1. The Project Engineer will submit to Public Works a weekly progress report. This will include a narrative of the construction completed this week, daily inspection reports and any field testing reports.
2. Prior to project acceptance the Project Engineer will submit a certification to Public Works. All lab and field testing reports shall be included. Test reports that show failing tests must have follow-up test reports that are acceptable. Any nonconforming issues shall be fully documented to include resolution. Construction as-builts shall be provided by the Project Engineer and submitted to Public Works. The as-builts shall also be submitted as per Section 2.3.J.

E. Construction Complaints

1. Complaints from citizens regarding the project shall be documented by the Project Coordinator and resolved. City of Cheney personnel shall be notified of such complaints.

F. Drainage Swale Inspections

1. The Project Engineer will verify that the volume of each finished drainage swale equals or exceeds the designed volume of the swale at a six-inch depth. Additionally, the Project Engineer will verify that there is adequate and continuous grade from the road to the swale for the effective conveyance of runoff. Once the Project Engineer finds the swale acceptable he/she shall submit a signed and stamped report stating the swale is constructed as per the approved plans. The report shall be submitted in the Project Certification package. The Project Engineer and the City will monitor the performance of the swales during the construction and warranty period for proper percolation. Swales that do not percolate properly will require corrective work or measures by the Applicant.

G. Utility Inspections

1. On all public and private utility construction for development, inspections will be performed by the Project Engineer or designated representative. The inspection shall include the items listed below. However, the listing provided below is not intended to be all inclusive. It will be the responsibility of the Project Engineer to determine additional inspection activities that may be needed for a specific project in order to report substantial conformance of the project with the City Standards.
  - a. Conformance of all construction materials with City Standards shall be verified prior to installation.
  - b. Utility trenches shall be inspected for proper dimensions and pipe zone clearances prior to placement of pipe.
  - c. The placement and compaction of the pipe zone material and bedding shall be inspected.
  - d. The pipe joints shall be inspected visually for proper insertion.
  - e. Horizontal alignment and grade of the pipe shall be checked for conformance to the standards prior to backfilling of the trench.
  - f. Tees/taps and stubs shall be inspected for correct installation prior to backfilling of the trench.



- g. Accurate measurements shall be made and recorded to facilitate the reestablishment of utility service tee/tap locations and stub end locations. The placement of the required stub markers shall be verified.
- h. Manholes and vaults shall be inspected for proper materials, location, assembly, and installation.
- i. Trench backfill operations shall be observed and compaction tests shall be performed. Minimum requirements for backfilling shall be as set forth in Attachment 2.4 within this document.
- j. All public and private utility lines that connect to the City's public system shall be tested until passing results have been approved by City staff. The testing shall be performed by the Contractor (except as noted below) and observed by City staff. The Project Coordinator shall schedule and provide notice to the City a minimum of 48 hours in advance. The City may require additional time for notification of the testing.
- k. All sewer testing shall follow completion of acceptable trench backfilling. Sewer line testing shall include low pressure air testing of the lines, vacuum testing of all manholes (in accordance with Department of Ecology's Criteria for Sewage Works Design), mandrel testing (as required by the City's Sewer Department) and television inspection (see Attachment 2.5 for protocol of television inspection of sewer).  
Water line testing may be performed before or after trench backfilling, at the contractor's option. If testing is done prior to trench backfill the contractor shall place enough backfill to prevent the water lines from moving during testing. Prior to connecting the new lines to the existing system the new lines must pass pressure testing and bacteria testing. The Project Coordinator must obtain approval from the Water Department prior to making the connection to the existing system.
- l. Daily inspection reports shall be prepared, summarizing construction activities, contractor work force and work period, testing results, problems encountered, and other pertinent information.
- m. The Project Coordinator or the Project Engineer shall notify Cheney's Public Works 48 hours in advance of starting construction of the new utilities and shall provide a generalized schedule for the progress of the work. City inspection personnel will make occasional site visits to inspect the work and to ensure the Project Engineer is properly performing inspection. If it is discovered during the City inspection of the project that the Contractor is performing substandard work or the level of inspection by the Project Engineer is not satisfactory the City will inform the Project Coordinator or Applicant and if the problem is not corrected immediately the City will either revoke the permit or provide full time inspection by City forces at the option of the Public Works Director. The Applicant will bear the cost of all inspections and material testing required to certify the project, which includes the City's full time inspection as required by the Public Works Director. Public Works shall have access to all construction inspection records and reports.

#### H. Changes During Construction

- 1. Changes during construction that materially affect the scope of the project and/or the accepted individual lot plans must be submitted for review by the City. Minor changes do not need to be reviewed by the City, but must be documented in the daily and weekly inspection reports.



2. When changes to the design are necessary, Applicant shall be responsible for coordinating the proposed design changes with the Project Engineer. The Project Engineer shall forward the proposed plan change, together with related calculations, to the City's Public Works Department for review and acceptance prior to construction.
- I. Project Acceptance of Completed Construction
    1. At the completion of the project the Project Engineer shall make a final inspection to determine if the project is in substantial conformance with the approved construction documents or there are deficiencies in the work.
    2. Once all deficiencies are corrected to the satisfaction of the Project Engineer a final inspection with the Project Engineer and Public Works staff shall be scheduled.
    3. Once Public Works is satisfied, with the work as determined in the final inspection meeting, the Project Engineer shall submit a certification package, as described in attachment #5, with a letter requesting final acceptance of the project. If Public Works finds the project complete, a Notice of Substantial Completion shall be sent to the Project Engineer and the warranty period shall start. Any remaining work shall be completed pursuant to an agreed schedule with the Applicant responsible to correct damage done by a third party (e.g. utility companies, builders, landscapers, etc.).
    4. If the certification package is incomplete or otherwise unacceptable, the Project Engineer shall be required to provide the missing documents before Public Works will issue the Notice of Substantial Completion. Public Works will review the completed certification package and issue a Notice of Substantial Completion, if appropriate. Once Public Works authorizes Substantial Completion the warranty period shall commence.
  - J. Record Drawings
    1. During construction the Project Engineer (or Surveyor) shall record any changes to the accepted plans. The approved plans should be modified to show all changes made during construction. The modified plans shall be labeled "Record Drawings" and stamped and signed by the Engineer and have the following statement: "I have reviewed the construction of this project's improvements and to my knowledge find it to be in substantial conformance with the accepted plans and the City of Cheney's standards except as noted."
    2. The completed as-built drawings shall be submitted to Cheney's Public Works as an electronic PDF file and in a CAD dwg. file, compatible with the City's current system. The CAD drawing shall include three existing local monuments, surveyed to correspond with the project's coordinate system.
  - K. Warranty Bond
    1. Prior to final acceptance of any public improvements the Applicant shall provide the City with a warranty bond in the amount specified by the Public Works Director. The term of the Warranty bond shall be for two years from the date the City provides the Notice of Substantial Completion. The bond must automatically renew until the warranty deficiencies have been corrected. Once all deficiencies have been completed at the end of the warranty period the Public Works Director shall issue a letter authorizing the release of the warranty bond.



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## 2.4 Penalties

- A. Failure to comply with the plan review procedure outlined above may be cause for withholding or withdrawing approval of plans, forfeiture of bond or non-acceptance of work by the City.

### **ATTACHMENTS**

- Attachment 2.1 – Agreement to Pay Fees
- Attachment 2.2 – Construction Phase Services Outline
- Attachment 2.3 – Flow Chart – Project Acceptance
- Attachment 2.4 – Minimum Testing Frequencies
- Attachment 2.5 – TV Inspection Protocol
- Attachment 2.6 – Final Certification Checklist - Sample





**ATTACHMENT 2.1 - AGREEMENT TO PAY FEES**

**FILE NUMBER** \_\_\_\_\_

This agreement is between City of Cheney and \_\_\_\_\_, ("Applicant")  
(name of person or entity)

whose interest in the project is \_\_\_\_\_,  
(i.e. owner, agent, etc.)

as of this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_. This agreement is for the project known as:

\_\_\_\_\_  
(project address, name or "plat name & phase" with file number)

The parties named herein, to include successors and assigns agree to the following:

1. To reimburse the City of Cheney for project review and inspection fees based on actual costs incurred by the City of Cheney. City fees, with an estimate, are provided through separate document. Fees will be billed monthly as accrued. Any amounts due, including any expenses incurred in the collection of an overdue account, must be paid prior to the City's acceptance of the project or issuance of any permit. If a project is approved and/or filed with a balance still owing, the unpaid balance shall be paid prior to the City authorizing construction.
2. Fees are due and payable as set forth on the City invoice.
3. Any invoices not paid within 30 days of the invoice date will be considered delinquent. If any outstanding balance on the account for this project is not paid within 30 days of the invoice date, no further reviews of the project documents will be conducted until the entire account balance is paid. Any balance not paid within 60 days of the invoice date may result in legal action or the initiation of referral to a collection agency. Applicant will be liable for any and all expenses incurred by the City for the collection of overdue accounts, including reasonable attorney fees.
4. The monthly billing should be sent to:

NAME / Attention: \_\_\_\_\_  
 COMPANY: \_\_\_\_\_  
 ADDRESS: \_\_\_\_\_  
 CITY: \_\_\_\_\_ STATE \_\_\_\_ ZIP \_\_\_\_\_  
 PHONE #: \_\_\_\_\_ PHONE # 2 \_\_\_\_\_  
 FAX #: \_\_\_\_\_  
 E-Mail #: \_\_\_\_\_

I understand that failure to pay these fees will result in delay in approval of the project for construction.

By signing below I hereby represent I am either : (a) the Owner of the property or project submitted to the City for review or the duly authorized agent of the Owner; and (b) that I will be personally liable for all fees due and owing the City under this Agreement.

SIGNATURE \_\_\_\_\_

\_\_\_\_\_  
(PRINT NAME)

\_\_\_\_\_  
(TITLE)

\_\_\_\_\_  
(ADDRESS)

Accepted

\_\_\_\_\_  
City Public Works Director



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## ATTACHMENT 2.2 – CONSTRUCTION PHASE SERVICES

### Required items to be completed by the Project Engineer:

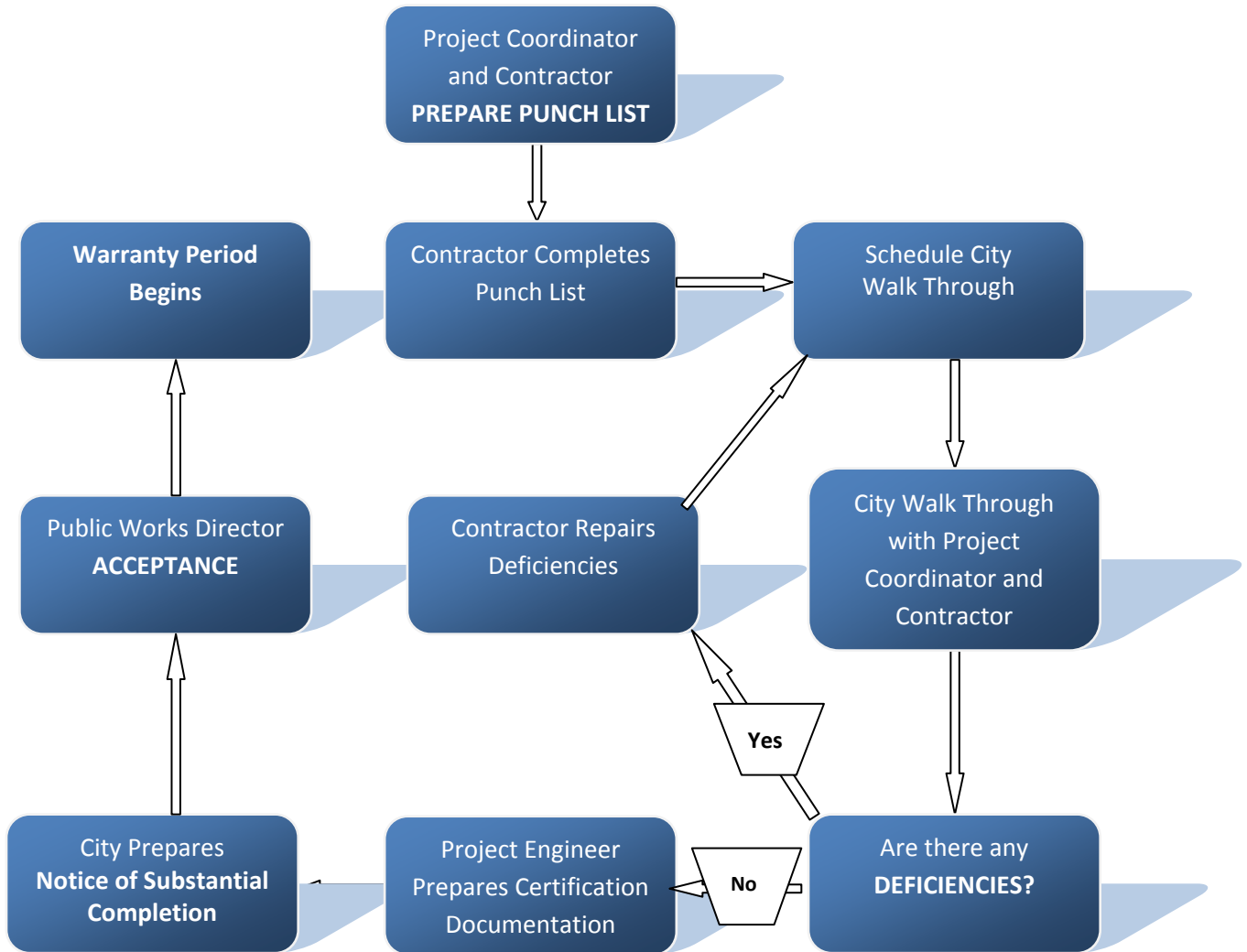
- I. Specific Certification Inspections
  - A. Roads
    - Erosion Control.
    - Drainage Improvements / Testing.
    - Embankment Placement / Density Control.
    - Trenching Backfill / Density Control.
    - Subgrade Line and Grade / Density Control.
    - Surfacing Line and Grade / Density Control.
    - Curbs and Sidewalks Line and Grade / Material Quality.
    -
  - B. Utility Pipe
    - Full time inspection initially, until the on-site inspector has verified the contractor's methods are within acceptable standards for trench excavation, pipe zone material placement, pipe installation, and trench backfill. Once the on-site inspector can certify the contractor's method inspection time may be reduced but testing frequencies, as per attachment 3, must be adhered to. In no case shall the on-site inspection be reduced to below half time.
- II. Review and approval of changes to approved plans including approval through the City Public Works if necessary.
- III. Record keeping and weekly reporting to the City.
- IV. Project acceptance of construction (see attachment 2).
- V. As-built survey / record drawings and side sewer reports.
- VI. Certification report.

### Required Items to be completed by designated Project Coordinator or Project Engineer:

- I. Pre-Construction meeting.
- II. Oversight of Construction staking (all curb, curb and gutter, and roadway alignment and grade shall be staked by a Washington State licensed surveyor).
- III. General project administration, coordination, and scheduled monitoring.
- IV. Traffic and dust control.
- V. Coordinate erosion control inspection as required by the Washington State Department of Ecology.
- VI. Response to construction complaints and resolution of complaints.
- VII. Coordinate Monumentation by a Washington State licensed surveyor.



**ATTACHMENT 2.3 - PROJECT ACCEPTANCE FLOW CHART**





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**ATTACHMENT 2.4 – MINIMUM TESTING FREQUENCIES**

Earth Embankment	- 1 compaction test / 500 CY placed
Road Subgrade	- 1 compaction test / 100 l.f. of lane or equivalent
Crushed Surfacing	- 1 compaction test / 100 l.f. / lift of lane or equivalent
Trenches	- 1 compaction test / 300 CY or 150 l.f. of trench, whichever is a higher frequency. Tests to be done at varying test depths.
Curb	- 1 compaction test / 150 l.f. of subgrade and crushed surfacing
Sidewalk	- 1 compaction test / 150 l.f. of subgrade and crushed surfacing
Concrete	- 1 set of four cylinders and 1 set of air, slump, temperature, etc. / day or / 100 CY
Aggregate	- 1 sieve analysis, % fracture count, and sand equivalent / source to verify material meets specification
HMA pavement	- 5 compaction tests per lot, minimum 5 compactions tests / day; Lot = 400 ton - 1 gradation test / 1000 tons - 1 maximum density test / 1000 tons - 1 asphalt content test / 1000 tons



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## **ATTACHMENT 2.5 - CITY OF CHENEY SEWER DEPARTMENT PROTOCOL FOR TELEVISION INSPECTION OF SEWER**

In the interest of developing a consistent methodology for the coordination and review of television inspections, the following steps have been established:

### **1. PRE-PAVING TELEVISION INSPECTION**

- a) At least one week prior to the desired pre-paving television inspection, the Project Coordinator shall request the television inspection through the Department of Waste Water Collection (WWC).
- b) In order for the inspection to take place sewer mains will need to be high-pressure cleaned, pressure tested and mandreled tested (as required by WWC). In addition, manholes will need to be accessible by the TV van. Backfill must be in place around the cone sections of the manholes. If the Contractor has placed temporary steel plates on top of the manholes, then the Contractor will need to provide manpower and equipment to remove and replace the plates to facilitate the television inspection.
- c) The City shall bear the cost of the initial inspection. Any additional TV inspections required by the sewer department shall be charged to the Contractor.

### **2. REVIEW OF PRE-PAVE TELEVISION INSPECTION**

- a) The sewer department shall review the TV inspection and submit a report. This report shall identify any repairs the sewer department may determine is required.
- b) The TV inspection video shall be made available to the Contractor if requested.

### **3. TV ACCEPTANCE**

- a) If the sewer department identifies any deficiencies the Contractor shall make the repairs, as necessary, at their own cost.
- b) Once the Contractor completes the repairs the sewer department shall re-TV the lines. All TV inspections beyond the first inspection shall be charged to the Contractor.
- c) The sewer department shall report to the Public Works Director once they find the sewer line acceptable.

### **4. CONNECTION TO THE NEW SEWER MAIN**

- a) No service connection shall be allowed until the new sewer lines have been accepted by Public Works.
- b) For acceptance the sewer lines shall pass pressure test, mandrel test (as required by the sewer department), TV inspection and passing vacuum tests on all sanitary sewer manholes.



**ATTACHMENT 2.6 – FINAL CERTIFICATION CHECKLIST (SAMPLE)**

**ATTACHMENT 2.6 – FINAL CERTIFICATION CHECKLIST GUIDELINE**

Project: \_\_\_\_\_

Certificate Head Letter: \_\_\_\_\_

Statement of intent to certify the project  
PE Stamp and Signature

Record Drawings Electronic Drawings \_\_\_\_\_

PE Stamp and Signature  
Lettered certification statement

Project Documents: \_\_\_\_\_

Daily Inspection Reports: \_\_\_\_\_

Field Reports: \_\_\_\_\_

Inspection of Asphalt Paving: \_\_\_\_\_

100% On site inspection during paving \_\_\_\_\_

Compaction Reports: \_\_\_\_\_

Sewer trench lifts \_\_\_\_\_

Water trench lifts \_\_\_\_\_

Utility trench lifts \_\_\_\_\_

Embankment \_\_\_\_\_

Subgrade \_\_\_\_\_

Crushed Rock Lifts \_\_\_\_\_

Material Documents: Field and Laboratory Tests: \_\_\_\_\_

	Field Test	Lab Test
Concrete:	(Slump, Air Content, Temp)	(Break Test)
Sub-Grade:	(Compaction)	(Gradation, Proctor)
Crushed Rock:	(Compaction, Depth)	(Gradation, Proctor)
Asphalt:	(Compaction, Thickness)	(Rice, Gradation, Oil Content)

On Site Inspections of Drainage Items: \_\_\_\_\_

Erosion Control Measures: \_\_\_\_\_

Drywells: \_\_\_\_\_

Gutter Inlets: \_\_\_\_\_

Culverts: \_\_\_\_\_

Sidewalk Vaults: \_\_\_\_\_

Drainage Ditches: \_\_\_\_\_

Swale Volume: \_\_\_\_\_

Other: \_\_\_\_\_

Incoming / Outgoing Correspondence: \_\_\_\_\_

(This is a guideline of required documents, but not limited to, for final certification.)

# **City of Cheney Engineering Design Standards**



## **Section 3 Streets, Alleys, & Bikeways**



### 3.0 STREETS, ALLEYS AND BIKEWAYS

Streets, alleys and bikeways shall be designed to provide efficient and economical travel ways, including pedestrian and bicycle travel, and create a safe and pleasant environment for the citizens of Cheney. An effective design shall consider the location of facilities in relation to land use, pedestrian and bicycle safety, adequate right of way width, traffic standards and safety, landscaping, drainage facilities, ease of maintenance, and the ability to provide effective and efficient public services. This section provides the specific design parameters for individual street elements.

#### 3.1 Right of Way

- A. Public right of way widths shall be in accordance with CMC 22.24.030 or as directed by the Public Works Director. Minimum right of way widths are shown in this code and are determined by the street type.
- B. Narrower right of way widths may be allowed under unique circumstances at the discretion of the Public Work Director via the Design Variance process. Variance requests will be evaluated based on topography, traffic condition, emergency vehicle access, zoning, existing development and on-street parking requirements.

#### 3.2 Roadways and Alleys

##### A. Street Width

- 1. Public street widths shall be in accordance with CMC 22.24.030. Private roads within the City limits shall be in accordance with local access road standards. Minimum widths and roadway design criteria are shown in Table 3-B.
- 2. A Half-Street is permitted as an interim facility. Half-Streets may be used pending construction of the entire street by the property owner on the opposite side of the road. When a project has frontage on an undeveloped or gravel roadway a half street improvement will be required. This will require the full improvement of the side adjacent to the project and the addition of 12 feet of the approved road cross-section and a 2 foot gravel shoulder on the side away from the development. Half-streets must be suitable for two-way traffic.

##### B. Turnarounds

Turnarounds are required when dead end streets are longer than 150' to allow emergency and service vehicles to turn around. The following types of turnarounds are acceptable for public and private streets. Other turn around designs will be considered by the Director on a case-by-case basis, but must meet the most current version of the International Fire Code (IFC).

- 1. Standard Cul-de-sac: The standard cul-de-sac is preferred for construction on local access dead end streets. The radius point of the bulb is on the street centerline.
- 2. Offset Cul-de-sac: An offset cul-de-sac has a radius point offset from the centerline, with one curb being tangent to the bulb curb. Like the standard cul-de-sac, it is intended for use on local access dead end streets.
- 3. Temporary Cul-de-sac: A temporary cul-de-sac is similar to the standard cul-de-



sac but allows for planned street continuation. Curbing is not installed in the temporary cul-de-sac, and the roadway dimensions resume at the terminus in preparation of further street construction (the terminus is suitably blocked to eliminate immediate access). When the street is extended, new curbs are constructed along the roadway tangent, extending from the end points of the original curbs and the excess asphalt is removed. All temporary turnarounds shall be surfaced with an all-weather surface capable of supporting an imposed load of at least 75,000 pounds.

4. Hammerhead: The hammerhead termination may be used on local access dead ends. Construction of a hammerhead termination on local access streets is allowed only on approval of the Director.
5. The following specific design criteria shall apply to the design of cul-de-sacs:
  - a. Cul-de-sac islands shall not be allowed.
  - b. Minimum curb radius for the bulb shall be 50 feet.
  - c. Minimum right of way radius for the bulb section shall be 56 feet. If the sidewalk is to be located on an easement, the minimum right of way radius is 51 feet.
  - d. Unless otherwise approved by the Engineer, cul-de-sacs shall be designed to "drain out" to the adjacent street to avoid flooding if the storm drainage system fails.
  - e. Cul-de-sac profiles shall be established to provide minimum one percent grades at all places along the gutter lines.

#### C. Entrance Gates

1. Proposed entrance gates shall not interfere with emergency vehicle access. An adequate fire lane must be provided. If a center island is used, a minimum 14-foot wide lane between the curb faces shall be provided. The center island shall not extend past the end of the gate when it is fully opened. In a case where there is no center island, the minimum road width is 20 feet. No parking on either side of the street will be allowed within 48 feet of the gate on both sides of the gate. The no parking zone shall be clearly signed on both sides of the gate. When fully opened, the gate shall not block access to structures or fire hydrants.
2. Gated streets require a queuing area to allow vehicles to exit the connecting street prior to the gate. The queuing area must be at least 48 feet long to accommodate fire vehicles. Queuing areas longer than 150 feet will require a public turnaround designed to City Standards.

#### D. Intersections

1. Arterial intersection designs are driven by the demands of the anticipated traffic flow. The minimum centerline distance between intersections shall be 150 feet.
2. Generally, intersections should be at right angles. The minimum acute intersecting angle for streets shall be 70 degrees. For stop sign-controlled streets the 70° (tangent) portion shall extend along the controlled street a minimum of 30 feet from the end of the curb radius. For all cases, the effects of sight distance shall be considered.



E. On-Street Parking

1. On-street parking shall be provided on both sides of the street for all Collector Arterial and Local Access Streets. See Table 3-B for required parking lane widths.

F. Alleys

1. Alleys shall be constructed in accordance with CMC 22.24.02 (g-i). All alleys shall be paved a minimum of twenty feet wide.

G. Profile Grades

1. The maximum profile grade for all public streets is 8 percent. For private streets, the maximum profile grade shall be 10 percent. A variance may be granted by the Director considering topography, safety, maintainability, function, and emergency vehicle access. The minimum profile grade for all streets is 0.8 percent. Cul-de-sac profiles shall be established per section 3.2.B.
2. The profile grade at all residential intersections, along minor roadways at arterials, and for all roadways at controlled intersections shall be no greater than 3 percent at any point within 75 feet of the near end of the curb radius.

H. Horizontal Curves

1. Horizontal curves are to be determined in accordance with normal civil engineering procedures, considering design speeds, sight distances, roadway crown, building proximity, and vertical grades. A 100-foot radius shall be considered the minimum unless otherwise authorized by the Engineer.
2. The maximum superelevation on horizontal curves shall be four (4) percent. The minimum horizontal curve radii shall be determined per AASHTO Design for Low Speed Urban Streets, based on design speed, which shall be 5 mph over the speed limit, and considering the roadway crown.
3. Pavement widening on horizontal curves to accommodate large vehicles shall be considered per AASHTO Chapter III - Elements of Design, Table III-23.

I. Vertical Curves

1. Refer to Table 3-C for sag and crest vertical curve design criteria.

J. Tapers

1. The standard taper length for narrowing or offsetting of a lane shall be based on the design speed, per the U.S. Department of Transportation Manual on Uniform Traffic Control Devices (MUTCD).

K. Medians

1. Proposed medians on any roadway will be evaluated on a case-by-case basis and allowed at the discretion of the Public Works Director. There shall be no parking adjacent to any median.



2. Medians, where approved, shall not exceed 600 feet in length without a break that allows emergency vehicles to cross through the median and continue in the same direction (S-Turn movement). The break in the median does not need to allow for U-turn movements.
- L. Bus Zones
1. Refer to the Spokane Transit Authority Design Guidelines for bus zone design criteria.
- M. Roadway Side Slopes
1. Roadway side slopes shall meet the requirements of Table 3-D; special sloping may be required to meet minimum sight distances.
- N. Pavement Markings
1. Design plans for pavement markings shall be submitted to the Public Works Department for review and acceptance prior to construction. Plans shall include all existing and proposed striping, show the full width of the street, and show existing conditions beyond the proposed development. Any existing markings that are to be removed shall be clearly designated.
  2. All crosswalks, stop bars and parking tees shall be thermoplastic. Centerline and shoulder striping may be painted.
  3. All pavement markings shall conform to the MUTCD specifications.
- O. Monuments
1. Prior to any construction within City rights-of-way, the Developer shall employ a Washington State Licensed Surveyor to conduct through search for all survey monuments. Any found monuments shall be referenced in accordance with current applicable state laws. A copy of the references shall be submitted to Public Works.
  2. If placing new or replacing existing monuments is required the developer shall do so in accordance with current applicable state laws.
  3. At a minimum, monumentation shall be provided and constructed at the following locations in accordance with CMC 22.16.100:
    - a. At center of each cul-de-sac
    - b. At point of intersection of all streets
    - c. At point of curvature on all horizontal curves
    - d. At point of tangency on all horizontal curves
    - e. On the roadway centerline at the end of every plat
  4. When the above locations are obstructed and a monument is unable to be set, reference points shall be set in a manner where the actual monument location can be re-established.
  5. The location of the monuments shall be clearly marked on the construction plans and final plat.



P. Asphalt Binder Selection

1. All Hot Mix Asphalt used in the traveled way shall use Performance Grade asphalt binders, in accordance with AASHTO Designation MP-1. The minimum base binder used shall be PG 64–28. Required base binders based on street type and condition are provided in the following table:

STREET TYPE / CONDITION	PERFORMANCE GRADE
Local Access Streets/Collector Arterials/Private Roads	64-28
Minor Arterials	70-28

Q. Pavement Section Thickness

1. All public and private roadways in the City shall be paved. A pavement surfacing design procedure must be performed for all roadways. Table 3-A may be used in place of performing a pavement design for local access streets and private roads. The design life for all roads shall be 20 years. The design procedure used must be approved by the Public Works Director and must consider the following:
  - a. Traffic Loading – an estimate of the number and types of loadings that roadway will carry for the design life. This estimate of loading must be established by a procedure accepted by the Engineer and be expressed in 18-Kip Equivalent Single Axle Loads (ESAL's).
  - b. Subgrade Support—a representative value for the stiffness of the native material on which the road will be built. This value will be established by a procedure accepted by the Director and be expressed as resilient modulus (MR). When determining MR, soil sampling is to include:
    - 1) Obtaining a sufficient number of soil samples which adequately represents the subgrade MR, and where significant changes in MR occur;
    - 2) Constructing a soil log to a minimum of five foot depth below proposed subgrade and classify the soil per USC; and
    - 3) Recording the location of where the samples were obtained, normally by station and offset.
  - c. Analysis- a procedure for establishing the surfacing depth requirements for a given traffic loading and subgrade resilient modulus. The Director must approve this procedure. The following procedure is pre-approved: Guide for Design of Pavement Structures (26), 1994 the American Association of State Highway and Transportation Officials (AASHTO).
2. The structural pavement calculations, soil sample locations, lab results, design criteria and recommendations are to be included in a report prepared by the sponsor's engineer. All design factors used are to be listed in the report, including traffic loads projected to occur over the life of the pavement. The report is to be stamped by an engineer, licensed in the State of Washington.



3. Minimum Thickness: Regardless of the thickness computed by the design procedure, the minimum thickness of the road structural section shall be as follows:

Local Access Street:	3" Class ½" HMA 6" Crushed Surfacing Top/Base Course
Minor Arterial / Collector Arterial:	2" Class ½" HMA 2" Class 1" HMA 7" Crushed Surfacing Top/Base Course

R. Pavement Patching

The City of Cheney has adopted the Spokane Regional Pavement Cut Policy which has been included in the Appendix. All pavement cuts for utility work and patches shall be designed and constructed in accordance with this policy and the City of Cheney's Standards.

**Table 3-A Pavement Design Matrix**

SOIL TYPE Per Unified Soil Classification System (USC)	LOCAL ACCESS STREET
GW	3 inches / 6 inches
GP	3 inches / 7 inches
GM	3 inches / 8 inches
GC	4 inches / 6 inches
SW	3 inches / 7 inches
SP	3 inches / 8 inches
SM	4 inches / 6 inches
SC	Pavement Design Needed
ML	5 inches / 6 inches
CL	Pavement Design Needed
OL	6 inches / 8 inches
MH, OH, Pt	Pavement Design Needed

Notes:

1. Values listed denote asphalt over crushed rock (minimum compacted thickness) {e.g. "3 inches / 6 inches denotes 3 inches class ½" HMA over 6 inches of crushed rock.}
2. When multiple soil classifications are encountered below the planned road subgrade, if the higher-strength soil is at least 2 ft. in depth and is above the lower-strength soil, then the structural pavement section applicable to the higher strength soil can be used only for soil types GW through SM.
3. For soil types GW through SM, the upper two feet of roadway subgrade shall be compacted to 95 percent of the maximum dry density based on the AASHTO T-180 test procedure.
4. To use this table the Engineer shall acquire soil samples at the project site and classify the soils encountered. The soil classifications shall be stamped by a an engineer, licensed in the state of Washington, and shall be submitted to the City for approval.



**Table 3B - Roadway Requirements and Widths**

FEATURE	MINOR ARTERIAL	COLLECTOR ARTERIAL	LOCAL ACCESS
Sidewalk	Required Both Sides Min. 5'	Required Both Sides Min. 5'	Required Both Sides Min. 5'
On-Street Parking	Not Required	Required Both Sides Min. 8'	Required Both Sides Min. 8'
Exterior Thru Lane	Required Min. 12'	Required Min. 12'	Required Min. 12'
Interior Thru Lane	Required Min. 12'	Not Required	Not Required
Two Way Left Turn Lane	May be Required Min. 12'	May be Required Min. 12'	Not Required
Bike Lane	Required Both Sides Min. 5'	Required Both Sides Min. 5'	Not Required
Minimum Curb to Curb Width	58'	50'	40'
R.O.W. Widths	80'	60'	50'

<sup>1</sup> Variances from the above standards may be granted via Design Variance, on a case-by-case basis by the Public Works Director based on the length of proposed street, traffic circulation, traffic volumes, location, alternate routes, and the ability of emergency services to access the site.

<sup>2</sup> Actual right of way widths will be determined based on the proposed lane configurations for each roadway and may exceed the minimum widths specified. Border Easements may be allowed for sidewalk and pedestrian buffer strips (which do not include drainage treatment facilities) in lieu of right of way dedication.

**Table 3C - Vertical Curve Design Parameters**

	MINOR ARTERIAL	COLLECTOR ARTERIAL
<b>MINIMUM DESIGN SPEED<sup>1</sup></b>	35 mph	35 mph
Vertical Curves are required if the Algebraic Grade Difference, A, is:	A>1%	A>1%

	ALLEY	BICYCLE/ PEDESTRIAN PATHWAY
<b>MINIMUM DESIGN SPEED<sup>1</sup></b>	20 mph	20 mph
Vertical Curves are required if the Algebraic Grade Difference, A, is:	A>2%	A>2%

CREST		SAG	
DESIGN SPEED	"K" Factor <sup>2</sup>	DESIGN SPEED	"K" Factor <sup>2</sup>
20 mph	167>K>10	20 mph	167>K>20
25 mph	167>K>20	25 mph	167>K>30
30 mph	167>K>30	30 mph	167>K>40
35 mph	167>K>50	35 mph	167>K>50
40 mph	167>K>80	40 mph	167>K>70

L = KA  
 Where: L = Length of Curve  
 K = "K" factor  
 A = Algebraic Difference between grades  
 K = "K" factor  
 A = Algebraic Difference between grades  
 K = "K" factor

<sup>1</sup> Design speed is posted speed plus 5 mph. In practice, speeds may be less or more than shown depending on other design factors not accounted for herein. The design engineer shall justify the use of values other than those listed above.

<sup>2</sup> Minimum "K" as defined in AASHTO, is used to find minimum curve length for sight distance. Maximum "K" used to find maximum curve length for drainage.



**Table 3D - Side Slopes**

	MINOR ARTERIALS	COLLECTOR ARTERIALS	LOCAL ACCESS
<b>GRADE BREAK AT BACK OF WALK</b>			
up	4:1	4:1	2:1
down	4:1	4:1	2:1
<b>GRADE BREAK AT ONE FOOT BEHIND WALK</b>			
Up	2:1	2:1	2:1
down	2:1	2:1	2:1
	ALLEYS	BICYCLE/ PEDESTRIAN PATHWAY	
<b>GRADE BREAK AT EDGE OF PAVEMENT</b>			
up	2:1		2:1
down	2:1		2:1
<b>GRADE BREAK AT EDGE OF TRAVELED WAY, INCLUDING ANY SHOULDERS</b>			
up	2:1		2:1
down	2:1		2:1

Notes:

1. Use WSDOT standards when curbs do not exist.
2. Grades shown are horizontal:vertical

**Table 3-E - Street Profile Grades**

	MINOR ARTERIAL	COLLECTOR ARTERIAL	LOCAL ACCESS	ALLEYS
<b>MINIMUM PROFILE GRADE</b>	0.8%	0.8%	0.8%	0.8%
<b>MAXIMUM PROFILE GRADE</b>	8.0%	8.0%	8.0%	10.0%

Notes:

1. Cul-de-sac profiles shall be established to provide minimum one percent grades at all places along the gutter lines.
2. Unless otherwise approved by the Engineer, the profile grade at all residential intersections, along the minor roadway at arterials, and for all roadways at controlled intersections shall be no greater than three percent at any point within 75 feet of the near end of the radius.

**Table 3-F - Curb Radii Design Parameters**

Actual return geometry must be able to accommodate the minimum design vehicle with the appropriate lane encroachment constraints.

**MINIMUM DESIGN VEHICLE**

Local Access	SU-30 or P
Collector Arterial	WB-40
Minor Arterial	WB-40

Notes:

1. Minimum design vehicle is determined as a function of the most restrictive zoning.
2. Source: Intersection Channelization Design Guide, National Cooperative Highway Research Program Report 279, 1985.



**MINIMUM ALLOWABLE SIMPLE CURB RADII**

FROM:	TO:		
	LOCAL ACCESS	COLLECTOR ARTERIAL	MINOR ARTERIAL
PRIVATE ROAD	20	30	30
LOCAL ACCESS	20	30	30
COLLECTOR ARTERIAL	30	30	30
MINOR ARTERIAL	30	30	30

Notes:

1. Minimum simple radii may not accommodate all vehicles. It may be necessary to use appropriately dimensioned two or three-centered curves.
2. Lane encroachments are not allowed on turning movements into principal and minor arterials, except where turning movements are subject to 4-way stop control or phased signalization.

**3.3 Curbs, Gutters, Pedestrian Buffer Strips, Driveways and Sidewalks**

A. Curbs and Gutters

1. Integral cement concrete curb and gutter shall be constructed per the City standards on all new construction. Curbs shall be constructed on 4" of Crushed Surfacing Top Course compacted to 95 percent of the maximum dry density. Special drainage issues may require the use of other curbing with gutter grading, upon approval of the Engineer. When repairing or replacing existing sections of curb, the type of curb constructed may match the adjacent curb.
2. The curb radius at alley entrances shall be 5 ft. Refer to Table 3-F for minimum simple curb radii on streets.
3. The actual curb return geometry must be able to accommodate the minimum design vehicle, as shown in Table 3-F, with the appropriate lane encroachment constraints.

B. Sidewalks

1. Curbs and sidewalks shall be required to be permitted and constructed within the City right-of-way on City access and arterial streets and within private road easements where the same are not already in existence, or the same are in a state of disrepair, as declared by the Public Works Director. The required sidewalk construction / repair shall be on all sides of private property parcels adjacent to City streets whenever any permit is issued for new construction or for substantial improvements to a parcel, or any improvements resulting in a change of occupancy classification. Locations of sidewalk placement or repair shall be included on plans submitted to Public Works for review.
2. Sidewalks shall be constructed with a width of 5' and a cross slope of 2% or ¼" per foot. Sidewalks shall be constructed on 4" of Crushed Surfacing Top Course compacted to 95 percent of the maximum dry density. Sidewalks shall be designed in accordance with the Standard Plans and City of Cheney design specification.



3. Elevated structural sidewalks shall be designed in accordance with the applicable portions of the latest edition of the Uniform Building Code. The minimum concentrated load, L, to be used in the design shall be 10,000 pounds applied over a contact area of 100 square inches. The minimum single axle load shall be 20,000 pounds. The design tire load shall be 600 pounds per inch of tire width.

C. Pedestrian Buffer Strips

1. Pedestrian Buffer Strips can be hard surfaced or planted depending on the location. Pedestrian Buffer strips shall be at least 4.5 feet wide. Hard surfaces include concrete, bricks and other pavers.
2. If roadside swales are proposed to treat stormwater runoff, the pedestrian buffer strip must be at least 10 feet wide with a maximum slope of 3:1. In situations where a separation between the sidewalk and the street is constrained by topography, narrow right of way, or existing development, a variance from this standard may be granted by the Public Works Director.

D. Curb Ramps

1. Curb ramps shall be designed in accordance with the requirements of ADAAG, the WSDOT Standard Specifications, and the City of Cheney Standard. Curb ramps shall be located in accordance with the City of Cheney Standard Plans.

E. Driveway Approaches

1. Approaches shall be constructed to define the access openings in accordance with the City of Standard Plan sheets entitled "Cement Concrete Approaches" and CMC 12.62. Driveway approaches must provide access to an off road parking area located on private property. The driveway shall be of sufficient length so a vehicle in the driveway does not project into the road right-of-way, sidewalk, or pathway. Driveway approaches shall be constructed to avoid interference with existing drainage inlets, culverts, road lighting standards, utility poles, traffic regulating devices, fire hydrants, curb ramps, or other public facilities. The applicant shall bear the cost of relocating any such public facility. The City Department holding authority for the particular structure shall decide how the facility will be located. Where the Public Works Director deems that these standards will not provide the proper control of access or safety, additional requirements may apply to insure public safety. All driveways must demonstrate adequate sight distance.
2. These approach standards are general in nature and pertain mainly to local access road situations. Arterials, railroad crossings, signalized intersections, channelization, and findings from a specific traffic analysis may result in superseding requirements. Refer to the Standard Plan entitled "Cement Concrete Approaches" for approach dimensions

F. Residential Approaches

1. Residential driveway approaches shall not exceed 20 feet in width for a two-car garage and 28 feet for a three-car garage. The total width of all driveway approaches on a road for any ownership shall not exceed 40% of the frontage of that ownership along the road and shall not be more than two in number. Refer



to the Standard Plan entitled "Cement Concrete Approaches" for approach dimensions. Any project or alteration of the existing approaches will require conformance with these standards along with replacement of any unused approaches with standard curb, gutter, and sidewalk. Driveways shall not be constructed, reconstructed, or altered to be within 50 feet of the end of a curb return for an intersection. Driveway approach grades within right of way shall not exceed 8% (a rise or descent of 8 feet in 100 feet) in the urban area.

2. Where the existing curb, gutter, or sidewalk is not continuous along the road frontage, the Project Sponsor shall construct the missing improvements.

#### G. Commercial / Industrial Approaches

1. Driveways and site development within commercial and industrial zones shall be arranged to allow vehicles to exit without backing out into the roadway. The minimum width of a driveway within a commercial or industrial zone shall be 24 feet. The maximum driveway approach width within a commercial or industrial zone shall be 35 feet, but only for uses where large trucks are anticipated. Each lot shall be allowed one driveway approach per street, unless the lot width exceeds 150 feet, in which case two driveway approaches may be approved. Shared driveways between adjacent properties is encouraged, but not required. Prior to construction, the owner shall provide evidence of a joint use, access, and maintenance agreement. Driveways shall not be constructed, reconstructed, or altered to be within 75 feet of the end of a curb return for an intersection or within 75 feet of a theoretical curb return end in standard location, if not present. Driveway approach grades within right of way shall not exceed 8% (a rise or descent of 8 feet in 100 feet).
2. The spacing between driveway approaches in the curb line of ownerships or leaseholds shall not be less than thirty (30) feet for commercial uses or less than fifty (50) feet for industrial uses measured parallel with the frontage. Driveway approaches should be consolidated and shared to the extent possible

#### H. Driveways

1. Driveway locations shall be designed to provide for safe operations and minimal disruption of traffic flow. Driveway locations and widths shall meet the requirements outlined in CMC 12.62.060. In general, the higher the street classification, the fewer the number of access points that are allowed. In areas of high-density housing, shared driveways are encouraged. Multiple unshared driveways that have minimal separation between them are discouraged.
2. The following criteria will be considered when reviewing a proposed driveway:
  - a. Land use
  - b. Design vehicle and site needs
  - c. Street classification
  - d. Street operational characteristics
  - e. Level of improvement on adjacent street
  - f. Distance from existing or proposed traffic control devices
  - g. Distance from intersections or other driveways
  - h. Potential exposure for pedestrians and bicycles
  - i. Sight distance
3. Driveway approaches shall be designed and constructed in accordance with CMC 12.62.060 and the standard plan. A deviation may be granted for truck movements in commercial areas.



4. In new developments, driveway locations shall be shown on street plans. Deed restrictions may be required where drainage facilities or emergency turnarounds are dependent upon driveway placement.
- I. Roadside Planting
    1. Any roadside planting shall conform to the City's clearances/clear zone standards as discussed in Section 3.7. Planting, removal, or pruning of any street tree shall be in accordance with Cheney Ordinance V-27 and CMC 21.42 and 12.60. All projects requiring landscaping within or affecting the public right-of-way shall submit a landscaping plan for review by Public Works.
  - J. Existing Street Trees
    1. When development occurs on sites with existing street trees, the following items must be addressed as part of the project:
      - a. All dead or diseased trees must be removed and replaced at the discretion of Public Works.
      - b. Trees that are missing shall be replaced at the discretion of Public Works
      - c. Broken or missing irrigation systems shall be repaired or replaced.
      - d. Broken or missing tree grates shall be repaired or replaced.
      - e. All concrete tree grates shall be replaced with metal grates meeting ADA requirements.
      - f. When structural sidewalk is removed and backfilled, concrete planter vaults shall be removed and replaced with metal culverts 6' in diameter by 3' depth as approved by Public Works.
      - g. Gaps between the tree grate and the soil surface exceeding 2 inches shall be filled in with a material approved by Public Works.
      - h. Tree grates that are not flush with the surrounding sidewalk shall be raised or lowered as necessary to prevent a tripping hazard.
      - i. No new utility pole location shall be established closer than 5 feet to an existing tree;
  - K. New Street Trees
    1. Tree selection shall be coordinated through the Public Works Department. Approval shall be obtained from the Director prior to planting tree(s) in the City right of way.
    2. When locating street trees, the following specific criteria shall apply:
      - a. Street tree installations shall meet all City of Cheney visibility requirements.
      - b. Street trees installed in tree pits or sidewalk cutouts shall be located so as to not interfere with street signs, lighting poles, utility wires bus stops or pads and to accommodate ADA pedestrian requirements.
      - c. Minimum horizontal distances from the centerline of a tree to other structures or improvements in the planting strip shall be as follows:
        - 1) 15 feet to edge of driveway;
        - 2) 25 feet to street light luminaire (15 feet may be allowed where lighting pattern is not affected);
        - 3) As required to provide an adequate clear sight triangle as per CMC 21.46;
        - 4) 5 feet to underground duct or pipe;



- 5) 10 feet from curb cut for drainage;
  - 6) 20 feet from drywell;
  - 7) 15 feet to hydrants and utility poles
- d. Trees that are suitable for wet areas shall be selected for planting within grass percolation areas. Trees that are planted within grass percolation areas shall not interfere with, obstruct, or retard the flow of water within the swale.
  - e. Spacing of street trees will be determined by Public Works.
  - f. If trees are to be planted in an area with no planting strip, the following criteria shall apply:
    - 1) A permanent, hard walking surface at least four feet wide shall be provided between the tree well or planting area and any structure or obstruction.
    - 2) Sidewalk cuts in concrete for tree planting shall be at least 44" x 44" to allow air and water to the root area.
    - 3) In cases where the existing walk cannot meet the four foot width requirement after tree planting, additional sidewalk width must be added within street right of way or easement, or the tree position must be modified.
  - g. Irrigation systems shall be required for all areas where street trees are planted.
  - h. Deviation from these Standards will be considered via the Design Variance process.

### 3.4 Signing and Illumination

#### A. Street Signs

1. All existing and proposed street signs required as part of street design shall be shown on the plans submitted to Public Works and shall be subject to review and approval by the Director. The plans shall include all existing and proposed signs, show the full width of the street, include any signs on the opposite side of the street, and show existing conditions beyond the proposed development.
2. All traffic control devices (TCD), including, but not limited to regulatory signs, warning signs, and guide signs shall adhere to the manual on Traffic Control Devices (MUTCD) standards. Refer to the City of Cheney Standard Plans for street name signs construction requirements.

#### B. Sign Posts

1. Refer to the City of Cheney Standard Plans for street sign post construction requirements.

#### C. Street Lighting and Traffic Signalization

1. Design of street lighting and traffic signalization shall be submitted to Public Works and shall be subject to review and approval by the Director. Street lighting plans shall be provided on arterials. If pedestrian or street lighting is proposed elsewhere, a lighting plan must be submitted to Public Works for review prior to construction.



### 3.5 Clearances/Clear Zones

#### A. Vertical Clearances

1. The clearance above any street surface shall be a minimum of sixteen and one-half (16 ½) feet to overhead obstacles. This height shall be maintained across the full width of the street, extending two feet behind the face of curb.
2. The clearance above sidewalks shall be a minimum of eight (8) feet to overhead obstacles. Shrubs and other items shall not extend into the sidewalk area.

#### B. Horizontal Clearances

1. The clear horizontal sight distance triangle at intersections shall be as described in AASHTO "A Policy on Geometric Design of Highways and Streets", Chapter 9, section on Sight Distance, and Section 21.46 of the Cheney Municipal Code.

#### C. Clear Zones

1. The term "clear zone" is used to designate the unobstructed area provided beyond the edge of the travel way on a public road for the recovery of errant vehicles.
  - a. On shouldered roads, rigid objects shall be placed no closer to the travel way than the clear zone distance as described in the current edition of AASHTO's "Roadside Design Guide". Within the clear zone, all hazards shall be protected by traffic barriers. In lieu of barriers, hazards may be constructed flush with the surface.
  - b. All proposed construction along SR 904 shall adhere to WSDOT Design Manual for all clear zone requirements.

### 3.6 Bikeways and Off-Road Pathways

A. Bicycle facilities shall be constructed where designated in Section 9.4.4 of the City's Comprehensive Plan, and shall be designed in accordance with City Standards. Side slopes adjacent to bikeways shall meet the requirements of Table 3-D. Where shared pedestrian/ bicycle pathways are constructed, the minimum width shall be 10 feet.

#### B. Off-Road Multi-Use Pathways

1. All off-road pathways shall be constructed as multi-use pathways and designed to accommodate, at a minimum, pedestrians and bicyclists. To promote multi-use compatibility and public safety, all public and private off-road multi-use pathways shall be constructed in accordance with the design standards below. Design drawings demonstrating compliance with said standards shall be submitted to the City of Cheney for review and approval prior to construction. Deviations to these design standards may only be permitted with the approval of the Public Works Director.
  - a. Width: The minimum width of all off-road pathways shall be 10 feet.
  - b. Construction: The pathway pavement may be constructed of either asphalt or concrete.



- c. Section: Asphalt shall be a minimum of two inches thick over four inches of crushed gravel, on a compacted subgrade. Concrete shall be four inches thick over two inches of crushed gravel, on a compacted subgrade.
- d. Shoulders: The pathway shall include a minimum of one-foot level shoulders on each side.
- e. Clearing: Trees and brush shall be cleared a minimum of fourteen feet (two feet each side of the pathway to a height of ten feet).
- f. Alignment: The pathway alignment shall follow the natural terrain of the land so as to minimize grading.
- g. Drainage: A discernable drainage ditch shall be constructed on the uphill side of a pathway. Culverts shall route stormwater runoff to the lower side of the trail to natural drainage ways.
- h. Grade: The maximum sustained grade shall be 12%. 15% grades may be allowed for short sections.
- i. Line of Sight: Minimum of 85 feet for grades less than 10% and 50 feet for grades greater than 10%
- j. Side Slopes: Pathways with downhill side slopes greater than 2:1 may, at the Director's discretion, require protective measures such as fencing.
- k. Pullouts Pullouts ten feet wide and 16 feet long should be constructed at significant lookout areas to allow for rest and aesthetic opportunities.

### **3.7 Pavement Cuts and Patches**

The City of Cheney has adopted the Spokane County / City of Spokane Regional Pavement Cut Policy as its standard for the cutting and patching of existing roadways.

# **City of Cheney Engineering Design Standards**



## **Section 4 Sanitary Sewers**



## 4.0 SANITARY SEWERS

Sanitary sewers should be designed to maintain self-cleaning velocities and allow for ease of maintenance.

This section presents design guidance for construction of sewers in the public right-of-way and on private property. Design criteria for wastewater pumping stations are discussed in Section 5.0.

### 4.1 Definitions

- A. **Average Design Flow:** The average daily flow of the maximum month.
- B. **Building Drain:** That part of the lowest piping of a drainage system which receives the sanitary discharge from piping inside the walls of a structure or building, and conveys it to a point two feet outside the outer face of a structure, wall or foundation into the side sewer or to an on-site sewage disposal system. Building drains shall not carry roof drainage, groundwater or surface runoff. (CMC 15.04.051)
- C. **Cleanout:** An upturned pipe which provides a means for flushing or inserting cleaning tools.
- D. **Cutoff Wall:** A wall, collar or other structure intended to control movement of the groundwater along a trench constructed for sewer line placement. Cutoff walls are typically used in areas of rock, when a natural barrier to groundwater is disturbed by sewer line construction. Cutoff wall details are shown in the Standard Plans.
- E. **Effluent:** Wastewater or other liquid, partially or completely treated, or in its natural state, flowing out of a reservoir, basin, treatment plant, or industrial treatment plant, or any part thereof.
- F. **Industrial Process Wastewater or Process Wastewater:** That category of wastewater containing water carried wastes other than those traditionally derived from human or household customer sources (as defined in CMC 15.04). Process wastewater is also sometimes referred to as "non-domestic sewage". There are two subcategories of process wastewater:
  - 1. **"Manufacturing Process Wastewater"**, which is wastewater of a nature, concentration, or consistency traditionally originating from industrial or manufacturing customers. This generally includes sewage from one or more heavy industrial or manufacturing process sources or industrial cleanup procedures. It includes one-process discharges or several commingled process discharges.
  - 2. **"Non-manufacturing Process Wastewater"**: which includes all other process wastewater. This generally includes wastewater from business, institutional or commercial customers which generate non-domestic wastewater components derived from a business or commercial process other than manufacturing or heavy industry. Examples of included sources are wastewater from commercial laundries, radiator shops, photo finishers as well as wastewater from vehicles used for storage or transportation of wastewater, such as septic tank pumps or haulers.





- G. **Interior Channel Drop:** A planned drop of the invert elevation within a manhole to convey wastewater from the incoming pipe(s) to the outgoing sewer.
- H. **Lateral or Lateral Sewer:** A sewer to which side or private sewers may be connected from adjacent properties.
- I. **Natural Outlet:** Any outlet into a watercourse, pond, ditch, lake or other body of surface water or groundwater. It does not include connections to the City of Cheney Wastewater Treatment Plant, authorized on-site sewage, stormwater disposal systems, or other authorized sewage disposal mechanisms or systems.
- J. **Noncontact Cooling Water:** That category of wastewater consisting of water used for cooling, generally in an industrial or manufacturing process, which does not come into direct contact with any raw material, intermediate product, waste product, or finished product. The term excludes all other categories of wastewater identified herein.
- K. **Nonstandard Strength Sewage:** Wastewater accepted for discharge into the Wastewater Treatment Plant, but which does not meet the criteria for acceptance as standard strength sewage, whether because of special characteristics, special treatment requirements, special monitoring or additional handling as a condition of acceptance. Nonstandard strength sewage is further defined in Chapter 15 of the Cheney Municipal Code.
- L. **On-Site Sewage Disposal System:** Any system or combination of piping, treatment or other facilities that store, treat, and/or dispose of sewage and effluent on the property where it originates, or an adjacent or nearby property under the ownership of the user of the system or in which the user has a recorded interest for the purpose of maintaining the system on such other property. In general, these include septic tanks, drainfields, pressure mounds, etc.
- M. **Peak Flow:** The maximum momentary load placed on a wastewater pumping station, sewer main, force main, etc.
- N. **Peak Factor:** A value which, when multiplied by the average design flow, yields an estimate of the highest flow rate to be expected over a short period of time.
- O. **Practicable:** Capable of being accomplished within prudent natural, social or economic constraints using readily available resources and reasonable reliable technology and practices.
- P. **Private Pump Station:** An appurtenance of a side sewer, private sewer or on-site sewage disposal system which, alone or in conjunction with the side sewer or private sewer, conveys standard strength sewage or effluent by lifting or pumping to another sewer.
- Q. **Private Sewer:** A sewer which is not owned or maintained by a public authority, and which serves two or more users on one or more parcels, and is constructed by private contract.
- R. **Private Storm Sewer:** A storm sewer not owned or maintained by a public authority.



- S. **Public Sewer:** A sewer which is controlled and maintained by a public authority.
- T. **Sanitary Sewage:** Also sometimes referred to as "domestic sewage" is that category of wastewater consisting of water-carried wastes from human and household customer sources. The term also includes water-carried wastes from some business, institutional or commercial customers which do not generate industrial process wastewater.
- U. **Sanitary Sewer:** A sewer which conveys sanitary sewage. Additionally, the term is used to mean any public sewer except a storm sewer.
- V. **Sewage:** A combination of the water-carried wastes from domestic, business or commercial, industrial or manufacturing sources, including residences, business buildings, institutions and industrial establishments. Sewage also includes surface water and storm water when discharged into a sewer.
- W. **Sewer:** A pipe, conduit, structure, or appurtenance for conveying sewage.
- X. **Side Sewer:** A sewer, from a single user, not directly controlled or maintained by a public authority, which begins two feet outside the outer face of a structure wall or foundation, conveying wastewater from the building drain to a public sewer or private sewer, including any tees, taps, wyes, etc. at the connection to the public sewer.
- Y. **Side Sewer Stub:** That portion of a side sewer which is constructed along with the sewer prior to direct connection to the premises to be served.
- Z. **Standard Strength Sewage:** Wastewater which complies with specifications designated by the Public Works Director, City Sewer Rates and Regulations or the Cheney Municipal Code as not requiring special treatment, monitoring or additional handling prior to acceptance by the Wastewater Treatment Plant, considering chemical, physical and organic content, including but not limited to B.O.D., suspended solids, and Phosphorus.
- AA. **Storm Water:** That category of wastewater consisting of runoff occurring during or following any form of natural precipitation and resulting from such precipitation, including snow melt.
- BB. **Storm Sewer or Storm Drain:** A sewer which conveys storm water.
- CC. **Trunk Sewer:** A sewer that receives many tributary branches and serves a large territory.
- DD. **Underdrain:** A drain that carries away groundwater. Also, the drain laid below a sewer through wet ground to facilitate construction.



EE. **Wastewater:** "Wastewater" includes anything released into the Wastewater Treatment Plant and generally includes water-carried wastes from domestic, business or commercial, or manufacturing or industrial sources. For purposes of reference, three categories of wastewater (as defined herein), based on its generic source are identified in usage:

1. sanitary sewage;
2. industrial process wastewater or process wastewater;
3. noncontact cooling water.

FF. Additionally, wastewater is divided into two general classes for purposes of rates and treatment requirements (as defined herein):

1. standard strength sewage
2. nonstandard strength sewage

#### 4.2 Public Sewers

Design of public sanitary sewers shall be in accordance with the City of Cheney standards and the following design parameters.

##### A. Pipe Sizes

1. Minimum pipe size for public sewers shall be 8 inches. Pipe size shall be determined based on the following design criteria:
  - a. Design population density shall be based on current or future zoning, potential zoning changes and/or site specific requirements.
  - b. Typical residential design flows are estimated at 190 gallons per day per 2.5 persons (76 gallons per capita per day).
  - c. An infiltration rate of 200 gallons per day per inch diameter per mile length of pipe shall be used.
  - d. Design shall be based on pipe flowing at a depth of 0.7 times the diameter.

##### B. Materials & Products

1. Gravity Sewer pipe shall be PVC in accordance with ASTM D3034, SDR 35. Gravity pipe with less than 2.5 feet of cover shall conform to AWWA Standard C900, DR14.
2. Fittings – All Pipe fittings shall be PVC
3. Pipe Bedding Material – bedding shall consist of select native material of which 100% shall pass a 5/8-inch square opening in sieve, and shall be uniformly graded from coarse to fine with not more than 15% passing a No. 200 screen. Bedding material shall be free of topsoil or organic matter.

##### C. Pipe Slopes

1. All public sewers shall be designed and constructed to give mean velocities, when flowing at a depth of 0.7 times the diameter, of not less than 2.0 feet per second (fps) for the anticipated total flow at build out of the area served by the pipe. The following minimum & desired slopes shall apply:



SANITARY SEWER SIZE (INCHES)	MIN. SLOPE (V = 2.0 FPS)(FEET PER 100')	MIN. DESIRED SLOPE (FEET PER 100')
8	0.40	0.52
10	0.28	0.36
12	0.22	0.29
15	0.15	0.20
18	0.12	0.16
21	0.10	0.13
24	0.08	0.10
27	0.07	0.09
30	0.06	0.08
36	0.05	0.07

2. Desired slopes are 1.3 times the minimums shown above, and should be used unless impractical, particularly at the start of lines. Desirable flow conditions shall always take precedence over upsizing a pipe to maintain a shallower grade.
3. Pipe slopes greater than 0.20 ft/ft shall include a stability analysis addressing the need for anchorage subject to approval of the Public Works Director.

D. Pipe Depth

1. When designing to provide basement service to existing structures, the designer shall assume that the sewer pipe invert leaving the structure is 2.5 feet below basement slab elevation (or 11.5 feet below the main floor elevation when basement elevations are unknown), and that the side sewer slope is 0.02 ft/ft.
2. When designing to provide basement service in undeveloped areas, a depth to pipe invert of 10'-6" feet below ordinance grade is typically recommended; however, the designer shall first consider the service needs of the overall basin. Final design depths in all undeveloped areas must be approved by the Director.
3. When basement service is not required, design depth shall provide for side sewer connections which pass under adjacent water mains. Pipe cover shall provide for frost protection and structural considerations. A minimum pipe cover at the curb line or proposed curb line of 8 feet shall apply. When conditions warrant shallower cover the Developer's Engineer shall submit a design deviation to Public Works. Upon review, Public Works shall determine if shallower cover is acceptable.
4. Sewers greater than 16 ft. deep shall have a minimum grade 1.2 times the standard minimum to offset construction difficulties.

E. Roughness Coefficient

1. A roughness coefficient  $n = 0.013$  shall be used for all pipe. The variable - n curve shown in Figure 4-1 shall be used for design.

F. Horizontal Alignment

1. Sanitary sewers shall generally be located along the centerline of the road or alley. Detectable metallic marking tape shall be installed at mid-depth in the sewer trench directly over the pipe to mark the pipe location as per the City of Cheney standards.
2. The maximum distance between manholes shall be 350 feet on all straight sewer lines unless otherwise approved by the Director.
3. Curvilinear sewers are not allowed without approval of the Director.



#### G. Vertical Alignment

1. All sewers shall be laid with uniform slope between manholes. Pipe crowns shall be matched when upsizing, subject to the minimum drops specified below. Downsizing of pipes shall be allowed only on approval of the Director. When downsizing is approved, a decrease in diameter of only one pipe size smaller shall be allowed at a manhole, and the invert elevation of the smaller (downsized) pipe shall provide the required minimum drop through the manhole.
2. A minimum interior channel drop of 0.1 feet shall be required through all manholes. Maximum interior channel drops shall be 1.5'. "Drop Manholes" shall not be allowed.

#### H. Manholes

1. The following design parameters shall apply to manholes in public sewers:
  - a. When Type II or Type III manholes are used, the manhole opening and steps shall be positioned above the upstream invert. For Type I manholes, steps shall be positioned over the shelf having the largest footing area.
  - b. Manholes shall be placed at each change of alignment, grade or pipe size, and at the intersection of two or more sewer pipes 8 inches or larger.
  - c. Manhole spacing requirements are detailed above in Section 4.2-F.
  - d. Manhole channel drops shall be constructed as required in Section 4.2G2.
  - e. No service shall directly enter a manhole. An exception would be made for end manholes that have no chance of being used to continue a main line. The Director's approval shall be required.

#### I. Connection to Existing Manholes

1. Where new sanitary sewer mains are to be connected to an existing manhole, the existing manhole shall be core drilled. A sand collar is to be placed on the sewer line and the connection is to be sealed with non-shrink grout inside and outside of manhole. A representative of Cheney's Sewer Department must be on-site during a connection to an existing sewer. Notify the Sewer Department 48 hours in advance of the connection.

#### J. Temporary Manholes

1. Temporary manholes shall be placed on all extensions of sewer pipes. These manholes are not required to have poured channels and are removed when the line is extended.

#### K. Combined Sewers

1. Combined sanitary and storm sewers are prohibited. No surface, groundwater or roof drain may be connected to a public sanitary sewer.

#### L. Separation of Sewers and Other Utilities

1. Crossings of sanitary sewers and other utilities shall be designed and constructed in accordance with the most recent edition of the Washington State Department of Ecology's Criteria for Sewage Works Design.



#### M. Easements

1. Sewer easements shall be a minimum of twenty (20) feet wide unless otherwise approved by the Director. Additional width may be required for deep sewers. Easements are required for all public sewer 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.

### 4.3 Side Sewers

This section provides recommended design guidelines pertaining specifically to sanitary side sewers. Connection of storm drains, roof drains, underdrains or any other type of surface or ground water collection facility to a side sewer is expressly prohibited.

#### A. Pipe Size and Alignment

1. Side sewer stubs shall be a minimum of 4-inch diameter for single family residences and duplexes and 6-inch diameter for all other uses including multi-family housing, and shall be installed from the public main to the right-of-way line or to a point 12 feet behind any existing or future sidewalk or curb, whichever is further back. Side sewer connections to the public main shall be done in accordance with the Standard Plans. Connections to the main shall be "Type A" unless otherwise approved by the Public Works Director.
2. The building drain shall extend at least 2 feet beyond the wall of the building served. Side sewers shall drain away from the building with a minimum slope of 0.02 ft/ft (1/4 inch per foot). Vertical and horizontal curves are not recommended.
3. PVC side sewer tees shall meet ASTM D3034, SDR 26.

#### B. Pipe Depth

1. All side sewers should have at least 3.5 feet of cover in all traveled ways or other locations where the weight of the vehicular traffic might crush the pipe, and not less than 2 feet of cover in other areas. Frost protection via pipe cover or insulation shall be considered in all designs.

#### C. Connection to Manholes and Catch Basins

1. No catch basin or surface drain may be connected to a side, private or public. Storm drainage and sanitary sewage shall not be combined in a single sewer on private property.

#### D. Connection to Public Sewer Main

1. Sewer connection permits will be issued by the Public Works Department. Side sewer connections shall be in accordance with the Standard Plans. Side sewers shall not connect directly to a manhole (see 4.2H1e for exception). All connections shall be coordinated with the Public Works Department. The City Sewer Department shall perform all taps to existing sewer mains. The City shall supply the tapping saddles and labor to perform the tap. The cost of the saddle and the City's labor shall be reimbursed through the permit fee. The Contractor



shall provide all excavation and trench safety measures required to perform the tap. If, at the opinion of the Sewer Department, the trench safety measures are not adequate the City crew will leave the site and Contractor will have to reschedule the City crew once proper trench safety measures are implemented. The City will not be liable for any delays due to improper trench safety issues. Notify the Sewer Department 48 hours in advance of the connection.

E. Cleanouts

1. Cleanouts, no deeper than one foot from the ground surface, are recommended on all side sewers. Cleanouts shall be provided every 100 feet and at every angle point 45 degrees or greater. Cleanouts shall only be allowed on side sewers 6" or less in diameter. Manholes shall be installed on all side sewers 8" and larger. All cleanout shall be installed per the Standard Plans.

#### 4.4 Private Sewers

- A. All private sewer systems connecting to the public system must meet all City Standards and testing requirements.

#### 4.5 Marking Tape

- A. All Public and Private sanitary sewer mains and services shall be installed with detectable continuous marking tape installed 12" to 18" below the finished subgrade. The marker shall be detectable metallic tape labeled "SEWER" and shall be furnished by the contractor.

#### 4.6 Testing and Inspections

- A. Testing of all public and private sanitary sewer manholes and piping shall be conducted after backfilling operations have been completed. All tests shall be coordinated with the Public Works Department and shall be witnessed by a City representative. In all cases, the Contractor shall furnish all labor, materials, and equipment to make the required tests and shall bear the full cost of the required test. In the event that test results do not conform to the accepted standards, the Contractor, at the Contractor's expense, shall correct all deficiencies and retest until they conform to the testing requirements. Notify the Sewer Department 48 hours in advance of the testing.
- B. Low Pressure Air Test
1. All new sanitary sewer mains and service lines shall be pressure tested using the low pressure test methods outlined in the most recent edition of the WSDOT Standard Specifications for Road, Bridge and Municipal Construction for sanitary sewer cleaning and testing.
- C. Manhole Test (Vacuum Test)
1. All new manholes shall be vacuum tested. The vacuum testing shall be done in accordance with ASTM C1244-93.



D. Deflection Test (Mandrel)

1. Deflection testing for PVC pipe may be required at the discretion of the City Engineer. When required, the testing shall be done in accordance with the most recent edition of the WSDOT Standard Specifications for Road, Bridge and Municipal Construction, Section 7-17.3(2)G.

E. Television Inspection

1. All new sewer lines 6" and larger shall be inspected by the use of a television camera before final acceptance. The City of Cheney will provide the initial television inspection at no cost to the owner. The Contractor shall bear all costs associated with any additional television inspections required after any deficiencies have been repaired. Refer to attachment 4 in Chapter 2 herein this manual.

- F. In cases where groundwater is present in sufficient quantities, infiltration tests may be required by the Director.

**4.7 General Notes (Sanitary Sewer)**

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

1. All workmanship and materials shall be in accordance with City of Cheney standards and the most current editions of the Washington State Standard Specifications for Road, Bridge and Municipal Construction and the Washington State Department of Ecology's Criteria for Sewage Works Design.
2. The Contractor shall be fully responsible for locating and protecting all existing utility lines. The Contractor shall verify all utility locations prior to construction by calling the Underground Utility One-Call Line at 811 a minimum of 48 hours prior to any excavation.
3. All approvals, permits, and easements required by the City of Cheney shall be obtained by the Contractor prior to the start of construction.
4. The City of Cheney Public Works Department shall be notified a minimum of 48 hours in advance of a tap connection to an existing main or lateral. The City inspector shall be present at the time of the tap.
5. Gravity sewer piping shall be PVC in accordance with ASTM D-3034, SDR 35 with joints and rubber gaskets conforming to ASTM D-3217 and ASTM F-477.
6. Precast manholes shall meet the requirements of ASTM C-478. Joints shall be rubber gasketed conforming to ASTM C-443 and shall be grouted from the inside. Lift holes shall be grouted from the outside and inside of the manhole.
7. All sewer mains shall be field staked for grades and alignments by a surveyor licensed in the State of Washington.
8. All sanitary sewer mains and services shall be installed with continuous detectable marking tape installed 12" to 18" below the finished subgrade. The marker shall be detectable metallic tape marked "SEWER".
9. Prior to backfill, all mains and appurtenances shall be inspected and approved by the City of Cheney. Approvals shall not relieve the Contractor for correction of any deficiencies and/or failures as determined by the subsequent testing and





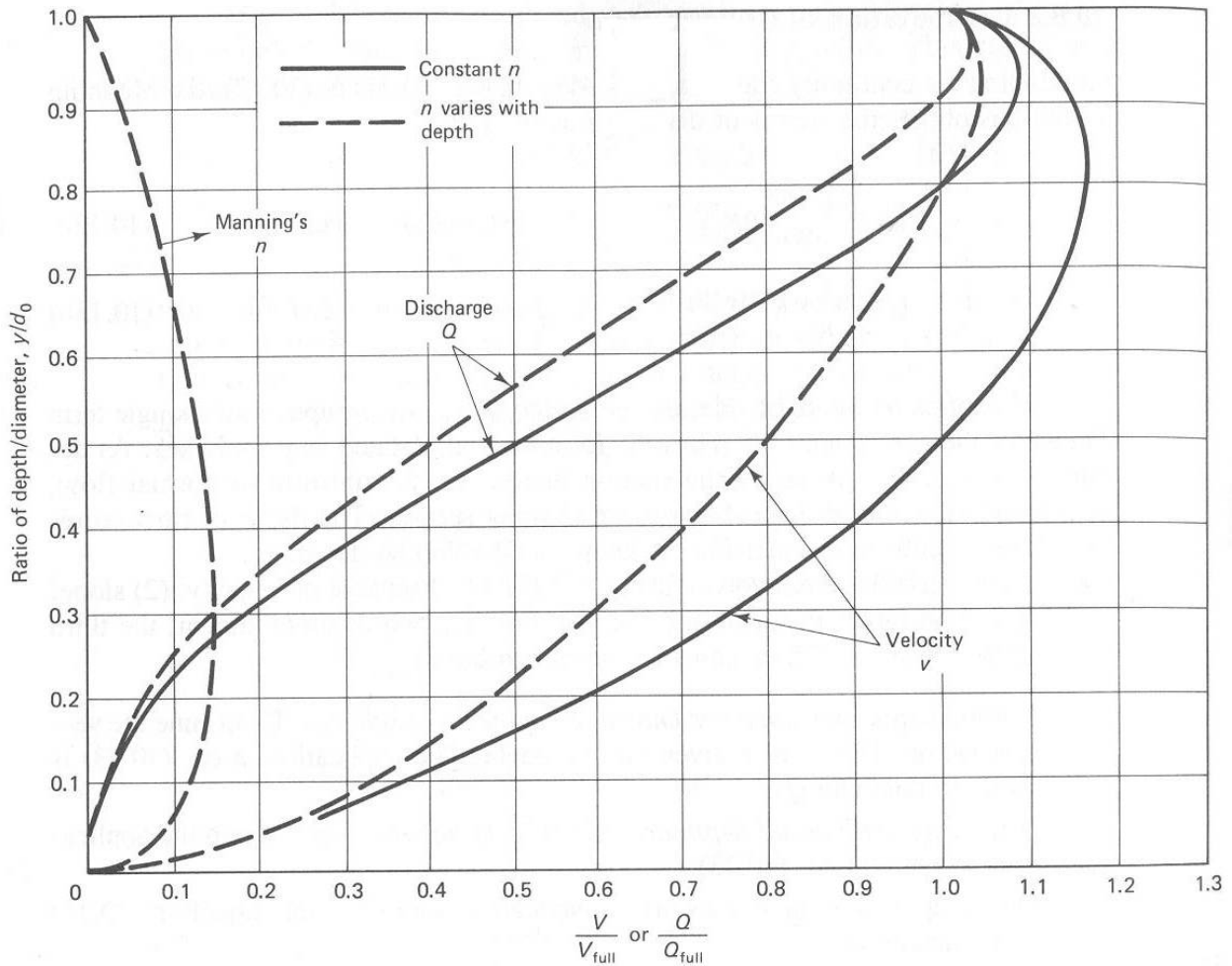
inspections. It shall be the Contractor's responsibility to notify the City of Cheney Public Works Department 48 hours in advance of all required inspections.

10. It shall be the responsibility of the Contractor to have a copy of these approved plans on the construction site at all times.
11. Any changes to the approved design shall be reviewed and approved by the Project Engineer and the City of Cheney.

#### 4.8 Tables and Figures

**Figure 4-1 Circular Channel Ratios (variable n)**

Experiments have shown that  $n$  varies slightly with depth. This figure gives velocity and flow rate ratios for varying  $n$  (solid line) and constant  $n$  (broken line) assumptions.



# **City of Cheney Engineering Design Standards**



## **Section 5 Wastewater Pump Stations**



## 5.0 WASTEWATER PUMP STATIONS

Design of wastewater pumping stations shall be performed by a professional engineer licensed in the State of Washington. Also, the design of wastewater pumping stations and force mains is an engineering matter and is not subject to detailed recommendations or requirements other than as required by these standards.

### 5.1 Definitions

- A. **Air Release Valve:** An air valve placed at the high points of a pipeline to release the air automatically and prevent the pipeline from becoming air-bound with a resultant increased head loss.
- B. **Average Design Flow:** The average daily flow of the maximum month.
- C. **Backflow Prevention Device:** Any effective device, method or construction used to prevent backflow into a potable water system.
- D. **Bar Screen:** A rack composed of parallel bars, either vertical or inclined, placed in a waterway to catch debris.
- E. **Centrifugal Pump:** A pump consisting of an impeller fixed on a rotating shaft and enclosed in a casing and having an inlet and a discharge connection. The rotating impeller creates pressure in the liquid by the velocity derived from centrifugal force.
- F. **Datum Reference:** Point for all readings for suction lift, suction head, total discharge head (TDH) and net positive suction head (NPSH). For horizontal shaft pumps, the datum elevation is the pump centerline. For vertical shaft pumps, the datum elevation is the elevation of the entrance eye of the suction impeller.
- G. **Dry Pit:** A dry compartment in a pumping station, near or below pumping level, where the pumps are located (do not be confused with a stormwater dry well)
- H. **Force Main:** A pressure pipe joining the pump discharge at a wastewater pumping station with a pint of gravity flow.
- I. **Impeller:** A rotating set of vanes designed to impel rotation of a mass of fluid.
- J. **Lift Station:** A wastewater pumping station that pumps wastewater to a higher elevation when the continuance of the sewer at reasonable slopes would involve excessive depths of trench (depths where repair or replacement would require special or costly construction techniques), or that raises wastewater from areas too low to drain into available sewers.
- K. **Net Positive Suction Head (NPSH):** The total suction head, in feet of liquid absolute, determined at the suction nozzle, less the vapor pressure of the liquid in feet absolute.
- L. **Peak Design Flow:** The largest estimated flow rate sustained over a 60-minute period in the design year of the pump station.



- M. **Static Head:** *The difference in suction and discharge water levels, does not include dynamic losses.*
- N. **Suction Head:** Suction head exists when the total suction head is above atmospheric pressure. As determined on test, it is the reading of the gage at the suction of the pump converted to feet of liquid and referred to datum, plus the velocity head at the point of gage attachment.
- O. **Suction Lift:** Suction lift exists when the total suction head is below atmospheric pressure. Total suction lift, as determined on test, is the reading of a liquid manometer at the suction nozzle of the pump converted to feet of liquid and referred to datum, minus the velocity head at the point of gage attachment.
- P. **Sump:** A tank or pit that receives wastewater and stored is temporarily, and from which the wastewater is pumped or ejected.
- Q. **Total Discharge Head:** The reading of a pressure gage at the discharge of the pump, converted to feet of liquid and referred to datum, plus the velocity head at the point of gage attachment.
- R. **Total Dynamic Head (TDH):** Also called "total head", TDH is the measure of energy increase per pound of the liquid imparted to it by the pump. Where suction lift exists, TDH is equal to the sum of the total discharge head and total suction lift, and, where positive suction head exists, TDH is the total discharge head minus the total suction head.
- S. **Velocity Head:** The theoretical vertical height to which a liquid body may be raised by its kinetic energy. It is equal to the square of the velocity divided by twice the acceleration due to gravity ( $v^2/2g$ ).
- T. **Water Hammer:** The phenomenon of oscillations in the pressure of water about its normal pressure in a closed conduit, flowing full, that results from a too-rapid acceleration or retardation of flow. Momentary pressure greatly in excess of the normal static pressure may be produced in a closed conduit by this phenomenon.
- U. **Wet Well:** A compartment in which wastewater is collected, and; (a) to which the suction pipe of a pump is connected, or (b) in which a submersible pump is installed.

## 5.2 General Requirements

- A. Justification for any proposed lift station is required which clearly exhibits that gravity lines are not available and not economically feasible.
- B. The number of lift stations for each basin shall be optimized.
- C. Wastewater pumping stations and force mains are to be provided solely for the conveyance of sanitary wastes. Under no circumstances shall any roof, foundation, surface or sub-surface drainage, or any other form of storm drainage be allowed to pass through the proposed facilities.



- D. Private lift stations shall not serve more than one property. Private lift stations are only allowed where gravity sewer exists adjacent to a property, but is not deep enough to serve all of the property. Private lift stations may be allowed where an existing condition could present a health hazard. Private lift stations require an engineering design report, specifications and detailed site plans for approval by the City of Cheney.
- E. Public and private lift stations must meet established minimum standards provided herein. Public lift stations will only be approved on a case-by-case basis. Only public lift stations will be maintained and operated by the City of Cheney.
- F. Due consideration shall be given to the selection of all materials used in the construction of wastewater pump stations, because of the presence of hydrogen sulfide and other corrosive gases, greases, oils, and other constituents frequently present in sewage.

### 5.3 Minimal Pump Station Design Requirements

- A. The Project 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 of any lift station shall conform to City Standards, Department of Ecology's "Criteria of Sewage Works Design" and applicable standards as set forth herein. The design report shall be submitted with each lift (pump) station and shall demonstrate its conformance with the standards as outlined herein. The report is to be stamped by an engineer, licensed in the State of Washington. At a minimum the following shall be submitted.
  - 1. The pump station design must have a minimum of two pumps
  - 2. Design flow analysis (break down of phases if applicable) including peak sewage flow calculations.
  - 3. All relevant elevations, such as; pump(s) off, discharge elevation, pumps(s) on, alarm elevation, max allowable storage elevation, etc.
  - 4. Maximum static head
  - 5. Force main size and length
  - 6. Pump station capacity (gpm) per each pump and multiple pumps
  - 7. Velocity within force main
  - 8. System head and pump curves (including compound pump curves when applicable)
  - 9. "n" values of force main
  - 10. Friction head loss (calculations)
  - 11. Velocity head
  - 12. Total dynamic head
  - 13. Pump time/cycle and number of cycles per day
  - 14. Storage available and storage required during a power outage scenario (min and max time)
  - 15. Discussion of odor control
  - 16. Water hammer calculations
  - 17. Buoyancy calculations (if the potential for high groundwater exists)
  - 18. Pump station specifications (generator specifications if applicable)
  - 19. Pump(s) specifications
  - 20. System back up plan (i.e. storage method, alternate power source)
  - 21. Maintenance Agreement (for private storage)
  - 22. Wiring Schematic



#### 5.4 System Head and Pump Curves

- A. System head curves with over laid selected pump curves shall be provided in each engineering design report. Data points for the system capacity curve shall be provided in tabular form and graphed with pump head capacity curve on the same axis. System capacity curves shall be plotted using the Hazen Williams coefficient values of  $C=100$  and  $C=130$ .
- B. Pump output in gpm at maximum and minimum head shall be clearly shown on system curves for each pump and combination of pumps.
- C. For stations with two or more pumps operating in parallel, multiple and single operation points shall be plotted on the system head curve.
- D. Pumps with the best efficiencies at all operating points shall be chosen.
- E. If a station is equipped with smaller impellers during start-up to handle lower than design flows, impellers sized to handle the design flow shall also be provided.

#### 5.5 Site Selection and Plan

- A. Location
  1. A lift station site shall be selected to serve the entire basin, considering ultimate build-out of the basin.
  2. In selecting a lift station site, consideration shall be given to minimizing its aesthetic, noise, and odor nuisance potential. The site shall be located at least 50 feet from any building or houses and a buffer zone between the lift station and its surrounding environment shall be provided. Buffer zones shall be designed to allow the lift station to blend into the surrounding environment and provide noise mitigation.
  3. The lift station site shall be readily accessible by maintenance vehicles during all weather conditions. The facility should be located off the traveled way of streets and alleys. The station should have an all weather access road at least 12 feet wide and a maximum slope of 10%. A vehicle turn-around area with a 50-foot outside turning radius to allow truck turn around shall be provided. A turn around shall be provided only if the access road exceeds 50 feet in length from the nearest dedicated street.

#### 5.6 Security/Equipment Protection

- A. The lift station site shall be enclosed in a security fence at least 6 feet high. All slabs, equipment, and utilities shall be located within the fenced area at least 3 feet from the fence.
- B. The lift station structures, electrical and mechanical equipment shall be designed to sustain no physical damage by the 100 year flood. The station should remain fully operational and accessible during the 25 year flood.



## 5.7 Temporary Public Lift Stations

- A. For temporary public lift stations, the Owner must grant an easement to the City. A copy of the recorded easement, plat, legal description and any other legal documents granting the easement shall be delivered prior to acceptance for operation and maintenance by the City. The easement shall extend to at least five feet outside the lift station fence and shall include the access road and turn-around areas. This easement shall be separate and in addition to any necessary pipeline easements. If the lift station is to become a permanent installation and operated by the City, transfer of title and ownership of the land to the City will be required prior to acceptance of the station for operation and maintenance by the City.

## 5.8 Design Standards

- A. All wastewater pump stations shall be submersible or wet pit-dry pit type lift stations. Suction lift, screw type or pneumatic ejector are not allowed. Wet pit–dry pit type with pedestal mounted flooded suction pumps may be considered.
- B. The design of any lift station shall conform to City standards, Department of Ecology’s “Criteria of Sewage Works Design” and applicable standards as set forth herein. In addition, the plans shall include the following:
- C. An overall site drawing of the lift station showing the location of all components including elevations;
- D. Electrical service size, voltage, and enclosure type and location in relation to the pump station;
- E. A list of specific materials used including quantity description and manufacturer name;
- F. A schematic and line diagram of the service and motor control center and lift station;
- G. The electrical and control systems shall be designed to meet state and local electrical code requirements;
- H. The plans shall show all applicable telemetry installation with schematics;
- I. An operation and maintenance manual from the lift station contractor shall be supplied;
- J. Pump operation, alarms, and electrical inspection of all lift stations is required.
- K. Pumping Rate and Number of Units
  1. At least two pump units shall be provided, each capable of handling the expected maximum flow. (Peak design flow.)
  2. Where three or more units are provided, they shall be designed to fit actual flow conditions and must be of such capacity that with any one unit out of service, the remaining units will have the capacity to handle the maximum sewage flow.
  3. When the station is expected to operate at a flow rate less than 0.5 times the average design flow for an extended period of time, the design shall address measures taken to prevent septicity due to long holding times in the wet well.



L. Grit and Clogging Protection

1. Where it may be necessary to pump sewage prior to grit removal, the design of the wet well should receive special attention, and the discharge piping should be designed to prevent grit settling in pump discharge lines of pumps not operating.

M. Pumping Units

1. Type of Pumps: Section 5.5 Submersible Lift Stations or Section 5.9-B Wet Pit-Dry Pit Lift Stations.
2. Pump Openings: Pumps shall be capable of passing spheres of at least 3 inches in diameter. Pump suction and discharge openings shall be at least 4 inches in diameter.
3. Priming: Pumps shall be so placed that under normal operating conditions they will operate under a positive suction head.
4. Intake: Each pump should have an individual intake. Wet well design should be such as to avoid turbulence/cavitation near the intake.
5. Operation Controls: Provisions should be made to automatically alternate the pumps in use. Pump station controls shall be above grade and should be equipped with a secure external disconnect switch. The motors and controls shall be securely housed to the satisfaction of Public Works.

N. Flow Measurement

1. Suitable devices for measuring sewage flow should be provided at all pumping stations.

O. Bypasses/Storage

1. Provision may be made for controlled bypasses and/or storage, if necessary to avoid excessive property or equipment damage. The controlled bypass shall be manually operated valve or plate covering the bypass discharge, and shall act as a pump connection port.
2. Where overflows affect public water supplies, a storage-detention basin, or tank, shall be provided that has a minimum 2 hours of detention capacity at the anticipated overflow rate. Storage-detention tanks, or basins, shall be designed to drain to the station wet well.

P. Alarm System

1. An alarm system shall be provided for all public and private pumping stations. Public lift stations shall have a telemetry alarm to 24-hour monitoring stations or telephone alarms to City personnel. Public lift stations shall also be tied into the City of Cheney's SCADA system. For private lift stations when telemetry is not used, an audio-visual device should be installed for external observation.
2. Alarms for high wet well, low wet well, and power failure should be provided, as a minimum, for all pump stations. Alarms signaling pumps and other component failures or malfunctions may also be required.





3. A backup power supply, such as a battery pack with automatic switchover features, shall be provided for the alarm system, such that a failure of the primary power source will not disable the alarm system. Test circuits should be provided to enable the alarm system to be tested and verified as in good working order.

Q. Materials Considerations

1. Consideration shall be given to the presence of hydrogen sulfide and other corrosive gases, greases, oils, and other constituents frequently present in sewage. With the exception of the pumps, pipe and wiring, metal materials located in areas subject to such conditions shall be stainless steel (guide rails, fasteners, cable, etc.)

R. Electrical Equipment

1. Electrical systems and components (e.g., motors, light, cables, conduits, switchboxes, control circuits) in enclosed or partially enclosed spaces where flammable mixtures occasionally may be present (including raw sewage wet wells) shall comply with the National Electrical Code requirements for Class 1 Division 1 locations.

S. Electrical Control Panel

1. The electrical control panel for public lift stations shall be located in a control building. The electrical control panel for a private lift station shall be located in a control building on a concrete housekeeping pad or, outside in a weather-proof enclosure. The electrical control panel shall be provided with the minimum following items:
  - a. Wet well level sensor system
  - b. Hand-off-automatic selector switch, each pump
  - c. Lag, lead and automatic pump selector switch
  - d. Elapse time indicator, each pump
  - e. Ammeter, each pump
  - f. Run indicator lights, each pump
  - g. Pilot light indicator for each and every alarm, automatic shut-down and running condition
  - h. Alarm reset and test button
  - i. Outside mounted red alarm light
  - j. 110 volt convenience outlet
  - k. Control power available indicator light
  - l. Wet well level gauge calibrated in feet
  - m. Alarm horn

T. Service Wiring

1. Underground wiring shall be provided between the pump station and nearest power pole or pad mounted transformer (sectionalizer) if underground power is available.



#### U. Telemetry

1. Each public lift station shall include a complete wireless telemetering system which shall indicate the minimum following conditions to the City of Cheney's SCADA system:
  - a. Telephone line failure
  - b. Commercial power failure
  - c. High-low wet well
  - d. Pump failure (check valve actuated)
  - e. Pump running
  - f. Water in dry well
  - g. Smoke in dry well/control building
  - h. Generator running (if required)
  - i. Generator failure (if required)
  - j. Station intrusion
2. The telemetering equipment shall match the City's existing telemetering equipment.

#### V. Lighting

1. Adequate interior and exterior lighting for the entire pump station shall be provided. Explosion proof is generally required.

#### W. Water Supply

1. There shall be no physical connection between any potable water supply and a sewage pumping station which under any conditions might cause contamination of the potable water supply. Potable water supply brought to the station shall comply with conditions stipulated in the Washington State Department of Health's Criteria for Accepted Cross Connection Control Assemblies. A minimum 1 inch water line with a reduced pressure backflow assembly shall be installed near the pump station for station cleaning purposes. The water service line shall be provided with a frost-free hydrant, hose, rack and nozzle for lift station wash down. Within the public lift station building a wash sink shall be provided with hot and cold running water.

#### X. Pump and Motor Removal

1. Provisions shall be made to facilitate removing pumps, motors, and other equipment, without interruption of system service.

#### Y. Access

1. Suitable and safe means of access should be provided to equipment requiring inspection or maintenance. All permanent lift stations shall be fenced to discourage the entrance of unauthorized persons and animals. The fenced site shall be adequately sized to allow enough room for City vehicles and personnel to work while still allowing adequate access into the control building.



## Z. Valves and Piping

1. Shutoff valves shall be placed on suction and discharge lines of each pump (as applicable) for normal pump isolation. A check valve shall be placed on each discharge line, between the shutoff valve and the pump. Pump suction and discharge piping should not be less than 4 inches in diameter except where design of special equipment allows. The velocity in the suction line should not exceed 6 feet per second and, in the discharge piping, 8 feet per second.
  - a. Valves 4 to 12 inches shall be plug valves with an epoxy coating to resist corrosion. A valve shall be located at a maximum of every 500 feet along a force main.
  - b. Check valves. Check valves used on lift stations shall have adjustable tension levers and spring. It shall have a working pressure of 150 psi. Valves shall be designed for use with corrosive fluids. A check valve shall be installed in a valve vault located adjacent to the lift stations wet well. Check valves shall conform to AWWA standards. Valves shall be mounted horizontally where space permits. Suitable shutoff and check valves shall be placed on the discharge line of each pump in a wet pit/dry pit lift station configuration. The check valve shall be located between the shutoff valve and the pump, and shall not be placed on the vertical portion of discharge piping. The seats of all check valves shall be removable without removing the valve itself. Suitable rising stem shutoff valves shall be placed on the suction line of each pump in a wet pit/dry pit lift station configuration.
  - c. Suction valve box lids may be used for isolation valves on a force main. Valve box lids shall be specified to be marked with "SEWER" so they can quickly be distinguished from valves in the water system.
  - d. All station piping larger than 2-inches shall be flanged ductile iron. Flexible coupling shall be used on all pump discharges. Other couplings shall be used to provide flexibility in re-assembling piping.

## AA. Odor Control & Ventilation

1. The effect of odor on adjacent land use and workers shall be assessed. Every effort shall be made in site selection to reduce potential odor pollution. Wind direction, duration and intensity are all important considerations that must be evaluated.
2. Odor control shall be provided if there is no station inflow for 6 hours or, if the wet well (wet pit) detention time exceeds 6 hours.
3. Ventilation shall be provided for all pump stations during all periods when the station is manned.

## 5.9 Submersible Lift Stations

- A. All City of Cheney sanitary sewer lift stations shall be of the submersible pump type. Submersible lift stations shall meet the following requirements:
  1. The pump and motor shall be designed and built to operate continuously while the motor casing is fully exposed above the sewage level.
  2. Pumps shall be rail mounted with a quick connect discharge connection.
  3. The pump shall be easily removable for inspection or service, requiring no bolt, nuts, or other fastening to be disconnected.



4. Each pump shall have both thermal and moisture sensors with automatic alarms.
5. A valve vault shall be provided outside of the wet well and shall house all check valves and shut-off valves.
6. Each pump shall be fitted with a galvanized pump lifting chain or stainless steel cable.
7. An access hatch shall be placed directly over each pump for pump liftout.
8. The pump power cables and control cables shall terminate in the control panel in a NEMA 4 junction box located in a hand hole just outside of the wet well.
9. A control building shall be located near the wet well and constructed above ground.

B. Type of Pumps

1. Pumps shall be heavy duty submersible non-clog centrifugal and designed specifically for municipal unscreened raw sewage application. The capacity of the lift station must be sufficient to pump peak flows with the largest pump out of service.

C. Pump removal

1. Submersible pumps shall be readily removable and replaceable without dewatering the wet well or requiring personnel to enter the wet well. Continuity of operation and other units shall be maintained.

D. Controls

1. The control panel shall be located outside the wet well and suitably protected from weather, humidity, and vandalism. For public lift stations, the control panel shall be located inside the control building.

E. Valves

1. All control valves on the discharge line for each pump shall be placed in a convenient location outside the wet well in a separate vault and be suitably protected from weather and vandalism. Outside valve covers shall not be allowed.

F. Submergence

1. Positive provision, such as backup controls, shall be made to assure submergence of the pumping units.

G. Wet Wells

1. Wet wells shall be considered a hazardous environment. Wet wells shall be designed and constructed to be as hazard free as possible, and corrosion-resistant materials shall be used throughout. No junction boxes shall be installed in the wet well. Float cables and/or pressure transducers shall be placed in a covered chase that shall extend from the control panel to the wet well. The chase shall include a removable cover for ease of service.



## H. Wet Well Structures

1. Whenever practical wastewater lift station wet wells shall be constructed of precast reinforced concrete or reinforced fiberglass and shall be circular. Wet wells that are installed below the groundwater table shall be adequately designed to prevent flotation without the use of hydrostatic pressure relief valves. Wet well size and depth shall be as required to accommodate the influent sewer, provide for adequate pump suction pipe or pump submergence as recommended by the pump manufacture and to provide adequate volume to prevent the excessive cycling of pumps. Partitioning the wet well to help accommodate future growth requirements is allowed, however, the design of any partition must be approved by the City of Cheney.
2. The required wet well working volume shall be calculated to optimize pump operation to met peak hour flow and minimum hour flow. The design engineer shall consider the diurnal nature of wastewater flow as well as the pump manufacturer's recommendations regarding pump start frequency when determining the wet well volume. Every effort shall be made to prevent wastewater in the wet well from becoming septic. The wet well shall contain adequate vertical room from level sensing adjustments above and below the design levels.
3. Primary high water alarm shall be set to wet well influent invert. A redundant high water alarm float shall be installed above the primary high water alarm
4. Minimum inside width shall be 5 feet, however, retention time, pump configuration and access may require a larger structure.
5. Wet well access shall be through a top slab opening with a lockable aluminum hatch cover and frame. The top slab access hatch shall be sufficiently large to remove all equipment from the wet well, but in no case smaller than 36 by 36 inches. All access hatches shall be torsion assisted and all components shall be non-corrosive. Removable safety railings or grates shall be provided around the access hatch in accordance with OSHA regulations.
6. Wet well shall have sloping sides to form a hopper at the bottom of the wet well. Slopes shall be approximately 1 horizontal to 1 vertical. Square corners shall be avoided. The flat portion of the wet well floor shall be minimized.
7. Wet liquid levels shall be controlled by pressure transducers, ultra sonic, or other similar types of level control systems.

### 5.10 Reliability and Power Supply

- A. The objective of reliability is to prevent the discharge of raw or partially treated sewage to any waters and to protect public health by preventing backup of sewage and subsequent discharge to basements, streets, and other public and private property.
- B. Public lift stations should be designed to operate on 480 volt 3-phase power supply whenever possible. Electrical system and components (e.g. motors, lights, cables, conduits, switch boxes, control circuits, etc.) in raw sewage wet wells/wet pits, or in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors may be present, shall comply with the National Electrical Code requirements for Class 1, Group D, Division 1 locations. In addition, electrical equipment located in the wet wells/wet pit shall be suitable for use under corrosive conditions. Each flexible cable shall be provided with watertight seal and separate strain relief. When such equipment is exposed to weather, it shall meet the minimum



requirements of weatherproof equipment (NEMA 3R) and be located in a water resistant maintenance environment.

### **5.11 Emergency Power Supply**

- A. Provisions shall be provided to accommodate station inflow in the event of a power outage. This may be affected by (a) including an emergency power supply, or (b) construction of emergency storage. All public stations except small STEP areas shall have an emergency backup power supply.
- B. Emergency Power
  - 1. Provisions for an emergency power supply shall be made either through connection of the station to at least two independent public utility sources, or through installation of in-place internal combustion diesel power generation equipment. Only diesel powered generators shall be provided.
- C. Emergency Storage
  - 1. Where storage is to be provided in lieu of an emergency power supply, wet well/wet pit capacity above the high level alarm should be sufficient to hold the peak flow expected during the areas maximum historic power outage but not less than twenty four hours.

### **5.12 Auxiliary Generating Equipment**

The following general requirements shall apply to all internal combustion engines used to drive auxiliary electrical generating equipment.

- A. Engine/Equipment Protection
  - 1. 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
  - 2. Engine block heaters are required.
- B. Size
  - 1. The engine shall have adequate rated power to start and continuously operate all connected loads.
- C. Fuel
  - 1. 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.



- D. Engine Ventilation
  - 1. The engine shall be located above grade with adequate ventilation of fuel vapors and exhaust gases.
- E. Routine Start-Up
  - 1. 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.
- F. Engine-Driven Generating Equipment
  - 1. 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.
- G. Noise Requirement
  - 1. Generator shall include provisions to eliminate generator noise at neighboring facilities or residences. Provisions shall include noise reduction covers and exhaust systems.

**5.13 Force Mains**

- A. Public force mains shall be ductile iron or high density polyethylene (HDPE) with a minimum diameter of 4 inches. Private force mains can be smaller diameter. Force main pipe within the lift station shall be flanged ductile iron. Alternate pipe materials will be considered in corrosive soils or unusual terrain provided a locating wire is used.
- B. Minimum depth of cover for force mains shall be 3.5 feet for frost protection.
- C. Force mains shall be sized so that the velocity is between 2.5 and 6.0 feet per second. For interim design flows, force main velocity may be as low as 2.0 feet per second.
- D. Velocity should not exceed 8.0 feet per second.
- E. The following flow rates define various pipe capacities.

FORCE MAIN DIAMETER (INCHES)	MIN. FLOW (GPM) (V=2.0 FPS)	MAX. FLOW (GPM) (V=8.0 FPS)
4	100	300
6	220	700
8	390	1250
10	610	1960
12	880	2820



- F. Force mains shall be design and tested to withstand twice the operating pressures expected for a minimum of 30 minutes. (Check water hammer). The minimum allowable test pressure shall be 100 psi. The test method shall be as prescribed for water mains.
- G. Force mains shall always terminate in a discharge manhole and then gravity flow through a gravity line into the main sewer system. The force main should never be designed to allow gravity drainage of the force main itself; this means there shall always be an up-grade slope on the force main leading into the discharge manhole.
- H. The maximum time required to flush the force main shall be calculated on the basis of minimum flow.
- I. Force mains having steep sections (over 33%) must be designed to discharge the volume contained in that section plus 100 additional feet during each pump cycle.
- J. Odor control shall be provided for the force main if the wet well plus the force main flush time exceeds 480 minutes.
- K. The use of air release valves shall be restricted to installations where, in the opinion of the Engineer, there is no possible alternative. Air release valves, when permitted, shall be located at localized high points along the force main, shall be of a type suitable for sewage service and shall be located in a manhole for purposes of maintenance.
- L. Calculations showing maximum pressures within the force main, which would occur upon total power failure while pumping, shall be provided.
- M. Force mains thrust restraint and backfill shall be as required for water mains, including installation of detectable warning tape (as per Section 4.5) and 10 gauge single strand copper wire attached to pipe.

#### **5.14 Private Grinder Pump Stations**

- A. Private grinder pumps are only permitted under special circumstances when no other means of sewer service is available. In general, gravity sewer shall be deepened to eliminate the need for grinder pumps. Use of private grinder pumps requires approval by the city and will be evaluated on a case-by-case basis. Applicant will need to demonstrate that there is no other feasible means of servicing lot/lots for acceptance.

#### **5.15 Grease Interceptors**

When pretreatment facilities are required for fats, oils, and greases, the facilities shall conform to the following:

- A. Design
  - 1. Grease interceptors shall be multiple compartment flotation chambers where grease floats to the water surface and is retained while the clear water underneath is discharged





2. The grease interceptor shall be followed by a sampling compartment to allow for monitoring of discharges from the pretreatment unit. Interceptors shall have fittings designed for grease retention.
3. There shall be an adequate number of manholes to provide access for cleaning and maintenance of all areas of the interceptor.

B. Sizing Criteria

1. The size of the grease interceptor shall be determined by using the following formula: seating capacity or the number of meals served per peak hour, whichever is greater x 6.0 gallons x 2.5 hours x storage factor = interceptor size in gallons.
2. Storage factor shall be as follows:
  - a. Facilities open less than 16 hours = 1
  - b. Facilities open for 16 hours or more = 2
  - c. Facilities open for 24 hours = 3

# **City of Cheney Engineering Design Standards**



## **Section 6 Stormwater Management**



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## 6.0 STORM WATER MANAGEMENT

The City of Cheney has adopted the “Spokane Regional Stormwater Manual” (SRSM) as its standard for the design and construction of stormwater collection and disposal facilities. The requirements outlined in this section shall supersede those described in the SRSM.

Erosion and Sediment Control Plans are required for projects or activities which could potentially cause significant excess runoff, erosion, or water quantity/quality impacts. Refer to Section 9.0 of the Spokane Regional Stormwater Manual for Erosion and Sediment Control Plan requirements.

### 6.1 Methods of Stormwater Conveyance and Disposal

#### A. Storm Sewers

1. Storm sewer design shall be in accordance with the requirements of Section 4.0 for public sanitary sewer design, with the following additions and exceptions:
2. Horizontal Alignment: Storm sewers shall generally be located in the roadway at the center of a travel lane or on the lane line as to avoid manhole placement under the vehicle tire path.
3. Minimum pipe cover shall be three feet for PVC pipe and one foot for ductile iron pipe.
4. Catch Basins: Design water surface for storm sewer catch basins shall be a minimum of six inches below the gutter grade at the inlet.
5. Storm water inlets shall be designed for the condition where the inlet is half-plugged with sediment and debris.
6. The roughness coefficient  $n = 0.013$  shall be used for all PVC, concrete and ductile iron storm sewer pipe. The variable -  $n$  curve shown in Figure 4-1 shall be used for design.
7. The minimum velocity in storm drainage pipes is 2.5 feet per second for the design storm.
8. In addition to storm water, noncontact cooling water and some unpolluted industrial process wastewaters may be discharged to a storm sewer upon approval of the Director and the Washington State Department of Ecology. Discharge of any other wastewater into a storm sewer is not allowed.

#### B. Combined Sewers

1. Combined sanitary and storm sewers are prohibited. No storm sewer or storm drainage structure may be connected to a sanitary sewer.

### 6.2 Stormwater Drainage in the Public Right of Way

#### A. Draining Stormwater from the Public Right of Way to Private Property

1. Plat dedications, property conveyance or easements to the City are required for construction of swales on private property for the purpose of draining stormwater from the public right-of-way. Covenants shall be established to prohibit alteration or filling in of swale areas. Adjacent property owners shall be required to maintain the swale areas within an easement and provide access for City maintenance personnel. The City shall be held harmless from all damages as a result of stormwater draining from the public right-of-way to the swales.

# **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 an 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 the 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 and acceptance by City Council.



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### 7.13 Distance from Other Utilities

- A. Water line locations and distances from other utilities shall meet the criteria outlined 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.