



**DESIGN
AND CONSTRUCTION
STANDARDS
AND SPECIFICATIONS**

**CITY OF EVANS
PUBLIC WORKS DEPARTMENT
AUGUST 2019**

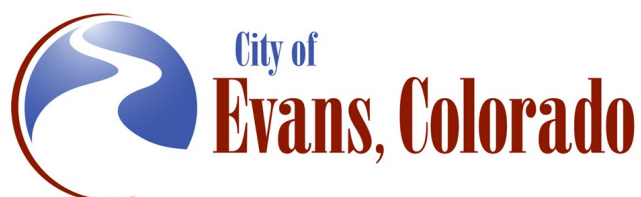


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GENERAL



NOTES

CITY OF EVANS
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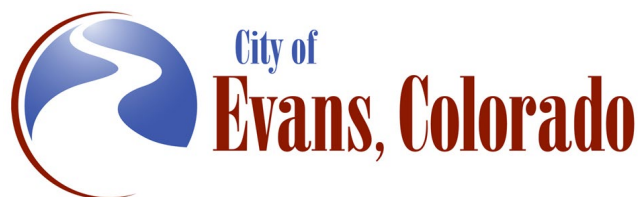


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SECTION 1 GENERAL CONDITIONS

1.01.01 INTENT

These specifications are intended to set the basis for both design and construction of facilities and systems within the City of Evans.

1.01.02 AUTHORITY

These standards are promulgated by the City Council of the City of Evans, Colorado, in accordance with the authority contained in the City of Evans Home Rule Charter and Section 13.04.020 of the City of Evans Municipal Code.

Interpretation, enforcement, and revision of these standards have been delegated to the Public Works Director or designee.

No action, direct or indirect, of or by any person in making any connection, disconnection, repair, or otherwise doing work with respect to any water, non-potable, sanitary, storm system, or street facility served by the City of Evans in violation of these standards shall continue after discovery of such violation.

These standards are composed of written standards of engineering practice, materials specifications, and standard drawings. Interpretation of each section or of any discrepancies between sections shall be made by the Public Works Director or designee.

1.01.03 EFFECTIVENESS

These standards supersede all former engineering standards which are or may be in conflict with these standards.

1.01.04 AMENDMENT NOTICE

These standards may be revised, amended, or added to at any time, and such revision, additions, or amendments shall be binding and of full force and effect as of the date of their adoption. The City is not responsible for the individual notification of amendment changes. The use of current standards is mandatory; therefore, the user is responsible for obtaining and complying with the most recent revised or amended specifications.

1.01.05 DEFINITIONS

Wherever the following words or phrases appear in these specifications they shall have the following meanings.

- A. ABILITY - That which a person can do on the basis of present development and training.
- B. ACCEPTANCE TESTING - Shall mean test(s) that will be performed by the developer/contractor according to City's specifications or its authorized designee. Acceptance tests shall include but not be limited to the following: Concrete: slump, compressive strength, air content, and aggregate sieve analysis tests; Geotech: moisture density relationship and density tests; Aggregate Base Course: moisture density relationship and density tests; Hot Bituminous Pavement: density tests.
- C. BASE COURSE - The layer or layers of specified or selected material placed on a sub-base or a subgrade to support a surface course.
- D. CDOT Standard Specifications - Colorado Department of Transportation, "Standard Specifications for Road and Bridge Construction" latest edition.
- E. CITY - The City of Evans.
- F. CITY ENGINEER - A term used to describe a qualified individual who is authorized to make a

decision in situations where a decision or action may be required by the Public Works Department of the City of Evans. The City Engineer or designee shall have the authority on behalf of the City to ascertain that all design and construction is equal to or exceeds the minimum requirements set forth in these criteria and standards.

- G. **COMPETENT** - A person who has the natural powers, physical or mental, to meet the demands of a situation or work; the word is widely used to describe the ability to meet all requirements, natural, legal, or other of a given task.
- H. **CONSTRUCTION DRAWINGS** - Detailed and working drawings including plan, profile, and detail sheets of proposed improvements approved by the City.
- I. **CONSULTANT** - The partnership, corporation, or individual who is a Registered Professional Engineer in the State of Colorado hired by the owner and is empowered to act as his agent for the project.
- J. **CONTRACT DOCUMENTS** - The contract documents include these Specifications, City-approved soils and pavement reports, project-specific special provisions, and drawings.
- K. **CONTRACTOR** - The corporation, association, partnership, or individual who has entered into an agreement with the owner to perform the work, and who is licensed and bonded in the City of Evans in accordance with the requirements of the City Code, for public right-of-way work.
- L. **CROSS CONNECTION** - Any physical arrangement whereby a public water supply is connected, directly or indirectly, with any non-potable or unapproved water supply system, sewer drain, conduit, pool storage reservoir, plumbing fixture, or other device which contains or may contain any contaminated water, liquid, or other waste of unknown or unsafe quality that could impart a contaminant to the public water supply as a result of back flow.
- M. **DAYS** - Intended as calendar days, not normal working days, unless stipulated as working days.
- N. **DESIGN ENGINEER** - The partnership, corporation, or individual who is a Registered Professional Engineer, according to Colorado statutes, and who is hired by the owner, and is empowered to act as his agent for the project.
- O. **DESIGN SPEED** - A speed established for design and correlation of the physical features of a street that influence vehicle operation; the maximum safe speed maintainable on a specified section of street when conditions permit design features to govern.
- P. **DESIGNEE** - An authorized designee of Public Works Director for the City of Evans, pertaining to interpretation, enforcement, and revision of departmental standards.
- Q. **DEVELOPER** - The owner, corporation, association, partnership, or individual who has entered into an agreement with the City and has entered into an agreement with the contractor to perform the work.
- R. **DEVELOPER'S AGREEMENT** - shall mean an agreement entered into between the City and developer, which guarantees construction of public improvements by developer to be dedicated to the City.
- S. **DIVISION** - When referred to in the CDOT Standard Specifications shall mean the City of Evans Public Works Department.
- T. **DRIVEWAY APPROACH** - That portion of concrete extending from the street gutter lip to the property line for the full width of the access from the public right-of-way to private property.

- U. EYEBROW - A bulb or semi-circular extension of a curb on one side of a street or at an intersection to provide more frontages for adding more lots.
- V. LETTER OF FINAL ACCEPTANCE - At the expiration date of the two (2) year warranty period and after all deficiencies are corrected to the satisfaction of the Public Works Director or designee a Letter of Final Acceptance will be issued.
- W. LETTER OF INITIAL ACCEPTANCE - At the end of the project and after all deficiencies are corrected to the satisfaction of the Public Works Director or designee a letter of initial acceptance will be issued and shall constitute the initiation of the warranty period.
- X. MAY - A permissive condition. No requirement for design or application is intended.
- Y. MEDIAN RADII - The minimum radius for curbing when used for street medians; measured to flow line.
- Z. NORMAL WORKING DAYS - Monday through Friday. Saturdays, Sundays, and legal holidays shall not be considered normal working days.
- AA. APPROVED EQUAL – Alternate equipment, materials, or process approved and accepted by the City as functionally the same as the listed product and of equivalent quality.
- BB. OWNER - The developer, corporation, association, partnership, or individual who has title to real property.
- CC. PLANS - Detailed working drawings including plan, title page, profile, and detail sheets as necessary for the quality of proposed construction improvements, approved by the engineer.
- DD. PROJECT AS BUILT RECORD DRAWINGS - Detailed drawings which have been prepared and sealed by the design engineer, upon completion and at the time of the certificate of completion, and show actual construction and contain field dimensions, elevations, details, changes made to the construction drawings by modification, details which were not included on the construction drawings, and horizontal and vertical locations of underground utilities which have been impacted by the utility installation.
- EE. PROJECT DESIGNER - Shall mean an authorized designee of the City Engineer assigned to complete project observation, review for contract performance, review for compliance with standards and specifications, and contract compliance.
- FF. PROVIDE - Furnish and install complete in place.
- GG. REMOVE - Remove and dispose of legally. Removed materials are the sole responsibility of the contractor.
- HH. ROAD - As used in this specification shall include the pavement section, right-of-way, sidewalks, driveways, bikeways, alleys, and alley approaches.
- II. SHALL - A mandatory condition. Where certain requirements in the design of application are described with the “shall” stipulation, it is mandatory that these requirements be met.
- JJ. SHOULD - An advisory condition. Where the word “should” is used, it is considered to be advisable usage, but not mandatory. Deviations may be allowed when reasons are given which show that the intent of the standard is met.

- KK. STANDARD SPECIFICATIONS - The current City of Evans specifications for streets, water, sanitary sewer, drainage, non-potable, and storm systems design and construction criteria.
- LL. STOPPING SIGHT DISTANCE - Shall mean that distance measured from the drivers’ eye, 3½ feet above the pavement to the top of any object six (6) inches high on the pavement anywhere on the road.
- MM. STREET - As used in this specification shall include the pavement section, right-of-way, sidewalks, driveways, bikeways, alleys and alley approaches.
- NN. STREET WIDTH - That distance measured from curb face to curb face across a street which should generally include the gutter pans on each side.
- OO. SUB-BASE - The layer or layers of specified or selected material placed on a sub-grade to support a base course, surface course, or both.
- PP. SUB-GRADE - The top surface of a roadbed upon which the pavement structure, shoulders, and curbs are constructed.
- QQ. SURFACE COURSE - One or more layers of a pavement structure designed to accommodate the traffic load, the top layer of which resists skidding, traffic abrasion, and the disintegrating effects of climate. The top layer is sometimes called “wearing course.”
- RR. UTILITIES - Shall mean all utilities on site prior to the time of any design; such as but not limited to water lines, sanitary sewer lines, drainage lines, electric lines, gas lines, telephone lines, and cable television lines.
- SS. UTILITY REPORT - The design backup and documentation necessary to demonstrate that the design of the public improvements is adequate and meets City requirements.
- TT. WORK - The entire completed construction or the various separately identifiable parts required to be furnished for the project. Work is the result of performing services, furnishing the labor and furnishing and incorporating materials and equipment into the construction.
- UU. WORKING DAYS - Any day, exclusive of Saturdays, Sundays, and holidays, on which weather and other conditions not under the control of the contractor will permit construction operations to proceed with the normal working force engaged in performing those items controlling the completion of the work.
- VV. WORKING HOURS - The contractor shall restrict working hours to between 7:00 a.m. and 7:00 p.m. on normal City of Evans business days unless prior approval has been obtained from the City.
- WW. WARRANTY PERIOD - That two (2) year time period between initial acceptance and final acceptance during which the developer/contractor shall maintain and repair all public improvements to be dedicated to the City. Such improvements may include but are not limited to, repairs to any pipes, fittings, manholes, pavement, and sidewalks.

1.01.06 ABBREVIATIONS

Wherever the following abbreviations appear in these specifications they shall have the following meanings.

- A. AASHTO - American Association of State Highway and Transportation Officials
- B. ACI - American Concrete Institute

- C. ANSI - American National Standards Institute
- D. ASSE - American Society of Sanitary Engineers
- E. ASTM - The American Society for Testing Materials
- F. AWWA - American Water Works Association
- G. BFPA – Backflow Prevention Assembly
- H. CDOT - Colorado Department of Transportation
- I. CDOT STANDARDS - Colorado Department of Transportation “Standard Specifications for Road and Bridge Construction,” latest edition
- J. DC or DCVA Double-Check Valve Assembly
- K. EDLA – Equivalent Daily Load Applications
- L. ESAL – Equivalent Single Axle Loads
- M. HDPE – High-Density Polyethylene
- N. HMA – Hot Mix Asphalt
- O. l.f. - Linear feet
- P. LOS – Level of Service
- Q. MHFD – Mile High Flood District (formerly UCFCDD)
- R. MUTCD - Manual of Uniform Traffic Control Devices
- S. OSHA - Occupational Safety and Health Administration
- T. psi - Pounds per square inch
- U. psig - Pounds per square inch gauge
- V. PVC – Polyvinyl Chloride
- W. PRV - Pressure Reducing Valve
- X. RP – Reduced Pressure
- Y. SDR – Standard Dimension Ratio
- Z. SF – Square Foot
- AA. SY – Square Yard
- BB. UNCC - Utility Notification Center of Colorado

- CC. USCFCCC & HR - University of Southern California Foundation for Cross-Connection Control and Hydraulic Research
- DD. WA - Water
- EE. WW - Wastewater

SECTION 2 GENERAL SPECIFICATIONS

1.02.01 GRANTING OF SERVICE

City facilities may be extended, at the applicant's expense, after approval by the Evans City Council. In the case of water and sewer, that approval may be based upon the recommendation of the Evans Water and Sewer Board. The water and sewer service extension requires that it has been determined that the location to be served is within the Evans service area, the City has the capability and capacity to serve the location, and the applicant can demonstrate evidence of fee ownership of the property to be served. The request for service must follow stipulations contained within all agreements entered into by the City of Evans and said applicant as set forth in these Specifications.

1.02.02 PERMITS

Permits shall be required for the construction of any city improvement. Permits must be obtained from the City of Evans Public Works Department before any work is commenced, and such permits shall only be issued to contractors licensed and bonded in the City of Evans. A permit may not be required provided the developer/contractor has entered into a formal developer's agreement or contract with the City of Evans.

1.02.03 PRE-APPLICATION CONFERENCE

In order to assist the developer with the application procedure, a pre-application conference may be held in which, the developer or his designee should be in attendance along with key designees from the Public Works Department.

1.02.04 APPLICATION PROCEDURE

The Evans Public Works Department will establish, and may amend at any time, procedures to be followed during work on City facilities. These procedures will include all requirements for documentation, submittals, fees, engineering design, construction, and acceptance.

- A. All drawings submitted must adhere to acceptable drafting standards as established by the Evans Public Works Department.

1.02.05 SUBMITTAL REQUIREMENTS

Development Construction Plans will be submitted to the Public Works Director or designee on twenty-two by thirty-four (22 x 34) inch sheets in a scale ranging from one (1) inch equals twenty (20) feet to one (1) inch equals 100 feet horizontal and one (1) inch equals five (5) feet vertical and shall include the following on the final submittal:

- A. Lots and blocks which are to be served.
- B. Streets, rights-of-way, easements, curbs and gutters, sidewalks, and property lines.
- C. Existing and proposed utilities, including water, sanitary sewer, non-potable irrigation, gas, phone, fiber optics, electrical, cable TV, storm sewers, etc. illustrating all critical crossings in plan, profile views, and indicate all points of connection to any existing systems.
- D. Show all proposed water and sanitary sewer service lines; fire lines, meter pits, and cleanout structures.
- E. Show and label all adjacent streets for reference to the site.

- F. Proposed construction plans shall indicate all mains, valves, hydrants, manholes, and appurtenances, including thrust blocks.
- G. Pipe materials, diameters, lengths, depths, and slopes will be indicated for each section.
- H. Location and size of planned water and sanitary sewer services, meter pits, and remote registers.
- I. Plan and profile of all lines including complete dimensions referenced to street centerlines. Show any proposed or existing crossings of water mains, along with existing ground lines and limits of proposed cuts and fills.
- J. Locations of driveways required where deemed necessary by the Public Works Director or designee in order to verify meter pit locations.
- K. North arrow (pointing to the top or right of page), scale, Professional Engineer's stamp, benchmark, and all elevations shall be included on each sheet.
- L. Traffic study, drainage report, copy of erosion control application, and the utility report.
- M. All survey points shall be tied to the City of Evans horizontal and vertical control networks. Horizontal control: NAD 83-92, and vertical control: NAVD 88.
- N. Submittal shall include one-half-sized paper set eleven by seventeen (11 x 17) inches and one full-sized electronic .pdf copy.
- O. Upon receiving final approval and prior to the initiation of any work, a high-quality paper copy, a .pdf copy, and an electronic version in AutoCAD format (.dwg) (preceding shall remain property of the City) shall be submitted to the Evans Public Works Department. The original will be stamped for approval by the Department of Public Works. A stamped approved .pdf copy will be returned to the engineer/developer. Prior to the initiation of any warranty period, as-built record drawings consisting of two (2) full-sized prints, and one (1) full-sized electronic .pdf copy shall be submitted to the Evans Public Works Department.

1.02.06 CONSTRUCTION PROCEDURE

Following final approval of the plans, the owner may proceed with construction. In addition to all construction requirements contained in other portions of these standards, the developer and his contractor shall observe the following:

- A. Prior to the commencement of work, a preconstruction conference shall be held between personnel representing Evans Public Works Department, the contractor, all subcontractors who are scheduled to perform the work, the consulting engineer, all involved utilities, and any other entities involved in the construction.
- B. Construction shall commence within twelve (12) months of the approval date shown on the plans or the plans become invalid and must be resubmitted for review and approval. City projects are exempt from this requirement.
- C. Development phasing of any project must be shown on the initial drawing submittal and made a part of the application procedure. No phasing will be permitted unless this requirement has been adhered to.
- D. The work shall be surveyed and staked under the supervision of a licensed land surveyor in accordance with the approved plans.

- E. The Evans Public Works Department shall be notified at least forty-eight (48) hours prior to start of work.
- F. Adequate provisions for notification of any customers who may experience a loss of water or sewer services must be developed. Such outages shall be kept to a minimum in compliance with Section 1.02.11 of these Standards.
- G. The Public Works Department shall be notified whenever it becomes necessary to open or close a valve on the existing water system. Only Public Works Department personnel are authorized to operate valves in the service area. Developer/contractors may operate valves under the supervision of Public Works Department personnel at the City Engineer's discretion.
- H. Water mains and sewer mains shall be tested in accordance with these standards.
- I. All work relating to water, non-potable, storm sewer and sanitary sewer utilities must be inspected by a Public Works Department Inspector.
- J. Construction should adhere to the following sequence unless otherwise specified by the Public Works Director or designee: 1) Sanitary sewer line installation, 2) Storm sewer line installation, 3) Non-potable water line installation, 4) water line installation, 5) curb and gutter installation. Installation of water lines will not be permitted until all compaction results for sanitary sewer lines have been submitted to and approved by the Evans Public Work's Department. Curb and gutter installation will not be permitted until all compaction results for water lines have been submitted to and approved by the Evans Public Works Department. Sleeves shall be installed for dry utilities at all utility crossings and roadway crossings.
- K. No work shall commence until the developer/contractor has an approved set of plans and current specifications from the Evans Public Works Department. The plans and specification shall be on the job site at all times. Approval from the Public Works Director or designee will be for general conformity to the plans and will not constitute blanket approval of all dimensions, quantities, and details of the material or equipment shown. Nor shall such approval relieve the developer/contractor or design engineer of his responsibility for errors contained in the drawings.
- L. Paving will not be permitted until manhole, valve box, sewer service, and curb stop installations have been verified in the field, all utility testing is completed and passed, and the subgrade compaction has been confirmed in the field by compaction testing and proof roll.

1.02.07 INSPECTION PROCEDURES

- A. Inspection and approval/acceptance by the Public Works Director or designee shall in no manner relieve the developer from responsibility for errors or omissions in the plans. Any errors shall be corrected by the developer to the satisfaction of the Public Works Department and at no expense to the City. Where a conflict occurs between or within standards, specifications and drawings, the more stringent or higher quality requirements shall apply.
- B. Installation of all new facilities within City service areas shall be inspected by a Public Works Inspector.
- C. The inspector shall see that materials are furnished and the work is performed in accordance with plans and specifications approved by the City of Evans Public Works Department. The developer/contractor shall furnish all reasonable aid and assistance required by the Public Works Director, designee, and/or City inspector for the proper examination of the materials and work. All work shall be performed in accordance with accepted workmanship practices and these engineering standards. Any work not accepted by the Public Works Director, designee, and/or City inspector shall be redone until compliance

with these standards is achieved. Instructions given by the City inspector relating to quality of materials and workmanship must be obeyed at once by the developer/contractor. The City Inspector shall not supervise nor set out work or give line and grade stakes.

All materials used shall be new and subject to the inspection and approval of the City inspector at all times. The inspector has the right to perform any testing deemed necessary to ensure compliance of the material with these standards. No material shall be used before inspected and approved by the City inspector. Failure or neglect on the part of the inspector to condemn or reject inferior materials or work shall not be construed to imply their acceptance should their inferiority become evident at any time prior to final acceptance of the work. City inspectors have the authority to reject defective or inferior materials and/or defective workmanship and to suspend work until such time as the developer/contractor shall correct the discrepancies in question.

Whenever defective materials and work are rejected, the developer/contractor shall promptly remove such defective materials and construction from the jobsite and replace all defective portions to the satisfaction of the Public Works Director or designee. In the event the developer/contractor fails to remove rejected materials from the jobsite within a reasonable length of time, not to exceed ten (10) working days, the Public Works Director or designee may arrange for such removal at the expense of the developer/contractor.

Inspection shall not relieve the developer/contractor from any obligation to perform the work strictly in accordance with the plans and specifications or any modifications thereof. Work not so constructed shall be removed and corrected by the developer/contractor at his sole expense, whenever so ordered by the Public Works Director or designee, without reference to any previous error or oversight in inspection.

- D. Except in cases of emergency, maintenance, or protection of work already done, no work shall be allowed between the hours of 7:00 P.M. and 7:00 A.M. Nor shall work be done on Saturday, Sunday, or legal holidays unless authorized by the Public Works Director or designee in each case. When City inspectors are required to work overtime, it shall be at the developer/contractor's expense. All requests for overtime shall be made to the Public Works Director or designee at least forty-eight (48) hours in advance. Reimbursement for such overtime shall be made by check to the City of Evans, prior to final acceptance.
- E. In the event one or more inspectors representing private consulting engineering firms are also inspecting a project, along with City of Evans Public Works Department inspectors, the instructions given by the City of Evans Public Works Department shall prevail in the event of conflicting instructions.

1.02.08 TRAFFIC CONTROL

The developer/contractor shall obtain an approved City of Evans Application and Permit for Excavation/Construction in Public Right-of-Way forty-eight (48) hours prior to any construction within City's right-of-way.

The flow of traffic on public streets and roadways shall be maintained at all times during construction in accordance with the rules and regulations of the governing authority at time of construction.

The developer/contractor shall be responsible for the provision of a safe travel right-of-way on all roadways on and adjacent to the jobsite. The developer/contractor shall erect or cause erection of proper traffic control warning devices around all excavations, embankments and obstructions and shall be responsible for the proper maintenance of said erected devices throughout the course of construction. All traffic control warning devices and their installation shall conform to the MUTCD, current edition.

The developer/contractor shall cause suitable warning lights; or flares to be provided and kept lighted at night or other times when visibility is limited.

The developer/contractor shall provide certified flagmen and/or off-duty police protection as may be determined by the Public Works Director or designee for the protection of the public, as well as workers on the jobsite.

The developer/contractor shall coordinate his work with the Public Works Director or designee in order that arrangements may be made for detours, parking, and access to property adjacent to work, etc., forty-eight (48) hours prior to their need.

The developer/contractor shall not close any street or portion of a street without receiving written permission from the Public Works Director or designee forty-eight (48) hours prior to such closure. It is the developer/contractor's responsibility to post advance road closure signs with their phone number and to notify the Weld County Dispatch, Weld County School District 6, Greeley-Evans Transit, and the police and fire departments having jurisdiction in the area of construction twenty-four (24) hours prior to closing any street.

The developer/contractor shall also notify the Weld County Dispatch, Weld County School District 6, Greeley-Evans Transit, and the police and fire departments immediately after opening of any street, alley, or fire lane.

The Public Works Director or designee shall close down work (except in extreme emergencies) which is not controlled in accordance with approved City barricading procedures or on projects which require a traffic control plan and such has not been obtained by the developer/contractor.

No work shall be allowed at signalized intersections or on major arterial roadways which impedes normal traffic flow from 6:00 A.M. until 8:30 A.M., and from 4:30 P.M. until 6:00 P.M., except during emergencies or with prior approval of the Public Works Director or designee.

1.02.09 STREET CUTS

Prior to proceeding with any work within the public right-of-way, the developer/contractor shall obtain a permit from the Public Works Department. The Public Works Department will specify minimum pavement sections for replacement on the basis of standards developed by that department and the classification of the street cut for utility installation and may specify additional minimum requirements. Permits may not be required provided the developer/contractor has entered into a formal developer's agreement or contract with the City of Evans.

Developer/contractors should use flow fill or flash fill as a trench backfill in public rights-of-way unless otherwise directed by the Public Works Director or designee.

The removal of pavement, sidewalks, driveways, or curb and gutter shall be performed in a neat and professional manner. Where utilities must cross these facilities, the exact width of the cut shall exceed the width of the trench at the subgrade by at least twelve (12) inches on either side of the cut. Portland cement concrete or asphaltic concrete surfaces shall be cut with a pavement saw to a minimum depth of four (4) inches prior to breaking. Cutting shall be limited to straight lines and acute angles shall be avoided.

Within street pavement, driveways or street curbing areas, the entire trench shall be backfilled with road base, placed and compacted in lifts of six (6) inches or less, or a City-approved alternative backfill material. The minimum asphalt replacement shall be five (5) inches of hot bituminous pavement; Grading S or SX. Hot bituminous pavement must be replaced with a minimum mat one (1) inch thicker than the removed thickness. The replacement of Portland cement concrete sidewalks, driveways, or curb and gutter shall be to the same dimensions as that removed for the utility installation. Portland cement concrete sidewalks shall have a minimum thickness of six (6) inches. Portland cement concrete driveways shall have a minimum thickness of six (6) inches. Portland cement concrete design mix shall conform to any and all applicable City of Evans standards regarding streets, curb and gutter, and sidewalks.

1.02.10 PROTECTION OF EXISTING FACILITIES

The developer/contractor shall verify all utility locations prior to any excavation work. According to Colorado State Statute § 9-1.5-103, anyone who engages in any type of excavation must provide advance notice to the underground facility owners. The notice must be at least two (2) business days, not including the day of the call, prior to any excavation. City of Evans requires all developer/contractor to contact the Utility Notification Center of Colorado (UNCC) at 811, or the City of Evans Utility Locate Hotline.

Existing power lines, telephone lines, vegetation or landscaping, fences, water mains and services, gas mains, sewer mains and services, cables, conduits, drainage and irrigation ditches and pipes, embankments and other structures in the vicinity of the work not authorized to be removed, shall be supported and protected from damage by the developer/contractor during the construction.

The type, size, and approximate location of all known underground utilities shall be shown on the master utility portion of the construction drawings. It shall be the responsibility of the developer/contractor to verify the existence and location of all underground utilities along the route of the work. The developer/contractor shall be held liable for all damages done to existing facilities and structures.

In the event that during construction it is determined that underground utility conduit or any above ground utility facilities are required to be relocated, the developer/contractor shall notify the UNCC and the City of Evans, two (2) business days, not including the day of the call, in advance of their approach to such utility.

1.02.11 OUTAGES

In the event that any interruption of utility services become necessary, the Public Works Director or designee and all affected customers must be notified personally by the developer/contractor in writing at least twenty-four (24) hours in advance. Additionally, services shall in no case be interrupted for more than eight (8) hours. Outages for schools, medical clinics, and various commercial businesses must be conducted at approved times as specified by the owner and upon approval by the Public Works Director or designee. If outages for more than four (4) hours are necessary, they must be conducted at times to cause the least inconvenience to the customers and upon the approval of the Public Works Director or designee. Under all circumstances work must be continuous until all customers are back in service. If in the process of installing a connection there exists an industry building that cannot be out of water, as designated by the Public Works Director or designee, such as a hospital, appropriate temporary means shall be taken to provide and convey water. The water and means of conveyance shall be approved by the Public Works Director or designee and be at the developer/contractor's expense.

1.02.12 SAFETY

The safety of workers and public shall be provided for as required by OSHA. The City Inspector shall not act as a construction site safety officer nor developer/contractor's foreman. The City has the right to issue a Stop Work Order at any time for what are deemed to be unsafe conditions.

Machinery, equipment, materials, and all hazards shall be guarded or eliminated in accordance with the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America and all applicable Federal regulations, including OSHA (Occupational Safety and Health Act), State, County, and municipal laws. No blasting shall be done without the approval of the Evans Fire Protection District and the Public Works Department. Safety equipment, devices, and clothing shall be utilized by personnel when required by Federal, State, and local laws.

1.02.13 MAINTENANCE GUARANTEE

All developer agreements, escrows, and letters of credit to construct and maintain necessary water distribution,

sewer collections, and other public improvements shall be approved by the Public Works Department and said agreements shall be entered into by the City of Evans and the owner/developer of the property prior to the time such improvements are constructed; pursuant to these Specifications, pertinent ordinances, rules, regulations and procedures; of the City of Evans. The City may enter into such agreements with developer or developer/contractors as may adequately protect the City's interests.

Developers and/or contractors will be required to provide suitable surety in the form of a bond or letter of credit to provide protection against the following situations:

- A. Repairs or maintenance work performed by the City of Evans by reason of default by the developer/contractor.
- B. Necessary repair of damages caused by the developer/contractor.
- C. Necessary repairs caused by installing defective material.
- D. Necessary repairs caused by poor installation techniques.
- E. Costs incurred by the City due to the developer/contractor's failure to perform in accordance with these standards.

1.02.14 ACCEPTANCE OF WORK

Water and sewer utilities shall be inspected by the City throughout installation. Prior to paving operations all valves and manholes shall be at the top of the subgrade, the water and sewer lines shall have passed all required tests, and the services shall be marked with a four by four (4 x 4) inch board with the appropriate color painted on the board and "S," "W," or "NP" stamped on the curb and gutter in line with the service.

Upon completion of installation and prior to paving operations, all sewer and water testing shall be completed, and documentation sent to the City.

Should any work require the cutting of the street, it shall be done at this time, prior to final paving. Concurrently, the contractor and developer shall check and ensure that all water and sewer services are offset from the centerline of each lot by five (5) feet each side unless otherwise indicated on the engineering drawings. No services are to be located in concrete areas.

After paving operations have been completed and all manholes and valves have been raised, a punch list shall be formulated and sent to both the contractor and the developer. Upon the request of the Public Works Director or designee, the developer/contractor shall provide lien waivers (or some other acceptable assurance) from all subcontractors and suppliers who have furnished labor, material, services for the design, construction, or installation of improvements. The developer shall also furnish an engineer's estimate of probable cost, showing a cost estimate of all infrastructure that will be accepted by the City of Evans.

The two (2) year warranty period should begin once the following conditions have been met:

- A. The punch list has been completed
- B. The final affidavit and/or lien waiver(s) have been signed
- C. The maintenance guarantee has been accepted by the City
- D. An engineer's estimate of probable cost has been given to the City
- E. Acceptable as-built drawings for all utility lines have been submitted to the Evans Public Works

Department in .pdf and AutoCAD format (.dwg).

The Public Works Director or designee shall send a letter to both the contractor and developer stating this date. No water meters shall be installed prior to initiating the two (2) year warranty period; except for park sprinkler meters, which must be installed and accepted, for service prior to the initiation of the two (2) year warranty period. Warranty periods may be initiated by phase, if all public improvements in that phase meet the above referenced requirements and provided the phasing has been shown on the approved prints.

Just prior to the end of the two (2) year warranty period, a third inspection and punch list shall be formulated by the Public Works Department and sent to both the contractor and the developer. Upon completion of this punch list to the satisfaction of the City, the Public Works Director or designee shall then send a letter to both the contractor and the developer, stating the acceptance of responsibility for perpetual maintenance of the water and sewer utility lines by the City of Evans. Any deviations from this format shall be supported in writing by the Public Works Director or designee.

Any maintenance, repairs, or replacements on all public improvements that have defects during the two (2) year warranty shall be performed by the contractor at the contractor's expense. The contractor shall be invoiced for all work performed during the two (2) year warranty period that is completed by the City of Evans. All payments for work performed shall be received by the Evans Public Works Department prior to the acceptance of responsibility for perpetual maintenance of the water and sanitary sewer utility lines.

1.02.15 MISCELLANEOUS

Reference to standard specifications, manuals, or codes of any technical society, organization, or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the current standard specification, manual, code, or laws or regulations in effect at the time of City approval. However, no provision of any referenced standard specification, manual, or code shall change the duties and responsibilities of the City or any of their consultants, agents, or employees from those set forth in these specifications. Work shall be done in compliance with the approved plans and to the satisfaction of the City.

Where special conditions not covered by these specifications exist, detailed drawings and specifications shall be submitted to the City of Evans for approval before contracts are awarded or work is begun.

Written approval from an authorized designee of the City of Evans Public Works Department must be obtained before any materials other than those materials specified in these standard specifications may be employed in the construction of roadways, structures water and sewer lines connected to or made a part of the infrastructure of the City of Evans.

SECTION 3 GENERAL CONSTRUCTION REQUIREMENTS

1.03.01 SCOPE

All installation of city facilities within the City of Evans in City right-of-way or City-owned property shall be constructed in accordance with the requirements of this specification and Colorado Department of Transportation Standard Specifications for Road and Bridge Construction, as referenced herein and as related to City Ordinances. All standard specifications, project special provisions, i.e., AWWA, ASTM, ACI, ISSA, etc. are made a portion of these specifications by reference and shall be the latest edition and revision thereof. The City of Evans standards, specifications, and special provisions shall take precedence over conflicting provisions in the CDOT Standard Specifications and other referenced standards. Whenever the provisions of these other standards are found to be inconsistent with any other regulations or codes, the City shall determine the standard to apply. The provisions of these regulations are minimum requirements that do not preclude imposition of more restrictive standards by agreement or by law.

Construction shall be done in accordance with engineered construction plans for the work, prepared under the direction of a Professional Engineer, licensed to practice in Colorado, and approved by the City of Evans Department of Public Works. Plans shall conform to the minimum design criteria of these specifications and shall show all the information called for on the construction plans check list shown in Appendix B. Construction shall conform to the standard detail drawings included in these specifications. Prior to the developer/contractor beginning work, an approved set of plans and specifications must be on file with the City of Evans Public Works Department. All contracts, bonds, insurance, permits, and licenses must be fully executed by the developer/contractor before beginning work. Developer/contractor shall have a copy of these Standards and Specifications on the site at all times during construction.

1.03.02 GENERAL

A. INTERPRETATION

The provisions of these specifications apply to the construction, enlargement, removal, alteration, relocation, repair, trenching, and restoration of any roadway public improvement or common facilities regulated herein.

The developer/contractor shall request clarification of all apparent conflicts by contacting the City. The City will not be responsible for any explanations, interpretations, or supplementary data provided by others.

B. VARIANCES FROM SPECIFICATIONS

When conflicts and/or questions arise between the accepted plans, specifications, development standards, referenced standards or other contract documents, the City shall make the final decision concerning such matters. Work shall be completed according to the amended design approved by the City. Clarification shall be obtained from the City for approval of omissions, conflicts, or revisions prior to construction of any amendments.

Requests for variance shall be submitted in writing to the City of Evans Public Works Department. The request shall state the variance requested, the justification and supporting data for the variance, and the requested change to the standards or specifications for the specific project. The City may require that exceptions be signed and sealed by a professional engineer registered to do work in the State of Colorado.

Variations to the specifications for street design and construction as outlined in this document shall be reviewed by the Public Works Director or designee, and shall meet the following criteria:

1. Special circumstances or conditions exist which limit the ability of the design to meet the design standards outlined in this document. Financial difficulties, loss of prospective profits, and previously approved exceptions in other developments shall not be considered special circumstances.
2. The variance represents an alternative design that will meet the intent of the standards and requirements set forth in this document. In either case, the variance will not be detrimental to the public interest or other property, or in conflict with the City Comprehensive Plan and Evans Design Specifications, and will not endanger the safety, health, or welfare of the public. All exceptions for construction specifications must be reviewed and acted on prior to construction.

C. OMISSIONS

Any work not specifically set forth in the construction plans or these standards, but which is necessary as determined by the City, shall be completed.

It is the intent of the standards and specifications to require a functionally complete project (or part thereof) to be constructed. Any work, materials, or equipment that may reasonably be inferred as being required to produce the intended result will be provided, whether or not specifically called for. When words which have a well-known technical or trade meaning are used to describe work, materials, or equipment, such words shall be interpreted in accordance with that meaning.

1.03.03 PROJECT ADMINISTRATION AND MANAGEMENT

A. PRECONSTRUCTION CONFERENCE

A pre-construction conference should be held prior to the commencement of any construction. Attendance should include the Public Works Department, owner/developer design engineer, general contractor, subcontractors including; earthwork, utilities, curb and gutter, paving and traffic control. All manufacturer's instructions and submittals shall be presented to the City at the pre-construction meeting.

B. REQUIRED PERMITS

All construction, including required cuts and fill on City right-of-way, shall be done by a bonded contractor as provided for in Chapter 12.04.020 of the Evans Municipal Code. No person, firm, or corporation may perform any work in the public right-of-way without first obtaining the appropriate permit through the Public Works Department. Once the permit is secured the contractor shall notify the Engineering Division twenty-four (24) hours prior to initiating construction.

Any permit application shall be accompanied by a continuous bond executed by a reliable surety company which bond shall be conditioned upon compliance with all the provisions of the ordinances of the City of Evans relating to construction in the public right-of-way and utility easements. Every applicant shall agree in making application for a permit to be bound by all provisions of the Evans Municipal Code.

A traffic control plan and cover sheet with explanation of work must be submitted and reviewed by Public Works Department before permit for excavation or construction in the city right-of-way will be issued.

The developer/contractor shall obtain all necessary permits for construction, unless otherwise directed by the City. All permits must be in accordance with City, County, State, and Federal requirements. City review and approval of all permits must be accomplished prior to the start of any construction.

It shall be the responsibility of the developer/contractor or utility to determine the type of permits required by the specific development. A copy of all permits must be available for inspection on the job site at all times. All required fees must be paid in advance, prior to commencement of any construction.

Utility construction, including new, reconstruction, and repair of private irrigation systems, power, gas, telephone, and cable TV lines and other various appurtenances related to these projects in the public right-of-way, shall obtain a City of Evans Permit for excavation/construction in public right-of-way before any construction commences. This permit also covers emergency street cuts.

C. PROJECT INSPECTION

All construction and installations shall be subject to inspection by the City. Certain types of work may have continuous inspection.

It shall be the responsibility of the person performing the work authorized by the permit to notify the City that such work is ready for inspection. The City requires that every request for inspection be received one working day before such service is desired. Such requests may be made by telephone to the Public Works Engineering Division, Monday through Friday between 8:00 A.M. and 5:00 P.M.

The City may grant approval to work outside of normal hours. This work can only be allowed with approval of the Public Works Director or designee. Inspection of such work may be assessed an inspection fee based upon the actual costs to the City associated with supplying a representative for overtime hours. Additionally, there will be a two (2) hour minimum for inspection work outside of the normal work hours. The contractor is responsible for notifying the Public Works Engineering Division of his intent to work overtime hours, weekends, or holidays. Such notice shall be given as soon as possible, but in no case less than twenty-four (24) hours prior to the overtime work.

The City shall have total control when determining the need for inspection of any work. The City may make or require other observations and reviews of any work as deemed necessary to ascertain compliance with the City's development standards, design and construction specifications, or other standards, specifications and codes.

The City is authorized to check all work performed in connection with construction in or on city properties.

City representatives present on site may advise contractors on these specifications and they have the authority to reject defective materials and workmanship.

The City shall, in no case, act as foreman or perform other duties for the contractor or interfere with the management of the work done by the contractor. The presence or absence of the City shall not, in any degree, relieve the responsibility or the obligation of the contractor to perform the work in accordance with the plans or specifications.

The City shall, at all times, have reasonable and safe access to the work whenever it is in preparation or in progress, and the contractor will provide proper facilities for such access for inspection. The City has the authority to select locations for tests.

Whenever any portion of these specifications are violated, the Public Works Director or designee may order that portion of construction which is in violation of these specifications or other approved plans, specifications, and materials to cease until such violation is corrected. If deficiencies are not corrected, performance shall be required of the developer/contractor's surety. A reinspection of constructed facilities shall occur at the end of the two (2) year warranty period.

D. MATERIALS AND QUALITY CONTROL TESTING

The developer/contractor is responsible for the quality control testing, acceptance testing, and protection of work. Quality control and acceptance testing may include tests associated with placing of concrete, asphalt, and base course; subgrade preparation; trench compaction, etc. Test results shall be reported to the City of Evans project inspector on a daily basis verbally or via text. The written results from these tests shall be forwarded to the City Engineering Division within two (2) weeks after the tests have been completed or as agreed to by both parties at the preconstruction meeting.

E. MATERIALS, MANUFACTURER'S CERTIFICATES AND RECOMMENDATIONS

All materials and equipment shall be of a quality acceptable to the City. If required by the City, the developer/contractor shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the instructions of the applicable supplier or manufacturer.

When deemed necessary by the City, the developer/contractor shall submit a certificate to the City, secured from the manufacturer of all the material used as a permanent part of the project, certifying that the product as used on the project, conforms to all City specifications. No material shall be used until the submittals are approved by the City.

All manufacturer's recommendations, instructions, or specifications regarding installation and use of products shall be considered a part of these Standards and Specifications and of equal force. Any conflict between the manufacturer's instructions and these Standards and Specifications shall be decided and settled by the City and shall not be open for arbitration. All such manufacturer's instructions and submittals shall be presented to the City at the pre-construction meeting.

F. TRAFFIC CONTROL

A traffic control plan (TCP) or method of handling traffic (MHT) shall be submitted and accepted by the Engineering Division, forty-eight (48) hours prior to commencing any work. If the proposed work is in the State Highway right-of-way, then a construction traffic control plan approved by CDOT must be submitted to the Engineering Division prior to commencing any work.

The developer/contractor shall be responsible for all types of traffic, including pedestrians, in the construction area. Special attention shall be given to individuals under the Americans with Disability Act. Any person who makes pavement cuts, excavations, places an embankment, or does any work in public right-of-way, including but not limited to areas along a public street, alley, or sidewalk, shall place barricades, warning signals, detour signs as appropriate, and/or other safety devices at the location, sufficient to warn the public of any hazard. Safety devices must be in compliance with the Manual of Uniform Traffic Control Devices (MUTCD) and the "Colorado Supplement" to the MUTCD, latest revision.

All work areas adjacent areas open to traffic; including but not limited to open cuts, trenches, ditches, manholes, and/or other hazards; shall be completely surrounded by approved fencing and other appropriate controls to protect and warn pedestrians and persons using bicycles, wheelchairs, and other vehicles. Temporary walkways must be provided.

The developer/contractor shall appoint a traffic control supervisor who shall be responsible for traffic control and who shall be certified by the American Traffic Safety Services Association (ATSSA) and/or the Colorado Contractor's Association (CCA). The supervisor must be available twenty-four (24) hours per day to resolve traffic control problems during construction. All traffic control supervisors shall have in their possession a current TCS card.

No interference with traffic flow on arterial or collector streets shall be permitted between 6:00 A.M. and 8:30 A.M., and 4:00 P.M. and 6:00 P.M. on typical workdays unless authorized by the City. No work shall be performed on local streets before 7:00 A.M. or after 7:00 P.M. each workday unless otherwise approved by the City. When work is stopped for the day, a minimum of two traffic lanes of an arterial or collector street shall be opened to traffic unless extended closure is authorized by the City. A traffic lane shall be considered satisfactory for opening to traffic only if it is maintained in a condition suitable for normal traffic flow. Any surface material besides placed and rolled asphalt shall be checked and maintained on a daily basis.

Intersections and driveways shall be closed for a minimum amount of time. The developer/contractor shall coordinate driveway closures by written notification with property owners one week prior to construction with final approval by the City.

After the streets are constructed, these streets must be controlled with either construction traffic control barricades or approved temporary or permanent traffic control signage (stop signs, street signs, etc.), and pavement markings until such time as the permanent markings and controls are in place.

All flaggers shall be properly trained according to State and Federal guidelines. The developer/contractor shall submit copies of flaggers' certification cards to the Engineering Division prior to construction. Flaggers shall have in their possession a current copy of their certification card.

Removal of any and all permanent signs shall be coordinated with the Engineering Division. It will be the responsibility of the developer/contractor to replace or repair signs as required due to poor workmanship and materials prior to and during the two (2) year warranty period after project completion and acceptance by the City.

The developer/contractor shall maintain all necessary barricades, permanent signs, temporary signs, pavement markings, and other traffic control devices during construction and between phases of construction, even if construction activity ceases for extended periods.

The developer/contractor shall maintain responsibility to change or adjust traffic control devices if conditions warrant during construction. The developer/contractor shall immediately repair and replace damaged or missing traffic control devices.

The City of Evans will not be responsible for the maintenance of traffic signs or pavement markings within a project until the improvements have been initially accepted by the City. At that time the Public Works Department will complete an inspection of the development to assure all said signs and pavement markings were installed in accordance to approved plans. If there are deficiencies, the developer/contractor or other party shall be responsible, at no cost to the City, to bring traffic control signs and pavement markings into compliance with approved plans.

Developments with private streets shall also adhere to these same guidelines, except their traffic control devices shall be permanently maintained by their Homeowner's Association group.

The developer/contractor shall hold harmless the City of Evans and City staff against claims arising out of any accidents involving construction work or construction traffic control.

G. CONSTRUCTION STAKES AND SURVEY MONUMENTS

Construction staking shall be the responsibility of the developer/contractor.

All vertical and horizontal control shall be based on the City's monumentation which is in accordance with the Northern Colorado State Plane Coordinate System NAD 83-92 (horizontal) and NAVD 88 (vertical). Proposed reference monumentation shall be approved by the City prior to survey. Surveyors

shall use the City’s section corners, in accordance with the City of Evans Geodetic Survey.

The policy of the City of Evans is to preserve and perpetuate survey monuments in accordance with State law.

H. BACKFILL

It is expected that the excavation will provide suitable backfill material. Wet, soft, or frozen material, pieces of asphalt or concrete, or other undesirable substances shall NOT be used as backfill material. Backfill material shall be free from rubbish and stones larger than five (5) inches in diameter, clods, and frozen lumps of soil. If the excavated material is not suitable for backfill, as determined by the City, suitable material shall be hauled in and utilized, and the rejected material hauled away. All snow shall be removed from trench prior to backfill operations. Backfilling shall be conducted at all times, in a manner to prevent damage to the installed materials and equipment and shall be kept as close to the installation operation as possible.

All backfill around structures shall be consolidated by mechanical tamping. Backfill shall be placed in lift thicknesses capable of being compacted to specified densities. The lifts of backfill material shall, in no case, exceed eighteen (18) inches

In areas where existing pavement is to be cut and replaced, material excavated shall be removed from the site and the trench backfilled and compacted with gravel road base or approved native material. The line, grade and joints of all pipelines shall be inspected by the City before any backfilling above the pipe is commenced. Squeegee sand shall not be considered backfill material and shall not extend more than twelve (12) inches above the top of the pipe.

Soil resistivity tests and/or any other soil tests may be required at the sole discretion of the Public Works Director or designee. The developer/contractor shall incur the costs of all soil testing, as required.

I. COMPACTION

Compaction shall be obtained by any method the developer/contractor desires except that water flushing, ponding, or jetting for consolidation shall NOT be permitted. Compact trench back-fill to density required in accordance with ASTM D698, ASTM D4253, and ASTM D4254. Comply with Table 1.01-1 trench compaction criteria.

Table 1.01-1
Compaction Criteria

Location	Soil Type	Density
Trench Backfill: Under Pavements Roadway Surfaces, Within R.O.W.	Cohesive Soil	95% (ASTM D698)
	Cohesive-less Soils	95% (ASTM D4253 & D4254)
Trench Backfill: Under Turf, Sod and Non-Traffic Area	Cohesive Soils	90% (ASTM D698)
	Cohesive-less Soils	90% (ASTM D4253 & D4254)

The minimum moisture content shall not deviate above or below the standard optimum by more than two (2) percent or a recommended value made by a Geotechnical Engineer.

If, in the judgment of the Public Works Director or designee, the trench shows signs of being improperly backfilled or if settlement occurs, the trenches will be reopened to a depth required for proper compaction, refilled and re-compacted, all in accordance with these specifications.

Compaction tests, taken by an independent commercial laboratory, shall be taken every 200 feet or at the discretion of the Public Works Director or designee while construction is proceeding. Testing shall be at a minimum of two (2) tests per 400 feet of trench and two at each sewer manhole or water structure on either side of the structure. The locations of the test may be determined by a representative of the City of Evans. Test results shall be reported to the City of Evans Public Works Department. Reports delivered to the city's inspector will be considered delivered to the Public Works Department. All compaction tests shall be taken at depths below subgrade ranging from one (1) foot above the top of pipe bedding material to one (1) foot below grade.

J. TRENCH MAINTENANCE

For a period of two (2) years after completion of the installation (two (2) year warranty period), the developer/contractor shall maintain and repair any trench settlement which may occur and shall make suitable repairs to any pipe, fitting, valve, valve box, pavement, sidewalks, or other structures which may be damaged as a result of backfill settlement as determined by the Public Works Director or designee

K. CONFORMITY OF WORK AND MATERIALS

All work performed and all materials furnished shall be within the lines, grades, cross sections, dimensions, and material requirements, including applicable tolerances, shown on the plans or indicated in these criteria and specifications. It shall be the responsibility of the developer/contractor to keep the work area clean during the performance of the work.

L. LOAD RESTRICTIONS

The developer/contractor shall comply with CDOT Standard Specifications for Road and Bridge Construction, latest edition, for truck load restrictions.

M. UTILITY COORDINATION

During construction the developer/contractor shall keep inlets, junction boxes, manholes, control valves, and fire hydrants clear at all times. For all street construction which impacts utilities, the developer/contractor shall provide a City-approved means of temporary service during the approved construction time, and properly reconnect such utility service immediately following construction.

In the event that a manhole frame, valve box, or other fixture is covered up during construction, it shall be made accessible raised to the proper alignment and grade, prior to acceptance by the City.

Locating or moving existing utilities or coordinating the installation of new utilities is the responsibility of the developer/contractor(s) performing the work. Relocation of utilities in a public right-of-way or easement shall be the responsibility of the developer/contractor.

N. PROTECTION OF EXISTING UNDERGROUND UTILITIES

The developer/contractor shall at all times take proper precautions for the protection of utilities, the presence of which are known or can be determined by field location of the utility companies. The developer/contractor shall be responsible for all expenses relating to damaged utilities. Hand excavation shall be used whenever necessary in close proximity to existing utilities. It is the developer/contractor's responsibility to call for utility locates and abide by those requirements as outlined by State statutes.

O. ARCHAEOLOGICAL FINDINGS

If the developer/contractor's excavating operations encounter remains of historical or archaeological

significance, the operations shall be temporarily discontinued. The developer/contractor shall notify the Engineering Division, which will contact the proper authorities, to determine the disposition of the remains and artifacts. The developer/contractor shall protect the site in such a manner as to preserve the artifacts encountered.

P. PRESERVATION OF PROPERTY

Existing improvements, adjacent property, utilities, trees and plants that are not to be removed shall be protected from injury or damage resulting from the developer/contractor's operations.

Q. PROTECTION OF PUBLIC AND PRIVATE INSTALLATIONS

The developer/contractor shall at all times take proper precautions for the protection of driveway culverts, street intersection culverts or aprons, irrigation crossings, mailboxes, driveway approaches, temporary or permanent street markings, signage, and all other identifiable installations that may be encountered during construction. The developer/contractor shall be responsible for all expenses relating to damaged public and private installations.

R. TIMELINESS OF REPAIRS

Repairs which are not considered a hazard to pedestrians, vehicles, or structures shall be completed within seven (7) days after receipt of notice to repair from the Public Works Department. Repairs which are considered a hazard to pedestrians, vehicles, or structures shall be completed within three (3) calendar days after receipt of notice to repair from the Public Works Department.

S. PERFORMANCE AND MAINTENANCE GUARANTEES

All development, subdivision, escrow, and letter of credit agreements to construct and maintain necessary water distribution, sewer collection, and other public improvements shall be approved by the Public Works Department. Said agreements shall be entered into by City and the owner/developer of the property prior to the time such improvements are constructed and shall be pursuant to these Specifications, pertinent ordinances, rules, regulations and procedures of the City of Evans. The City may enter into such agreements with developer/contractor as may adequately protect the City's interests.

Developers/owners and contractors will be required to provide a performance guarantee with the City of Evans for repairs or maintenance work performed by the City of Evans by reason of default by the developer/contractor, necessary repair of damages caused by the developer/contractor, necessary repairs caused by developer/contractor's poor installation techniques, and costs incurred by the City due to the developer/contractor's failure to perform in accordance with these standards.

T. ACCEPTANCE OF WORK

Any new facilities shall be inspected throughout installation. Prior to paving operations, all valves and manholes shall be at least at the top of the subgrade. The water and sewer lines shall have passed the required tests. The ends of the services shall be marked with a four by four (4x4) inch with the appropriate color painted on the board and marked at the curb face with "S," "W," or "NP." The developer/contractor will also check and ensure that all water and sewer services are offset from the centerline of each lot by five (5) feet each side, unless otherwise indicated on the engineering drawings. No services or meters are to be located in concrete areas. Upon completion of installation and prior to paving operations, all sewer and water testing shall be completed, and documentation sent to the City.

After paving and all other operations have been completed, a punch list shall be formulated and sent to the developer/contractor. Upon request from the Public Works Director or designee, the developer/contractor shall provide lien waivers (or some other acceptable assurance) from all

subcontractors, and suppliers who have furnished labor, material, or services for the design, construction, or installation of improvements.

Once the items on this punch list have been completed, the final affidavit and/or lien waiver has been signed, the maintenance guarantee has been accepted by the City, and cost estimate and as-built drawings for all utilities lines have been submitted to the Evans Public Works Department, the two (2) year warranty period shall begin. The Public Works Director or designee shall send a letter to both the contractor and developer stating this date. Warranty periods may be initiated by phase, if all public improvements in that phase meet the above referenced requirements, including paving, and if the phasing has been shown on the approved plans.

No water meters shall be installed prior to initiating the two (2) year warranty period except for park sprinkler meters, which must be installed and accepted for service prior to the initiation of the two (2) year warranty period. Meters for sprinkler systems must be installed in the meter pit or vault prior to any taps being performed by developer/contractor's tapping crew.

Just prior to the end of the two (2) year warranty period, a third inspection and, if necessary, a punch list, shall be formulated and sent to the developer. Upon completion of the items on this punch list to the satisfaction of the City, the Public Works Director or designee shall then send a letter to the developer, stating the acceptance of responsibility for perpetual maintenance of the public improvements by the City of Evans.

Any maintenance, repairs, or replacements on all public improvements that have defects during the two (2) year warranty shall be performed by the developer/contractor at the developer/contractor's expense. The developer/contractor shall be invoiced for all work performed during the two (2) year warranty period that is completed by the City of Evans. All payments for work performed shall be received by the Public Works Department prior to the city's acceptance of responsibility for perpetual maintenance of the water and sanitary sewer utility lines.

U. PAYMENTS

When the CDOT Standard Specifications refers to payment or basis of payment it shall be disregarded unless specifically referred to in other contract documents associated with the work. The City of Evans has no responsibility for payments unless the work was contracted by the City.

V. CONFLICTS/QUESTIONS

When conflicts and/or questions arise between the accepted plans, specifications, development standards, referenced standards, or other contract documents, the City shall make the final decision concerning such matters.

W. LIABILITY

The City and the City's authorized representatives charged with the enforcement of these Standards and Specifications, acting in good faith and without malice in the discharge of their duties, shall not thereby be rendered personally liable for any damage that may accrue to persons or property as a result of any act or by reason of any act or omission in the discharge of their duties.

X. NO WAIVER OF LEGAL RIGHTS

The City will not be precluded or stopped by any measurement, estimate, or certificate (made either before or after the completion and acceptance of the work) from showing the true amount and character of the work performed and the materials furnished by the developer/contractor, or from showing that any such measurement, estimate, or certificate is untrue or is incorrectly made.



EROSION & SEDIMENT CONTROL SPECIFICATIONS

**CITY OF EVANS
PUBLIC WORKS DEPARTMENT
AUGUST 2019**

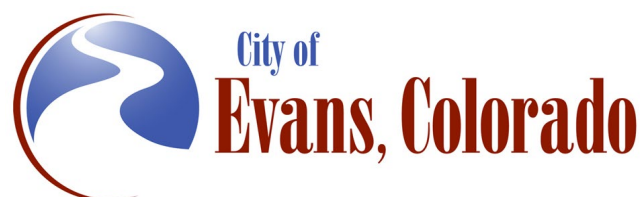




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SECTION 1 EROSION AND SEDIMENT CONTROL

2.01.01 REQUIREMENTS

Erosion control measures shall be designed in conformance with the Mile High Flood District (MHFD) Urban Storm Drainage Criteria Manual (as amended), hereon referred to as the Manual. All land-disturbing activities within the City of Evans shall be in compliance with the City of Evans MS4 Program, and applicable Colorado Discharge Permit System (CDPS) Stormwater, and Colorado Air Quality Control Commission regulations, when applicable. If the project disturbs one (1) or more acres of land, or is part of a larger overall development, Stormwater Permits for Construction Projects from the City of Evans and the Water Quality Control Division of Colorado Department of Public Health and Environment (CDPHE) must be obtained and evidence of the permit must accompany an application for a grading permit. All earth disturbing activities within the City must comply with the City’s permitting ordinances and requirements and conform to erosion, sediment control and drainage ordinances and regulations.

2.01.02 SUBMITTAL

A statement describing the erosion control methods shall be submitted as part of the preliminary and final drainage reports for all developments. Grading, erosion, and sediment control construction drawings will not be approved prior to approval of the final drainage report. A detailed erosion and sediment control plan must accompany the grading plan and drainage report for all development or redevelopments disturbing one or more acres of land or land that is part of a larger common development

If grading or other earth disturbing activities are to be made on one (1) or more acres or land that is part of a larger common development, an Erosion and Sediment Control Plan shall be submitted to, and approved by, the Director of Public Works or designee along with a copy of the CDPHE issued Construction Site Stormwater Permit cover letter evidencing the State-issued permit certification number, prior to receiving a Grading Permit and/or an Erosion and Sediment Control Permit as required in the Evans Municipal Code, as amended.

2.01.03 EROSION AND SEDIMENT CONTROL PLAN NARRATIVE REPORT

An Erosion and Sediment Control Plan consisting of a written narrative report and a site plan map shall be submitted to the Director of Public Works or designee for review and approval.

The narrative report shall contain, or refer to, the drainage report and include the following:

- A. **APPLICANT CONTACT INFORMATION.** Name, address, and telephone number of the applicant;
- B. **PROFESSIONAL ENGINEER CONTACT INFORMATION.** The name, address, and telephone number of the professional engineer preparing the Erosion and Sediment Control Plan, if different from the applicant.
- C. **PROJECT DESCRIPTION.** A brief description of the nature and purpose of the land disturbing activity; including the:
 - 1. Total area of the site,
 - 2. Area of disturbance involved, and
 - 3. Project location including township, range, section, and quarter-section, or the latitude and longitude, of the approximate center of the project.
- D. **EXISTING SITE CONDITIONS.** A description of the existing topography, vegetation, drainage, and any wetlands on the site;

- E. **ADJACENT AREAS.** A description of neighboring areas identifying land uses, streams, lakes, wetlands, roads, and other features as required by the Director of Public Works or designee, which might be affected by the land disturbance;
- F. **SOILS.** A brief description of the soils on the site including soil type and names, mapping unit, erodibility, permeability, hydrologic soil group, depth, texture, and soil structure (This information may be obtained from the soil report for the site, NRCS (Natural Resources Conservation Service) web soil survey, or, if available, from soils reports from adjacent sites if acceptable to the Director of Public Works or designee.)
- G. **AREAS AND VOLUMES.** An estimate of the quantity (in cubic yards) of excavation and fill involved, and the surface area in acres of the proposed disturbance;
- H. **EROSION AND SEDIMENT CONTROL MEASURES.** A description of the methods described in the Manual which will be used to control erosion and sediment on the site; (Refer to the Manual for installation details and design criteria for approved erosion and sediment control best management practices.)
- I. **PROJECT SCHEDULE.** A specified schedule indicating the anticipated starting and completion dates of the site grading and/or construction sequence as required by the Director of Public Works or designee, including the date of anticipated installation and removal of erosion and sediment control measures and the period during which each area will be exposed prior to the completion of temporary erosion and sediment control measures;
- J. **PERMANENT STABILIZATION.** A brief description, including specifications, of how the site will be stabilized after construction is completed;
- K. **STORMWATER MANAGEMENT CONSIDERATIONS.** Explain how stormwater runoff from and through the site will be handled during construction and include a description of the post-construction stormwater quality control measures to be included as a part of the site development;
- L. **MAINTENANCE.** A schedule of regular inspections during construction, a plan for the repair of erosion and sediment control structures as necessary, and a description of proposed routine sediment basin maintenance;
- M. **PROJECTED COST OF BEST MANAGEMENT PRACTICES.** The estimated total cost for installation and maintenance of the required temporary soil erosion and sediment control measures to assist the Director of Public Works or designee to determine surety or financial guarantee requirements for the proposed plan;
- N. **CALCULATIONS.** Any calculations made for the design of sediment basins, diversions, waterways, runoff and stormwater detention basins (if applicable) and similar structures or improvements as may be required by the Director of Public Works or designee;
- O. **OTHER INFORMATION REQUIRED.** Other information or data as may be required by the Director of Public Works or designee;
- P. **FINANCIAL GUARANTEE.** A surety, bond, letter of credit, escrow account or other financial guarantee acceptable to the City of Evans submitted in an amount sufficient to install and maintain for a period of two (2) years the temporary and permanent erosion and sediment control measures described in the plan;
- Q. **SIGNATURE PAGE.** A signature page for the applicant, owner or developer acknowledging review and acceptance of responsibility, and a statement by the Professional Engineer acknowledging

responsibility for the preparation of the Erosion and Sediment Control Plan, and

- R. OWNER/APPLICANT CERTIFICATION STATEMENT. A statement as follows:
"This Erosion and Sediment Control Plan has been placed in the City of Evans file for this project. The Plan fulfills the Urban Drainage and Flood Control District's technical criteria and the criteria for erosion control and requirements of City of Evans to the best of my knowledge. I understand that additional erosion control measures may be needed if unforeseen erosion problems occur or if the submitted Plan does not function as intended. The requirements of this Plan shall run with the land and be the obligation of the land owner until such time as the plan is properly completed, modified or voided"

2.01.04 EROSION AND SEDIMENT CONTROL PLAN

- A. The Erosion and Sediment Control Plan at a scale of one (1) inch to twenty (20) feet (1":20') up to one (1) inch to 200 feet (1":200'). The plan may be placed on the site drainage plan if it can be clearly presented. The Erosion and Sediment Control Plan shall include:
 1. The property lines for the site on which the work will be performed
 2. Existing topography at one (1) or two (2) foot contour intervals. The map should extend a minimum of fifty (50) feet beyond the property line;
 3. Proposed topography at one (1) or two (2) foot contour intervals. The map should show elevations, dimensions, location, extent, and the slope of all proposed grading, including building site and driveway grades, if known;
 4. Location of any existing structures or hydrologic features on the site.
 5. Location of all structures or natural features on the land adjacent to the site and within a minimum of one hundred (100) feet of the site boundary line, including street gutter, storm sewer, channel, or other waters receiving storm runoff from the site;
 6. Location of all proposed structures and development on the site, if known;
 7. Identification of areas which are to be cleared and graded;
 8. Identification of areas designated for topsoil and subsoil storage;
 9. Identification of areas designated for equipment, fuel, lubricants, chemical and waste storage;
 10. Location of temporary roads designated for use during the construction period;
 11. Plans of all drainage features, paved areas, retaining walls, cribbing, planting, temporary or permanent soil erosion control measures, or other features to be constructed in connection with, or as a part of, the proposed work together with a map showing the drainage area of land tributary to the site and estimated two (2) year runoff of the area served by all drains. All erosion control measures should be depicted using standard map symbols.
 12. Design drawings of sediment controls, temporary diversions, and any practices proposed for use and are not referenced in these criteria;
 13. Other information or data as may be reasonably required by the Director of Public Works or designee;
 14. A signature page for the applicant, owner or developer acknowledging review and acceptance of responsibility, and a statement by the Professional Engineer acknowledging responsibility for the preparation of the Erosion and Sediment Control Plan, and
 15. An owner/applicant statement as defined in section 2.01.03:

2.01.05 APPROVAL OF EROSION AND SEDIMENT CONTROL PLAN

An Erosion and Sediment Control Plan is required prior to issuance of an Over-lot Grading or Erosion and Sediment Control Permit by the City of Evans. The final Erosion and Sediment Control Plan shall be consistent with a drainage report considered acceptable to the Director Public Works or designee. Approval of the Erosion and Sediment Control Plan does not imply acceptance or approval of drainage plans, utility plans, street or road plans, design of retaining walls, or any other aspect of site development.

2.01.06 INSPECTIONS

- A. A schedule of weekly inspections shall be conducted by the contractor during construction to evaluate a plan for the timely repair of erosion and sediment control BMPs that are in disrepair.
- B. The Erosion and Sediment Control Plan shall become a living document to show the removal or installation of BMPs as the construction phasing evolves.
- C. Weekly inspection reports shall be kept on-site during construction at all times. A copy of the narrative, Erosion and Sediment Control Plan, and City and State permits shall be kept on-site at all times.
- D. Once construction is completed, quarterly inspections of the site will be required until final acceptance of the site by the City of Evans.

2.01.07 EXEMPTIONS AND VARIANCES

- A. EXEMPTIONS. The following are exempt from the erosion control planning process, however, exempting the owner from preparing an erosion control plan and applying for a grading permit does not exempt the owner from controlling erosion of soil at each construction site through the use of the techniques described in these Standards and Specifications Volume 3 of the Urban Drainage and Flood Control Criteria Manual:
 - 1. Agricultural use of land.
 - 2. Grading or an excavation below finished grade for basements, footings, retaining walls, or other structures on plots zoned R1 - R3 of less than one (1) acre in size unless required otherwise.
 - 3. A sidewalk or driveway authorized by a valid permit.
 - 4. Pavement repair on public and private roadways such as pothole repair and pavement patching (BMP installation and right-of-way permit still required).
 - 5. Asphalt pavement roto-milling that is only for street maintenance purposes and has no other construction associated with it. BMPs are still required to be implemented.
 - 6. Emergency situations that pose an imminent risk to life or property, such as hazardous waste clean-up operations and fire.
 - 7. Geotechnical boring investigations, utility locating, and potholing.
 - 8. Emergency utility repairs.
 - 9. Fencing and maintenance of existing fencing.
 - 10. Other: City of Evans, or CDOT projects that may have sound barrier wall installations not allowing drainage to pass through (BMP installation still required).
 - 11. Pavement repair and replacement on public trails with less than one (1) acre of disturbance.
 - 12. Oil and gas well sites (covered by a statewide permit).
 - 13. Eligible non-standard MS4 permitted sites
 - 14. Land-disturbing activities involving less than one (1) acre of disturbed area.
 - 15. Individual lots involving less than one (1) acre of disturbed area in a larger subdivision project shall **NOT** be considered separate development projects, but rather as a part of the subdivision development as a whole. It will be the responsibility of the homebuilder to conform to all requirements of the approved Erosion and Sediment Control Plan for the subdivision. As part of any building permit for which a specific erosion control plan is not required, the following statement must be included in the building permit application:

"We have reviewed the Erosion and Sediment Control Plan for [subdivision name] and agree to conform to all requirements contained therein and all erosion control requirements of the City of Evans. We further agree to construct and maintain all erosion and sediment control measures required on the individual lot(s) subject to this Building Permit and/or in accordance with the provisions of the City of Evans MS4 Stormwater Management Program for Construction Projects."

16. Underground utility construction including the installation, maintenance, and repair of all utilities under hard-surfaced roads, streets, or sidewalks provided such land-disturbing activity is confined to the area which is hard-surfaced and provided that runoff and erosion from soil stockpiles are confined and will not enter the drainage system.
17. Gravel, sand, dirt or topsoil removal as authorized pursuant to approval of the Colorado Mined Land Reclamation Board, provided said approval includes an erosion and sediment control plan that meets the minimums specified.
18. Projects having a period of exposure (from time of land disturbance until permanent erosion control measures are installed) of less than fourteen (14) days.
19. Where the owner certifies in writing to the Director of Public Works or designee, and the Director agrees in writing that the planned work and the final structures or topographical changes will not result in or contribute to soil erosion or sedimentation and will not interfere with any existing drainage course in such a manner as to cause damage to any adjacent property or result in the deposition of debris or sediment on any public way, will not present any hazard to any persons or property, and will have no detrimental influence upon the public welfare or upon the total development of the watershed.

B. VARIANCES – The Director of Public Works or designee has the authority to waive or modify any criteria and/or practices specified within the Manual which relate to the application of specific erosion and sediment control practices if the Director determines that the criteria and/or practices are inappropriate or do not apply to existing site conditions and by granting the variance acknowledges:

1. That storm and surface waters will be properly drained and controlled, pollution will be reduced, and the health, safety, property and welfare of landowners and inhabitants within the City will be safeguarded and protected;
2. The variance will not create a hazard to life, health, and property;
3. As a result of the variance being granted there will not be untimely, indiscriminate, or unnecessary removal or destruction of trees and groundcover;
4. The surface water runoff will be minimized and properly managed;
5. The variance will not contribute to uncontrolled diversion, flooding or siltation in the City’s streams, rivers, lakes, storm drainage systems, and public roadside improvements;
6. The variance will not increase the risk of landslides, erosion, and unstable building sites; and will ensure prompt development, restoration, replanting, and effective erosion control of lands after clearing and grading; and
7. The granting of the variance will ensure that the use of the site is consistent with the intent of the Evans Municipal Code. Application for a variance shall be submitted prior to or with the initial Stormwater Management Plan (SWMP) submission, and shall include:
 - A specification of the criteria and/or practice from which the applicant seeks a variance;
 - The justification for the variance;
 - Proposed alternate criteria, practice or standard measures to be used in lieu of the criteria.
8. The City Engineer or designee may grant the variance, grant the variance with conditions, or deny the variance.

2.01.08 EROSION CONTROL MEASURES

Detailed erosion control measures must be provided to protect the following:

- A. Inlets, culverts, and storm sewers;
- B. Drainage ways having channel flow lines which exceed one (1) percent slope;
- C. Streams or other water bodies which are immediately adjacent to land disturbed by construction

activity;

- D. Cut and fill areas where exposed soil exists;
- E. Properties and improved streets adjacent to construction activity;
- F. Other details, projects or activities as required by the City Engineer or designee.

Temporary erosion control measures such as sediment traps or silt fences must be properly placed in accordance with the approved grading plan prior to any earthmoving on site. Erosion control measures shall be kept in good repair and fully functional until the erosion potential from the site no longer exists under the terms of the City of Evans MS4 Stormwater Management Program.

Permanent erosion control such as paving, sod, seed, mulching, etc., is generally expected to be in place prior to beginning the two-year public improvements warranty period or City acceptance.

2.01.09 PUBLIC NOTICE SIGN REQUIREMENTS

All developments disturbing one (1) acre or greater to post a sign that will provide public notice of the developments requirement to adhere to stormwater run-off and sediment control plans. Within twenty-four (24) hours of receiving a stormwater permit from the City, the developer shall post the sign at the entrance of the development in an area accessible to the public which contains the following information:

- A. The contact information for the responsible person in charge of construction;
- B. The developer’s name;
- C. The project name;
- D. A brief description of the project; and
- E. The grading permit application date.

The sign shall be not less than three (3) feet above the ground and should be no smaller than eleven (11) by seventeen (17) inches.

2.01.10 EROSION AND SEDIMENT CONTROL CRITERIA

The following is a summary of erosion and sediment control activities as described in the erosion control section of the MHFD USDCM Volume 3. Refer to erosion control section of the of the Manual for a complete listing of erosion and sediment control activities and criteria.

- A. **EROSION CONTROL.** Permanent or temporary soil surface stabilization shall be applied to disturbed areas and soil stockpiles as soon as possible but no later than fourteen (14) days after final grade is reached on any portion of the site. Soil surface stabilization shall also be applied within fourteen (14) days to disturbed areas that may not be at final grade but will remain dormant (undisturbed) for longer than an additional thirty (30) days.
- B. **SURFACE ROUGHENING.** Surface roughening shall be performed after final grading to create depressions two (2) to four (4) inches deep and four (4) to six (6) inches apart horizontal to contour grades.
- C. **MULCHING.** All disturbed areas shall be properly mulched, or seeded and mulched, within fourteen (14) days after final grade is reached on any portion of the site not otherwise permanently

stabilized.

- D. **REVEGETATION.** A viable vegetative cover shall be established within one (1) year on all disturbed areas and soil stockpiles not otherwise permanently stabilized. Vegetation is not considered established until a ground cover is achieved which, in the opinion of the Director of Public Works or designee, is sufficiently mature to control soil erosion and can survive severe weather conditions.
- E. **TEMPORARY REVEGETATION.** Temporary revegetation is required on all disturbed areas having a period of exposure prior to final stabilization of one (1) to two (2) years. All temporary seeding shall be properly mulched.
- F. **PERMANENT REVEGETATION.** Permanent revegetation is required on all disturbed areas having a period of exposure greater than two years, or for an indeterminate length of time. A City of Evans standard seed mix shall be planted and mulched or other approved revegetation plan.
- G. **ROADS AND SOIL STOCKPILES.** Road cuts, road fills, and parking lot areas shall be covered as early as possible with the appropriate aggregate base course where this is specified as part of the pavement. This practice is not needed when final construction of roads will take place within thirty (30) days of reaching final subgrade level.
- H. **NON-PAVED ROAD STABILIZATION.** All non-paved portions of roads shall be seeded and mulched as soon as possible after final grading has occurred, but in no case later than fourteen (14) days after grading has been completed.
- I. **STABILIZING STOCKPILES.** Soil stockpiles expected to be in place longer than sixty (60) days shall be seeded with a temporary grass cover and mulched within fourteen (14) days after completion of stockpile construction.
- J. **STOCKPILES NEAR DRAINAGEWAYS.** If stockpiles are located within 100 feet of a drainageway, additional sediment controls, such as a diversion dike or silt fence, shall be provided.
- K. **SEDIMENT CONTROL.** Properties and roadways adjacent to a construction site shall be protected from eroded sediment being transported to them.
- L. **VEHICLE TRACKING.** Whenever construction vehicles enter onto paved roads, provisions shall be made to prevent the transport of sediment (mud and dirt) by vehicles tracking onto the paved surface. Whenever sediment is transported onto a public road, regardless of the size of the site, the roads shall be cleaned at the end of each day.
- M. **SLOPE DIVERSION DIKES.** Temporary diversion dikes shall be provided as required by the provisions these Standards and Specifications. Diversion dikes located above disturbed areas may be discharged to a permanent or temporary channel. Diversion dikes located mid-slope on a disturbed area shall discharge to temporary slope drain. Diversion dikes located at the base of a disturbed area shall discharge to a sediment trap or basin.
- N. **ROADS AND ROADSIDE SWALES.** For road areas that are not paved within thirty (30) days of final grading and have not received early application of road base, rough-cut street controls shall be provided.
- O. **SEDIMENT ENTRAPMENT MEASURES.** All runoff leaving a disturbed area shall pass through at least one sediment entrapment facility before it exits the site. Sediment entrapment measures include straw bale barriers, sediment control logs, silt fences, and sediment basins. The criteria for selection and design criteria and use of sediment entrapment facilities are given in MHFD USDCM Vol 3. All runoff leaving a disturbed area shall pass through at least one sediment entrapment

facility before it exits the site.

- P. **WORKING WITHIN OR CROSSING A WATERWAY.** Construction vehicles shall be kept out of waterways to the maximum extent practicable. Where an actively flowing watercourse is be crossed regularly by construction vehicles, a temporary stream crossing or channel diversion shall be provided.
- Q. **OUTLET PROTECTION.** The outlets of temporary slope drains, culverts, sediment traps, and sediment basins shall be protected from erosion and scour.
- R. **INLET PROTECTION.** All storm sewer inlets made operable during construction shall have sediment entrapment facilities installed to prevent sediment-laden runoff from entering the inlet.
- S. **CHEMICALS, OILS AND MATERIAL STORAGE.** Areas used for storage of chemicals, petroleum-based products and waste materials, including solid and liquid waste, shall be designed to prevent discharge of these materials in the runoff from a construction site.
- T. **DISPOSITION OF TEMPORARY MEASURES.** All temporary erosion and sediment control measures shall be removed within thirty (30) days after final stabilization is achieved, or after the temporary measures are no longer needed, whichever occurs earliest, or as authorized by the Director of Public Works or designee.
- U. **MAINTENANCE.** All temporary and permanent erosion and sediment control practices shall be maintained and repaired by the owner during the construction phase and two-year warranty period as needed to assure continued performance of their intended function. All facilities shall be inspected and replaced if necessary, following each precipitation or snowmelt event that results in runoff.

2.01.11 **LAWN AND GRASS SPECIFICATIONS**

A. **GENERAL CONDITIONS**

The contractor shall be responsible for confirming and correlating actual job site conditions and dimensions, for acquiring information that pertains solely to the fabrication process or to techniques of construction, and for coordinating the work with all other trades. The contractor is encouraged to inspect the site. Contractors with a Certified Landscape Technician are preferred. Any application of herbicides must be done by appropriately licensed applicators.

At any location where it is necessary to cross over a sidewalk, curb, or any other concrete or asphalt area, every effort shall be made to protect said concrete or asphalt from damage. In the event that any concrete or asphalt does become damaged, it is the responsibility of the contractor to repair or replace the damage.

All access shall be located by the City of Evans and agreed to by the contractor.

The contractor is responsible for any necessary repairs to any and all irrigation components damaged during the seeding/sodding/soil preparation/etc., process.

The contractor is responsible for supplying all bag/quantity tags to the City of Evans at the completion of the project.

The contractor shall supply all labor, equipment, materials, and incidentals, as identified in the contract.

Daily cleanup of the construction site is required for safety, courtesy, and aesthetic reasons. This includes access areas into and out of the site.

At the completion of the contract, the contractor shall clean up all construction materials and debris, properly dispose of all said material and debris off site, and leave the construction site in a condition approved by the City of Evans.

B. SUBMITTALS

Submit each item in this article according to the conditions of the contract and particular specifications for the project.

Product data for the following:

- Fertilizers
- Erosion control materials
- Herbicides
- Compost - documentation from a reputable soils lab confirming compost meets or exceeds these Specifications.

Certification of grass seed from seed vendor for the composition of each grass-seed mixture stating the botanical and common name and percentage by weight of each species and variety and percentage of purity, germination, and weed seed (if any). Include the year of production and date of packaging. Seed packaging and identification tags are to be submitted to the Public Works Department at the completion of seeding.

Certification of each seed mixture for sod, identifying sod source including name and telephone number of supplier.

Material test reports from qualified independent testing agency indicating and interpreting test results relative to compliance of the following materials with requirements indicated:

Analysis of existing topsoil's on site as detailed in these Specifications.

Seeding schedule indicating anticipated dates for each type of planting to be furnished by Contractor.

C. DELIVERY, STORAGE, AND HANDLING

1. Seed: Deliver seed in original sealed, labeled, and undamaged containers.
2. Sod: Harvest, deliver, store, and handle sod according to the requirements of the American Sod Producers Associations (ASPA) Specifications for Turfgrass Sod Materials and Transplanting/Installing
3. Storage: All materials shall be furnished in original manufactures shipping bags or containers and remain so until used. All materials shall be stored in manner, which will prevent them from coming into contact with precipitation, surface water, or other contaminating substances.
4. Damage in transit or storage: All materials, which have become wet, moldy, or otherwise damaged in transit or in storage shall not be used.

D. COORDINATION AND SCHEDULING

1. Planting Season: Sow lawn seed and native grass seed during normal planting seasons for type of seeding work required. Seeding schedule to be provided by owner upon award of contract. Correlate seeding with specified maintenance periods to provide required maintenance from date of Completion and final acceptance of project installation.

2. Weather Limitations: Proceed with planting only when existing and forecast weather conditions are suitable.

E. INSPECTION

When work has been completed on each phase of the project (grading, ripping, compost spreading, fertilizing, compost and fertilizer incorporation, final grading, debris removal, seeding/sodding) the contractor and the Public Works Department shall inspect the site together and determine the total area of work and whether the work is satisfactory and has been completed in accordance with the specifications required.

Deficiencies, if any, shall be noted and a punch list of these deficiencies will be given to the contractor by the Public Works Department. The contractor shall immediately correct any deficiencies identified on the punch list.

F. MAINTENANCE

1. Contractor to maintain seeded landscaping for a two (2) year (or as required per City MS4 Permit) maintenance period from the date of final acceptance of the project by the Public Works Department including all watering, mowing, trimming, reseeding, resodding, fertilizing, chemical and physical weed control and removal, and other operations as necessary for a healthy lawn.
2. Contractor to maintain sodded landscaping for a minimum thirty (30) day maintenance period from the date of final acceptance of the project by the Public Works Department including all watering, mowing, trimming, reseeding, resodding, fertilizing, chemical and physical weed control and removal, and other operations as necessary for a healthy lawn.
3. Replant bare areas larger than six (6) inches in diameter with same materials specified for each seed type within maintenance period.
4. Regrade, replant, and establish control, with erosion blankets or crimped straw, in eroded areas to produce a uniformly smooth surface.
5. Refill, regrade, and replant any tire rut areas from maintenance vehicles or mowers to produce a uniformly smooth surface.
6. Add new mulch in areas where mulch has been disturbed by wind or maintenance operations sufficiently to nullify its purpose. Anchor as required to prevent displacement.
7. Watering: Contractor shall be responsible for watering of seeded areas if he deems necessary to insure performance under this section. Apply only the amount of water necessary to maintain seeded areas in a healthy condition until the end of the warranty period. Reduce amount of water accordingly after seed is established. Avoid standing water, surface wash, or erosion from over watering. Trees and shrubs will need additional water for establishment and should be irrigated separately following an approved irrigation schedule.
8. Mowing: Mow grasses as soon as there is enough top growth to cut with mower set at three (3) inch height for Bluegrass and Fescue species and at a height required to leave a five (5) to six (6) inch stubble for native grass species. Mow native grass species a minimum of three (3) times per growing season during the maintenance period. Repeat mowing of Bluegrass and Fescue species as required to maintain specified height without cutting more than one-third (1/3) the height of the grass leaf growth at anyone mowing. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet.

9. Post fertilization: Apply fertilizer to Bluegrass and Fescue lawns after first mowing and when grass is dry. Use fertilizer as specified within these Specifications.

G. PRODUCTS

1. Topsoil: Use existing on-site soils. Amend existing surface soils with soil amendments to produce acceptable topsoil.
2. Herbicides: Coordinate EPA-registered and approved-of type utilized by the City of Evans Parks and Recreation Department.
3. Fertilizer: Fertilizer shall be a standard commercial product of uniform composition, free flowing and conforming to applicable State and Federal laws. Deliver in original, unopened containers unless provisions are made and approved by the Public Works Department for bulk deliveries. No Cyanamid compounds are permitted in mixed fertilizers. Submit manufacturers guaranteed analysis, name, trademark, and conformance to State law for all fertilizers. Application rates shall be based on recommendations of the soil analysis from the soils testing laboratory. Due caution shall be taken to avoid over-spreading.
4. Mulches: Provide air-dry, clean, mildew and seed free, threshed straw of wheat, rye, oats, or barley. Hay or cornstalks are not acceptable. At least seventy (70) percent of the mulch shall be ten (10) inches or more in length. Mulch shall not contain any noxious weed, must, cake, or decay.

H. EROSION CONTROL MATERIALS

1. General: Erosion control blankets, mats, or other commercial products for stabilizing land disturbed areas may be required in certain areas.
2. Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh on slopes exceeding 1:3. Include manufacturers recommended steel wire staples, six (6) inches in length.
3. Fiber Mesh: Biodegradable twisted jute or spun-coir mesh, 0.92 lb./ yd² (0.5/m²) minimum, with fifty (50) to sixty (60) percent open area. Include manufacturers recommended steel wire staples, six (6) inches in length.
4. Erosion control blankets/materials shall be rated for “long-term use” whenever available.

I. SOIL AMENDMENTS

All seeding and sodding installations will require soil preparation that includes the addition of compost at a rate of four (4) cubic yards of compost per thousand square feet (1000 SF) over the designated area(s).

The contractor is to supply A-1 Organic (Eaton, CO, 970-454-3492) Premium 3 compost or an approved equal. If the contractor is supplying an equal, it is the responsibility of the contractor to prove his product is an equal.

The compost shall be a well decomposed, stable, weed free organic matter source derived from agricultural, food, or industrial residuals; biosolids (treated sewage sludge); yard trimmings, or source-separated or mixed solid waste. The product shall contain no substances toxic to plants and shall be reasonably free (<1% by dry weight) of man-made foreign matter. The compost will possess no objectionable odors and shall resemble the raw material from which it was derived. The products parameters shall be as follows:

Table 2.01-1
Soil Amendment Parameters

pH Range:	5.5 - 8.0
Nutrient Content (dry weight basis):	N 1 % or above P 1 % or above
Organic Matter Content:	50 - 60 %
Bulk Density:	800 -1,000 lbs./SY
Moisture Content:	35 - 55
Particle size:	Pass through a one (1) inch screen or smaller
Stability:	Stable to highly stable, providing nutrients for plant growth
Maturity/Growth Screening:	Demonstrate ability to enhance plant growth
Soluble Salt Concentration:	4.0 dS (mmhols/cm) or less preferred

Prior to application, contractor is responsible for providing a sample and recent (within ninety (90) days) written documentation from a reputable soils lab confirming their compost meets or exceeds the above parameters.

J. SOD

Certified turfgrass sod complying with ASPA specifications for machine-cut thickness, size, strength, moisture content, and mowed height, and free of weeds and undesirable native grasses. Provide viable sod of uniform density, color, and texture of the following turfgrass species, strongly rooted, and capable of vigorous growth and development when planted.

Species: Provide sod of grass species and varieties, proportions by weight, and minimum percentages of purity, germination, and maximum percentage of weed seed.

Sod shall be Colorado grown, 100% certified blended Kentucky Bluegrass of three (3) to four (4) types, or a mixture approved by the City of Evans, complying with applicable Colorado and Federal regulations, having a healthy root system, regularly fertilized, watered, mowed, sprayed, and free from objectionable weeds and/or grasses. Sod strips shall have from five-eighths (5/8) inch minimum to one (1) inch maximum thickness of soil adhering to the root system, cut into strips eighteen (18) inch maximum width by twenty-four (24) inch minimum length.

Sod which has dried out, or sod with adhering soil which breaks, tears. Or crumbles away will not be accepted.

Sod cut for more than thirty-six (36) hours will not be accepted. Sod rolls shall be kept moist, protected from sun, heat, and wind, and properly protected in transport.

The sod source shall be made known to and approved by the City Public Works Department.

K. SEED

1. Grass Seed: Provide seed of grass species and varieties, proportions by weight, and minimum percentages of purity, germination, and maximum percentage of weed seed as indicated on schedules in this section.
2. Proportions and Mixing: All seed shall be mixed by a wholesale seed supplier in the proportions necessary to obtain the application rate specified in PLS units (native grasses only) or lbs./acre for other turf grasses.
3. Labels: All seed and seed mixes shall be furnished in bags or containers clearly labeled to show the name and address of the supplier, the common and scientific and variety name(s) of the seed(s), the lot number, net weight, percent of weed seed content, and the guaranteed percent of purity and germination.

4. Certification of Seed Testing: Contractor shall furnish to the Public Works Department a signed statement certifying that the seed furnished is from the lot that has been tested.
5. Seed is not to be used under any circumstances if it is wet, moldy, germinated, older than one year old, or is otherwise damaged in transit or storage.

L. SEED MIXTURE SCHEDULES—OPEN SPACE

1. Short grass mix. Seed must be applied with seed driller @ a rate of 11+ lbs. PLS per acre. (If broadcast, approved by the City of Evans only, apply @ a rate of 22+ PLS lbs. per acre).

Table 2.01-2
Short Grass Mix

Species	% Mix
Sand Drop Seed	10
Blue Grama	27
Little Bluestem	26
Sideoats Grama	27
Sand Lovegrass	10

2. Tall grass mix. Seed must be applied with seed driller @ a rate of 21+ lbs. PLS per acre. (If broadcast, approved by the City of Evans only, apply @ a rate of 42+ PLS lbs. per acre).

Table 2.01-3
Tall Grass Mix

Species	% Mix
Prairie Sandreed	30
Sand Bluestem	30
Yellow Indiangrass	30
Switchgrass	10

3. Combined mix. Seed must be applied with seed driller @ a rate of 13+ lbs. PLS per acre. (If broadcast, approved by the City of Evans only, apply @ a rate of 26+ PLS lbs. per acre).

Table 2.01-4
Combined Mix

Species	% Mix
Sand Drop Seed	10
Blue Grama	20
Little Bluestem	10
Sideoats Grama	10
Sand Lovegrass	10
Prairie Sandreed	10
Sand Bluestem	10
Yellow Indiangrass	10
Switchgrass	10

M. DETENTION POND AREAS

1. Slopes. Seed must be applied with seed driller @ a rate of 11+ lbs. PLS per acre. (If broadcast, approved by the City of Evans only, apply @ a rate of 22+ lbs. PLS per acre).

Table 2.01-5
Detention Pond Slopes

Species	% Mix
Blue Grama	27
Sideoats Grama	27
Little Bluestem	26
Sand Drop Seed	10
Sand Lovegrass	10

- Bottom areas of Detention Pond. Seed must be applied with seed driller @ a rate of 30+ lbs. PLS per acre. (If broadcast, approved by the City of Evans only, apply @ a rate of 60+ lbs. PLS per acre).

Table 2.01-6
Detention Pond Bottom Areas

Species	% Mix
Western Wheatgrass	90
Alkaligrass	10

- Outlet or low areas of Detention Pond. Seed must be applied with seed driller @ a rate of 8+ lbs. PLS per acre. (If broadcast, approved by the City of Evans only, apply @ a rate of 16+ lbs. PLS per acre).

Table 2.01-7
Detention Pond Outlet or Low Areas

Species	% Mix
Reed Canary Grass	75
Creeping Meadow Foxtail	25

N. RIGHT OF WAYS (ROADSIDES)

- Low grow mix. Seed must be applied with seed driller @ a rate of 22 lbs. PLS per acre. (If broadcast, approved by the City of Evans only, apply @ a rate of 44+ lbs. PLS per acre).

Table 2.01-8
Rights-of-Way Low Grow Mix

Species	% Mix
Buffalo Grass	60
Blue Grama	40

O. MULTI-USE PARK MIXTURE - GENERAL TURF

- Bluegrass Mixture. Seed must be applied with seed driller ONLY at a rate of 5 lbs. /1000 ft².

Table 2.01-9
Bluegrass Mixture

Species	% Mix
Kentucky Bluegrass (Limousine)	30
Kentucky Bluegrass* (Quantum Leap)	30
Kentucky Bluegrass* (Rugby II)	30
Perennial Ryegrass (Playmate Blend), <u>OR</u>	10
Calypso II, Racer, Manhattan III	100
*optional - substitute one of the two varieties with Marquis.	

P. EXECUTION

1. Examination. Examine areas to receive lawns and grass for compliance with requirements and for conditions affecting performance of work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.
2. Performance of Work: All work is to be performed by personnel thoroughly familiar with the proper and accepted methods for soil preparation, herbicide applications, fertilizing, seeding, mulching, etc. All work is to be performed under the supervision of the contractor’s superintendent, who shall be thoroughly familiar with the provisions of these specifications.

Q. PREPARATION

Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil bearing water runoff or airborne dust to adjacent properties and walkways.

Apply commercial Roundup, or equal, to all areas to be seeded a minimum of two (2) weeks after topsoil has been redistributed (if necessary) and prior to application of soil amendments. Apply herbicide only when weeds are growing vigorously and not when rain or precipitation is expected within twenty-four (24) hours. Apply at manufacturer’s recommended rate a minimum of two (2) weeks prior to seeding.

R. SOIL PREPARATION

Topsoil Analysis: Contractor to supply a soil analysis made by a qualified independent soil testing agency stating percentages of organic matter, actual percentages of inorganic matter (silt, clay, sand), deleterious material, pH, CEC (cation exchange capacity), SAR (sodium absorption rate), and mineral a plant nutrient content of topsoil in quantities measured in ppm. Prior to seeding the contractor will pay for and submit a soils test report on samples of material to be vegetated within the project area. At least one soils test per project soil type must be submitted.

The laboratory should be informed as to the proposed species to be planted, methods of irrigation, exposure, and elevation. Based on this information the laboratory shall provide written recommendations for soil amendments, fertilizers, and report the suitability of topsoil for lawn seed and native seed growth.

General: All ripping and tilling operations shall be done in a direction which follows the natural contours of the land on slopes of three to one (3:1) or less. Soils on slopes greater than three to one (3:1) will be prepared for planting in a manner specified by the Parks Representative. Any irregularities in the ground surface resulting from soil preparation operations shall be corrected and sloped to drain.

Limit subgrade preparation to areas that will be planted in the immediate future.

Any fill soil added to raise the soil level in any area shall be placed in no greater than six (6) inch lifts and then compacted to eliminate future settling (maximum compaction ninety (90) percent relative density).

Topsoil shall be ripped or tilled to a depth of six (6) inches to break up restrictive layers prior to seeding operations. Soils shall be worked until no clods greater than two (2) inches in diameter remain.

Clear the prepared area of stones, wood, vegetation, roots, rubbish, and all debris that will not pass through the tines of a garden rake (one (1) inch or over in diameter). Contractor must coordinate a

(clean-up) inspection by Public Works Department.

Contractor shall supply and deliver compost and spread the compost at the site specified. Uniformly and evenly spread three cubic yards of organic compost per thousand square feet (3 CY/1000 SF) over the designated area(s). Do not spread if planting soil or subgrade is frozen.

Disc or till compost material into the soil to a minimum depth of six (6) inches.

Rough grade the area with a drag mat to break up any and all clods and to establish a smooth uniform finish texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Clear the prepared area of stones, wood, roots, rubbish, and all debris that will not pass through the tines of a garden rake (one (1) inch or over in diameter) or any other objects that interfere with planting or maintenance operations.

Just prior to seeding, evenly broadcast and work into the soil, five (5) pounds per 1,000 SF (5lbs/1000SF) of 18-46-0 fertilizer. Contractor to submit to Public Works Department manufacturer's analyses and all tags from fertilizer must be submitted at the completion of the application. Fine grade the site to a smooth uniform grade in preparation for seeding.

Moisten prepared lawn areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

Restore prepared areas if eroded or otherwise disturbed after grading and before planting.

Allow for sod thickness in areas to be sodded.

S. EXECUTION - SOD

Any areas to be sodded or any and all turf grass disturbed during the construction process shall be constructed and/or repaired as indicated in these Specifications.

All affected areas will have existing sod removed with a sod cutter or other appropriate equipment to provide a uniform edge for sod replacement. All stripped sod shall be removed from the site and properly disposed of.

1. After any sod removal the area will be ripped to a minimum depth of six (6) inches.
2. Any fill soil added to raise the soil level in any area shall be placed in no greater than six (6) inch lifts and then compacted to eliminate future settling (maximum compaction ninety (90) percent relative density).
3. Follow all soil preparation specifications listed in these Specifications.
4. After rough grading and clean-up, the area must then be rolled to reduce future settling.
5. The prepared area(s) will then be fertilized at the rate specified from the topsoil analysis. Contractor must submit manufacturer's tag to verify analysis compliance.
6. Sodding dates must be submitted and approved by the Public Works Department.
7. Contractor must notify the Public Works Department twenty-four (24) hours prior to actual sodding to obtain approval of grade and sod bed prior to sodding. To avoid ponding, no tolerance of variance in sod area grading is permitted. If determined by the Public Works Department that the area must be regraded, contractor will regrade and/or add fill dirt (topsoil) to provide a smooth, even, and uniform transition from the undisturbed to the construction areas. If determined necessary by the Public Works Department, contractor may need to repeat all prior steps for compost and fertilization of the area.
8. Lay sod within twenty-four (24) hours of stripping. Do not lay sod if dormant or if ground is frozen.
9. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to sub grade or sod during installation. Tamp and roll lightly to ensure contact with sub grade,

eliminate air pockets, and to form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.

10. Lay sod across angle of slopes exceeding three (horizontal) to one (vertical) (3:1).
11. Anchor sod on slopes exceeding six (horizontal) to one (vertical) (6:1) with wooden pegs or steel staple anchors spaced as recommended by sod supplier but not less than two (2) anchors per sod strip to prevent slippage.
12. Saturate sod with fine water spray within two (2) hours of planting. During first week, water daily or more frequently as necessary to maintain moist soil to a minimum depth of one-and-one-half (1½) inches below the sod.

T. EXECUTION - SEEDING

1. Drill seed the site(s) using the specified seed mixes at the specified rates. Contractor shall use a seeder designed for the type of seed to be planted. All seed is to be drilled one-quarter (¼) inch to one-half (½) inch into the soil at the specified rate with a mechanical, power driven seeding drill. Rows shall be spaced not more than seven (7) inches apart. If using a range drill, the contractor shall drill one-half of the required rate in one compass direction and then drill the remaining one-half of the rate in a direction ninety (90) degrees to the first half.
2. In areas that may be inaccessible to drill seeding due to space constraints or slope, contractor shall recommend a best course of action to the Public Works Department in one of two methods available:
 - Hydro seeding: Apply seeded slurry with a hydraulic seeder at a rate at two (2) times the specified lbs./acre. Apply evenly in two intersecting directions. Immediately following seeding, immediately apply mulch to a thickness of one-eighth (1/8) inch. Maintain clear of shrubs and trees.
 - Hand seeding (native seed areas only): Seed shall be uniformly broadcast at two (2) times the specified lbs. PLS/acre rate. Evenly distributed by sowing seed in equal quantities in two (2) directions at right angles to each other. Do not broadcast or drop seed when wind velocity exceeds five (5) mph. Cover seed with a soil to a depth of one-quarter (¼) to one-half (½) inch.
3. Protect hand seeded slopes exceeding one to three (1:3) against erosion, with biodegradable erosion control blankets installed and stapled according to manufacturer's recommendations. Any area subject to erosion control must be made aware to Public Works Department prior to actual seeding.
4. Protect seeded areas with slopes less than one to three (1:3) against erosion by crimping straw mulch immediately after completion of seeding operations. Spread uniformly at a rate not to exceed two (2) tons per acre to form a continuous blanket one and one-half (1½) inch loose depth over seeded areas. Spread by hand, blower, mechanical spreader, or other suitable equipment.
5. Seed is not to be used under any circumstances if it is wet, moldy, germinated, older than one (1) year old, or is otherwise damaged in transit or storage.

U. HERBICIDES

Herbicides and other chemicals, when used, shall be applied using well-maintained spraying equipment by individuals working for the contractor who are appropriately licensed by the State or Federal agency having jurisdiction over such applications. It shall be the responsibility of the contractor to be knowledgeable of any and all current laws and regulations pertaining to herbicide and other chemical applications, and to advise the Public Works Department immediately if any requests for these applications made by the Public Works Department are inappropriate as they pertain to these laws and regulations.

Herbicides and other chemicals shall not be applied during periods when wind or other physical conditions cause the herbicides to be transported a distance of more than five (5) feet from the immediate area where they are being applied. It shall be the responsibility of the contractor to notify the Public Works Department immediately if any weather or other physical condition exists, which

would make applications inappropriate.

The contractor and the manufacturers recommendation shall apply all herbicides and other chemical at rates as determined.

V. PROTECTION

Protect seeded areas from unnecessary pedestrian or vehicular traffic until well-established through the use of fencing, barricades, and signage. Provide any additional erosion control measures which are necessary for the successful establishment of grass areas.



**CITY OF EVANS
PUBLIC WORKS DEPARTMENT
AUGUST 2019**

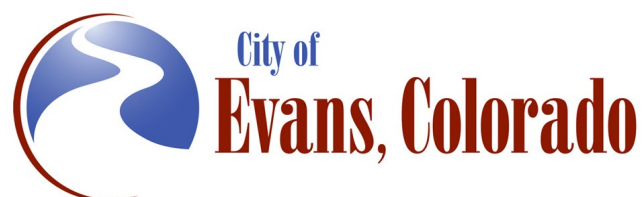


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SECTION 1 MINIMUM DESIGN CRITERIA

3.01.01 SCOPE

The purpose of this section is to present the City of Evans criteria for the design of streets. It is to be used by developers, design architects, and design engineers in the design of public and private streets for which approval by the City of Evans Public Works Department is required. All street design, layout, alignment, and classification shall conform to these design criteria, the City of Evans Subdivision Regulations, Comprehensive Plan, Transportation Master Plan, and the Evans Municipal Code.

3.01.02 INTENT

City's review and acceptance will only be to determine if the plans, specifications, and construction conform to the City's requirements. City's review and acceptance will not relieve the design professional and developer/contractor from responsibility for any variation from the City requirements or adequate design standards. The City's review and approval shall not constitute any assumption of responsibility or liability for the design or construction.

Design criteria as presented are intended to aid in preparation of plans and specifications for improvements within the City of Evans. These design criteria are considered minimum and a complete design may require more than is presented in this document. In special situations where the minimum standards are considered inappropriate, a variance to these criteria may be considered. Written request for each variance shall be directed to the Public Works Department.

3.01.03 GENERAL REQUIREMENTS

Prior to any private construction, a developer's agreement will be required for public improvements.

The provisions stipulated in this section are general in nature and shall be considered as applicable to all parts of these specifications, including any supplements and revisions.

Whenever the provisions of these specifications are found to be inconsistent with any other regulations or codes, the City shall determine the standard to apply. The provisions of these Specifications are minimum requirements that do not preclude imposition of more restrictive standards by agreement or by law.

Projects shall comply with all laws, regulations, codes, and ordinances applicable to the design and the furnishing and performance of the work. Except where otherwise expressly required by applicable laws, regulations, codes or ordinances, the City shall not be responsible for monitoring compliance with any law, regulation, code or ordinance.

Prior to the developer/contractor beginning work, an approved set of plans and specifications must be on file with the City of Evans. All contracts, bonds, insurance, permits, and licenses must be fully executed by the developer/contractor before beginning work. Contractor shall have a copy of these Standards and Specifications on the site at all times during construction.

All construction within the public right-of-way shall be designed by, or under the direct supervision of a registered professional engineer (PE) licensed to practice in the State of Colorado. All drawings and support data submitted to the City for approval must bear the PE's seal and signature. Construction will not be allowed until these documents have been certified by a PE. Any over-lot grading completed during the design phase of the project must be certified by a PE prior to the beginning of construction.

Consideration shall be given, within the established framework of local streets, to provide for uniformity of street widths, proper alignment, and conformity to existing street patterns. The street design shall be directly related to the traffic needs. The streets, intersections, driveways, and pedestrian facilities shall be designed to provide for the greatest safety for motorists, bicyclists, and pedestrians.

Developments adjacent to non-arterial streets shall dedicate rights-of-way and construct functional streets adjacent to the development. Developers adjacent to arterial roadways will dedicate right of way, in addition to constructing curb gutter and sidewalk, sidewalks and the outside lane. They may also be responsible for building a second lane to make the roadway functional. This additional lane width may be reimbursed from available transportation impact fees or as stipulated in associated development agreements.

All alleys shall be paved to a full width and should provide access to a paved street at both ends.

Residential lots adjacent to an arterial street shall be served by a local street paralleling such arterial, or by a series of cul-de-sacs or eyebrows off a parallel local or collector street. No direct access will be allowed from any lot abutting an arterial street.

Street improvement plans shall include the entire street width. Construction of partial street widths should be avoided, however approval may be granted by the Public Works Director. Sufficient engineering data shall be provided to demonstrate acceptable drainage, sight distance, and other related issues.

Development projects adjacent to existing public roadways must, in addition to dedicating additional right-of-way for future street expansion needs, evaluate existing improvements along those rights-of-way. These improvements include but are not limited to private utilities, irrigation facilities, fences, etc. Developments must provide for proper engineering and construction as necessary to modify and/or protect those facilities as well as provide proper development grading along the existing roadways to accommodate the design and construction of any future roadway improvements. City shall indicate type and requirements of the future adjacent roadway cross-section.

All proposed projects shall be referenced to the City of Evans' adopted vertical control network and shall obtain the location and elevation of the nearest appropriate reference monument from the City prior to survey.

3.01.04 GEOTECHNICAL REPORT

A geotechnical report shall be submitted to the City for review and acceptance prior to any construction related to the installation of public roadway improvements.

3.01.05 TRAFFIC IMPACT STUDIES

A traffic impact study is required to adequately assess the impact of a development proposal on the existing and/or planned street system. Unless waived by the Public Works Director, a written traffic impact study shall be required for all development proposals. Reference Appendix B for the City's Traffic Impact Study Policy.

3.01.06 PRECONSTRUCTION CONFERENCE

A preconstruction conference will be required prior to the beginning of construction. Attendance should include the Public Works Department, developer, general contractor, sub-contractors including earthwork, utilities, concrete, paving, and traffic control, and utility representatives.

3.01.07 RIGHTS-OF-WAY AND STREET CROSS-SECTIONS

Sufficient right-of-way shall be provided as required for the future roadway cross-section, maintenance of the street including cut or fill slopes, auxiliary lanes, landscaping, signing, utilities, and other aspects of the development.

Right-of-way and street widths shall meet or exceed the minimums set forth in Table 3.01-1. Additional right-of-way and roadway width may be required to accommodate traffic or other development needs such as turn lanes,

acceleration/deceleration lanes, extra lanes, pedestrian or bicycle facilities, landscaping, utilities, or construction requirements such as cut or fill slopes.

Table 3.01-1
General Street Parameters

Street Classification	Gateway Arterial (Freedom Parkway)	Arterial	Major Collector	Commercial Collector	Minor Collector	Local	Rural Local	Alley
ROW Width (ft)	120	110	80	70	65	60	60	30
Roadway Width (ft)	72	68	52	42	40	38	28	20
Roadway Width @ Intersections (ft)	120-140	80	64	50	40	38	28	20
Travel Lanes	4	4	4	2	2	2	2	2
Travel Lane Width (ft)	12	12	12	12	12	10	12	10
Bike Lanes	NA	NA	NA	NA	YES	NA	NA	NA
Bike Lane Width (ft)	NA	NA	NA	NA	5	NA	NA	NA
Parking Lane Width (ft)	NA	NA	NA	N/A	N/A	9	NA	NA
Traffic Volume ADT (<)	35,000	20,000	10,000	5,000	5,000	2,500	2,500	500
Design Speed (mph)	60	60	55	50	40	30	30	25
Posted Speed (mph)	55	55	50	45	35	25	25	20

See Section Details (S-21 through S-31).

A. GATEWAY ARTERIAL

Gateway Arterials shall be designed with four twelve-foot (4 - 12') travel lanes and with a twenty (20) foot raised landscaped median, with standard curb and gutter for a total width roadway of seventy-two (72) feet from flowline to flowline. Parking is prohibited on both sides of the roadway.

B. ARTERIAL

Arterials shall be designed with four twelve-foot (4 - 12') travel lanes and with a sixteen (16) foot center turning lane and/or a sixteen (16) foot raised landscaped median, with standard curb and gutter for a total width roadway of sixty-eight (68) feet from flowline to flowline. Parking is prohibited on both sides of the roadway.

C. MAJOR COLLECTOR

Major collectors shall be designed with four twelve-foot (4 - 12') travel lanes and standard curb and gutter for a total width roadway of fifty-two (52) feet from flowline to flowline. Parking is prohibited on both sides of the roadway. Provision may be necessary for an extended gutter pan to allow for a six (6) foot bike lane on each side of the roadway where bike lanes are appropriate.

D. COMMERCIAL COLLECTOR

Commercial collectors shall be designed with two twelve-foot (2 - 12') travel lanes and with a fourteen (14) foot center turning lane and/or a fourteen (14) foot raised landscaped median, with standard curb and gutter for a total width of forty-two (42) feet from flowline to flowline. Parking is prohibited on both sides of the roadway. Provision may be necessary for an extended gutter pan to allow for a six (6) foot bike lane on each side of the roadway where bike lanes are appropriate.

E. MINOR COLLECTOR

Minor collector #1 shall be designed with two twelve-foot (2 - 12') travel lanes with a twelve (12) foot turn lane, and with forty (40) feet roadway width flowline to flowline, with standard curb and gutter. Parking is not allowed on either side of the roadway. Provision may be necessary for an extended gutter pan to allow for a six (6) foot bike lane on each side of the roadway where bike lanes are appropriate.

F. LOCAL

Local #1 street shall be designed with a thirty-eight (38) foot roadway width from flowline to flowline with standard curb and gutter. Parking is allowed on both sides of the roadway.

G. RURAL LOCAL

Rural Local street may be specified for rural and/or large lot developments, each lot consisting of at least one (1) acre. Roadway widths (flowline to flowline) shall be designed with twenty-eight (28) feet of pavement. Parking is prohibited on both sides of the roadway.

H. ALLEY

Alleys shall be designed with twenty (20) foot roadway widths (flowline to flowline). Parking is prohibited on both sides of the roadway.

Table 3.01-2
Street Right-of-Way

Street Classification	R-O-W (in feet)*	Sidewalk on both sides (in feet)	Conditions
Gateway Arterial	120	10-foot detached	13-foot landscaped parkways** 20-foot raised median*** Driveways not permitted.
Arterial	110	10-foot detached	Driveways not permitted. 11-foot landscaped parkways** 16-foot turn lane or raised median***
Major Collector	80	8-foot detached	Driveways discouraged. 6-foot landscaped parkways**
Commercial Collector	70	8-foot attached	Driveways discouraged. 12-foot turn lane or median***
Minor Collector	65	8-foot attached	12-foot turn lane
Local	60	5-foot detached & 6-foot attached	6-foot landscaped parkways**
Rural Local	60	None	Permitted only adjacent lots of one acre or greater. Driveway crossing permitted at approved locations only. Minimum 10' drainage easements, minimum 5' utility easements outside right-of-way, both sides.
Alley	24	None	N/A

*Right-of-way option: In accordance with traffic studies/warrants, additional right-of-way may be required by the Director of Public Works or designee.

**Parkway landscaping: Parkways shall consist of City-approved ground cover with landscaped/xeriscaped areas that include shrubs, bushes, hedges or other landscaping ornaments as approved by the City. Minimum two (2) inch caliper deciduous trees shall be planted at thirty (30) to forty (40) foot spacings in the center of all parkways. Species shall be selected from the City-approved plant materials list. The placement of all trees shall meet the city’s sight distance standard.

***Landscaped median: Medians shall consist of City-approved ground cover with landscaped/xeriscaped areas that include two (2) inch caliper deciduous trees planted at thirty (30) to forty (40) foot spacings in the center of all medians. Shrub groupings may be added to the median design but shall not substitute for any trees. Species shall be selected from the City-approved plant materials list. The placement of all trees shall meet the City’s sight distance standards. The developer shall be responsible for installing the median and providing an appropriate maintenance mechanism for the median, including any irrigation.

3.01.08 STREET ALIGNMENT

The street pattern in a subdivision shall be the most advantageous configuration to serve adjoining areas and the entire neighborhood or district. Where appropriate to the design, proposed streets shall be continuous and in alignment with existing, planned, or platted streets.

Proposed streets shall be extended to the boundary lines of the subdivision, except where prohibited by topography or other physical conditions, or where such extension is not necessary for connection to adjacent properties. Where streets will be extended beyond the property line, sufficient engineering data shall be provided to establish feasibility of extension meeting City specifications.

Streets locations shall be in accordance with the City of Evans Comprehensive and Transportation Plans.

Provision for utility lines and facilities shall be provided as required for all street classifications.

A. HORIZONTAL ALIGNMENT CRITERIA

All proposed streets shall intersect at right angles unless topography and other limiting factors of good design and safety require otherwise. In no case shall the angle of intersection vary more than ten (10) degrees from a right angle to 100 feet back from the flowline of the intersected street.

Where street intersections are not in alignment, the street's centerline shall be offset in accordance with the Table 3.01-3.

Table 3.01-3
Intersecting Minimum Roadway Offset

Roadway Type	Distance
Arterial	660 feet
Collector	330 feet
Local	200 feet

The number of intersecting streets along arterials shall be held to a minimum. Such intersections shall be set apart not less than 660 feet on center.

Arterials and collectors intersecting with other arterial and collector streets should be at least one-quarter (¼) mile apart. Local streets should not intersect major collectors or arterial streets.

All proposed streets shall conform with the horizontal curve standards outlined in Table 3.01-4.

Table 3.01-4
Horizontal Curve Standards

Street Type	Minimum Curve Radius (ft)	Minimum Tangent Centerline between all Curve Radius Points (ft)
Gateway Arterial & Arterial	1,530	300
Major & Commercial Collector	745	250
Minor Collector	450	150
Local #1	250	100
Rural Local	200	100
Alley (where permitted)	60	---

B. VERTICAL ALIGNMENT CRITERIA

Vertical alignment and grades shall be designed to bear a logical relationship to the existing topography and drainage needs, and shall provide for the safety of motorists, pedestrians, and bicyclists.

Continuous changing of grades that create a "roller coaster" effect is not permitted.

All proposed streets shall conform with the minimum and maximum allowable street slope and street grade standards shown in Table 3.01-5.

Table 3.01-5
Allowable Street Slopes

Street Type	Street Grades % Min. /Max. (a) (b)	Street Cross Slope % (c)
Gateway Arterial & Arterial	0.6/5.0	2.0 Normal crown 4.0 Max. for super elevation
Major & Commercial Collector	0.6/7.0	2.0 Normal crown 4.0 Max. for super elevation
Minor Collector #1 & #2	0.6/7.0	2.0 Normal crown
Boulevard Collector	0.6/7.0	2.0 Normal crown
Local #1	0.6/8.0	2.0 Normal crown
Local #2	0.6/8.0	2.0 Normal crown
Rural Local	0.6/8.0	2.0 Normal crown
Alley (where permitted)	0.6/8.0	2.0 Min.
Emergency	0.6/8.0	2.0 Min.

- Notes: (a) Grading behind sidewalks and between detached sidewalk and curb shall be a maximum slope of 4:1.
 (b) Minimum grade may be reduced at City Engineer’s discretion.
 (c) Normal crown slope is two (2) percent. One (1) to four (4) percent is allowable at transition and other non-normal section with special design review.

Minimum grade on gutter shall be 0.6%. Cross-pans, cul-de-sacs, and curb return gutters shall have a minimum grade of 0.6%. See Standard Details (S-5).

Connections with existing streets shall be made in a way that will create a smooth transition. The higher volume street at an intersection shall govern the through grade and cross-sections. The maximum allowable approach grade at an intersection shall be two (2) percent for a distance as designated by Table 3.01-6.

Table 3.01-6
Approach Distance to Intersection

Intersected Street	Approaching Street		
	Local	Collector	Arterial
Arterial	-----	-----	200 feet
Collector	-----	75 feet	150 feet
Local	50 feet	50 feet	-----

Distances shown are measured from the flowline intersections. The intersection of any street with a higher classification street shall be designed to the ultimate street grade of that street. The grading of the property adjacent to the higher classification street shall meet these ultimate grades.

See Street Intersection Approach Details (Nos. S-30 and S-31) located in Appendix A for elevation reference points and street crown transitions at street intersections for collector and arterial, and for local and collector, respectively.

A detail of the intersection, to show drainage and rideability, must be provided. Connection with existing streets shall be smooth transitions and existing grades shall be shown for at least 150 feet on all sides of the connection. The grade and ground lines of all streets that dead end, except cul-de-sacs, shall be continued for 500 feet beyond the proposed construction. The grade and ground lines of all arterials shall be designed to continue 1,000 feet beyond the end of proposed construction.

The minimum K values for crest and sag vertical curves shall be in accordance with the Minimum K Value Table in the current AASHTO manual.

The purpose of super elevating a roadway is to improve the riding comfort on curves where the traveling speed is great enough to exert a lateral thrust greater than that which can reasonably be resisted by friction alone.

In the City of Evans, super elevation may be allowed on arterial streets and selected collector streets in order to reduce the minimum centerline radius allowed. Super-elevation shall not be used on local streets. When super-elevations are required, the super elevation shall be in accordance with the recommendations of AASHTO and approved by the City.

When super elevation is used, a minimum 100-foot run-out shall be used entering and exiting the super elevated portion. In cases where the super elevation transition changes the gutter on one side of the street from water carrying to non-water carrying, the water must enter a storm sewer system or other acceptable outlet from the street, rather than crossing said street in sheet flow. The gutter shall always be inflow type.

When super elevation is used, the rate of super elevation shall be clearly shown on the drawings along with exaggerated (preferably one (1) inch equal twenty (20) feet horizontal, one (1) inch equal one (1) foot vertical) profiles of the centerline and both flowlines. The super elevation run-out length, crown run-out length, and point at which full super elevation is reached shall be clearly shown.

The design engineer shall show center line profiles on utility plans with center line stationing. Actual distances and grades of curb returns through the intersection shall be shown.

For arterial and major collector streets and for widening of existing streets, the design engineer shall provide cross-sections to the construction limits at a minimum of fifty (50) foot intervals on all streets showing existing and proposed construction. All driveways and center line profiles shall be provided to include the street, curb, gutter and walk to a point twenty (20) feet beyond the edge of the proposed roadway.

3.01.09 STREET CHARACTERISTICS

All street classifications shall be designed for the safety of motorists, pedestrians and bicyclists. Accessibility shall be provided in accordance with all ADA requirements.

Streets shall be designed to meet the design characteristics indicated in Table 3.01-7.

Table 3.01-7
Street Design Speed

Street Type	Design Speed (MPH)	Posted Speed Limit (MPH)	Number of travel lanes
Arterial	55	less than or equal to 45	4
Major & Commercial Collector	45	less than or equal to 40	4
Minor Collector	40	less than or equal to 35	2
Local	35	less than or equal to 30	2
Rural Local	35	less than or equal to 30	2

Table 3.01-8, Standard Design Volume, Design/Posted Speed, and Truck Percentage Table includes the standard design volumes, speed, and percent truck requirements to be used in the design of all streets unless site-specific conditions or the approved traffic impact study warrant different criteria.

Table 3.01-8
Standard Design Volume, Design Speed, & Truck Percentage

Street Type	Design Volume (AADT)	Design Speed (MPH)	Posted Speed (MPH)	% Truck
Gateway Arterial & Arterial	<35,000 & <20,000	60	55	(1) *
Major Collector	>10,000	55	45	(1) *
Commercial Collector	4,000 to 7,000	50	45	(1) *
Minor Collector	1,500 to 4,000	40	40	(1) *
Local	<1,500	30	25	1%
Local Rural	<2,500	30	25	1%
Alley	<500		20	5%

*Note: For collectors and arterials the percent truck usage shall be determined on a case-by-case basis.

A. GATEWAY ARTERIAL & ARTERIAL

FUNCTION - See Standard Details (S-22 and S-21). Arterial routes shall be designed to permit relatively unimpeded traffic movement and are intended for use on those routes where four (4) moving lanes and one (1) left-turn lane are required.

CONTINUITY - Arterials are continuous for several miles, generally connecting with intercity routes.

PLANNING CHARACTERISTICS - Arterials should be employed where traffic demand dictates. Arterials should be spaced from one-half to one (½ to 1) mile apart and should, where possible, be continuous. Arterials should act as boundaries between neighborhood areas. Intersections with collectors and arterial streets should be at least one-quarter (¼) mile apart. No street parking is allowed on arterial streets.

SAFETY - Arterial streets shall be designed to handle traffic volumes loading from and onto collector and arterial roadways.

TRAFFIC CONTROL - Traffic control shall be provided. Regulation of traffic shall be accomplished through the use of traffic signs, signals, and channelization. Traffic signals will normally be required at intersections with other arterials and some collectors. Warrant studies will be used to determine locations.

ACCESS CONDITIONS - Intersections shall be designed at-grade. Access from streets of lower classification will be permitted, but in all cases will be controlled by traffic control devices. Direct access to abutting property is not permitted unless no other access is reasonably available.

B. MAJOR AND COMMERCIAL COLLECTOR

FUNCTION - See Standard Details (S-23 and S-24). Major collector streets shall be designed to permit relatively unimpeded traffic movement and are intended for use on those routes where four (4) moving lanes are required but where a larger classified street is not warranted.

CONTINUITY - Major and commercial collectors are continuous for two (2) miles or more.

PLANNING CHARACTERISTICS - Major and commercial collector streets should be employed where traffic demands dictate. Major collector streets are intended for use in commercial/industrial areas or high density residential. Intersections with other collector and arterial streets should be at least one-quarter (¼) mile apart. Street parking is not allowed on major collector streets.

SAFETY - Major and commercial collectors shall be designed to handle traffic volumes loading from and onto local, other collector, and arterial roadways.

TRAFFIC CONTROL - Traffic control shall be provided. Regulation of traffic shall be accomplished through the use of traffic signs, signals, and channelization. Traffic signals will normally be located only at intersections with arterials.

ACCESS CONDITIONS - Intersections shall be designed at-grade. Access from streets of lower classification will be permitted, but in all cases will be controlled by traffic control devices. Direct access to abutting property is not permitted unless no other access is reasonably available.

C. MINOR COLLECTOR

FUNCTION - See Standard Details (S-25). Minor collectors collect and distribute traffic between arterial and local streets and serve as main connectors within communities, and link one neighborhood with another. Traffic carried by collector streets should have an origin or a destination within the community. Utility line easements shall be available.

CONTINUITY - Minor collectors should have continuity throughout a neighborhood but need not extend beyond the neighborhood. The minor collector is continuous for less than two (2) miles.

PLANNING CHARACTERISTICS - Minor collectors are generally intended for use within residential neighborhoods. Intersections with other collector and arterial streets should be at least one-quarter $\frac{1}{4}$ mile apart. Street parking is not allowed on minor collector streets.

SAFETY - Minor collectors shall be designed to handle traffic volumes loading from and onto local, other collector, and arterial roadways.

TRAFFIC CONTROL - Regulation of traffic shall be accomplished through the use of stop signs and channelization. Traffic signals are normally used only at intersections with major collectors and arterial streets.

ACCESS CONDITIONS - Intersections shall be designed at-grade with access to abutting property permitted.

E. LOCAL STREETS

FUNCTION - See Standard Details (S-21 through S-28). Local streets shall provide direct access to adjacent property. Traffic carried by local streets should have an origin or a destination within the neighborhood. Utility line easements shall be available.

LIMITED CONTINUITY - Local streets should be designed to discourage through traffic from moving through the neighborhood. Local-Standard #1 streets should, however, be continuous within the local commercial area. Local streets are generally no longer than one-half ($\frac{1}{2}$) mile.

PLANNING CHARACTERISTICS - Local streets should not intersect major collectors or arterial streets. There are three (3) different types of local streets based on planned use.

Local streets are intended for use in medium to high density residential neighborhoods. Parking shall be allowed on both sides of Local-Standard #1 streets.

Rural local streets are intended for residential developments with a minimum lot size of two (2) acres (gross). Rural Local streets should not intersect major collectors or arterial streets. No on-street parking shall be allowed on a Rural Local street.

SAFETY - Local streets shall be designed for safety of motorists, pedestrians, and bicyclists and the ease of access to adjacent parcels of land.

TRAFFIC CONTROL - Traffic control shall be provided using stop signs at all intersections.

ACCESS CONDITIONS - Intersections shall be designed at-grade with direct access to abutting property permitted.

3.01.10 INTERSECTIONS

Intersections shall be designed to provide for the safety of motorists, pedestrians, and bicyclists.

Rights of way at intersections shall be adequate to provide for necessary improvements.

Intersection design shall take into consideration auxiliary turn lanes as required by the approved traffic impact study, or as required for site-specific conditions.

The design criteria for all street intersections shall conform with the horizontal alignment criteria outlined in these Specifications.

Pedestrian curb ramp access at all intersections and all other locations as determined by the Director of Public Works or designee shall be designed and constructed. See Standard Details (S-11 through S-15) for additional specifications.

Clear vision zone is that area which shall be maintained free of obstructions to preserve the sight, distance, and safety of motorists, pedestrians, and bicyclists, by requiring an unobstructed Intersection Sight Distance (ISD) area.

ISD is the unobstructed line of sight necessary for most drivers stopped at an intersection to see an approaching vehicle to avoid a collision. When the lines of sight for both left and right directions are combined, a sight triangle is formed. There should be no visual obstructions over thirty-six (36) inches higher than the street level within this triangle.

The ISD depends on the design speed and desired vehicle maneuver (left, right, crossing). These areas shall be free from shrubs, berms, fences, signs, structures, parked vehicles, cabinets, or other materials or items greater than thirty-six (36) inches in height from the street level. Trees, within the sight distance triangle (whether within the public right-of-way or on private property) must not impair sight distance. Permits for planting trees are required by the City Parks and Recreation Department which will provide guidelines for the type, location, and spacing of trees. The minimum distances in Table 3.01-9 are typical sight distance triangles to be used under normal conditions and may be modified by the City in order to protect the public safety and welfare in the event that exceptional sight conditions necessitate such a modification. Y distances are measured along the closest edge of the traveled roadway. Current ASSHTO guidelines will govern if more restrictive.

Table 3.01-9
Sight Distance Triangle Setbacks

Type of Street	Speed (mph) of Major Street	Y Distance (feet)	X Distance (feet)
Arterial	35 - 50 +	450	15
Collector	30 - 35	350	15
Local	25 - 30	250	15

Note: All "X" distances shall be fifteen (15) feet measured perpendicular from the projected flowline back to center of travel/turn lane of the intersecting street. See Detail S-6 in Appendix A.

3.01.11 CUL-DE-SACS

Permanent dead-end streets shall be in the form of a cul-de-sac. Dead-end streets without a cul-de-sac shall not be allowed unless designed to connect with a future street. Temporary dead-end streets should be constructed with a temporary turn around or a temporary connection to another street, as directed by the City Engineer. A minimum sixty (60) foot radius temporary turn-around easement shall be required as determined by the City on temporary dead-end streets. See Standard Details (S-6).

Cul-de-sacs shall have a maximum length of 500 feet (measured along the centerline, from the center line of the intersecting street to the center point of the bulb).

Cul-de-sacs shall have a minimum flowline or edge of pavement radius of 50 feet. Cul-de-sacs shall have a minimum right-of-way radius of sixty (60) feet.

Surface drainage on a cul-de-sac shall be toward the intersecting street. Drainage to back of cul-de-sac must be approved by the Public Works Department. If drainage to the back of the cul-de-sac is approved, a twenty (20) foot (minimum) drainage Tract or easement shall be provided for a storm water pipe and emergency storm water overflow pan, see Standard Details (S-19). All other design criteria shall be based on the design criteria for the particular street classification.

3.01.12 PAVEMENT DESIGN

Pavement design shall be in accordance with the roadway structural design section of these specifications.

3.01.13 TRANSITIONS

Lane and pavement transition length shall be in accordance with current AASHTO requirements.

3.01.14 STREET PROJECTIONS INTO ADJOINING FUTURE SUBDIVISIONS

The location of projected streets shall allow for the proper projection of the storm sewer and sanitary system into adjacent natural drainage/service areas.

A stub street is a street that extends to dead end into an adjacent un-platted area. The storm drainage from the street will not be allowed to be directed onto the adjacent land. All utilities shall be extended to the boundary of these areas.

Stub streets shall end at the property line or beyond phase line with a temporary cul-de-sac unless the City allows otherwise.

All stub streets shall be constructed as a part of the development project. MUTCD Type III barricades shall be permanently installed on all stub streets that do not end on a cul-de-sac.

3.01.15 BUS STOPS

The following minimum design standards are offered as guidelines for the design and construction of bus stops. The City may vary any of the following requirements as deemed appropriate for the site and its particular situation. It is important that the applicant contact the City early in the review process to determine the exact location and proposed capacity of a bus stop in the proposed development. For additional specifications refer to Standard Details (S-2).

A. WIDTH

Bus lanes and stops shall be constructed be HMA over aggregate base or Portland cement concrete over aggregate base and at least ten (10) feet wide, or the same width as the normal travel lane, whichever is wider.

B. LENGTH

1. Near Intersection Stop

Near intersection bus stops should be at least fifty (50) feet long for a single bus, plus a thirty (30) to seventy (70) foot distance to the radius of intersection.

2. Mid-block Stop

Mid-block bus stops should be asphalt or concrete and include a composite of transition requirements for near and far-side bus stops. Total impacted area for a single bus stop would be seventy (70) feet as a thirty (30) foot bus stop with two (2) twenty (20) foot transitions before and after the bus stop or as approved by the City of Evans.

C. BUS SHELTER

Bus shelters should be used at major bus stops to protect users from the weather. Locations with high passenger demands and low bus service frequency should be given priority. The shelter should have maximum transparency and be highly visible from the surrounding area to assure users' safety. Shelters should be of vandal-proof construction and materials, durable, and easily maintained. The appearance of the shelter should be visually pleasing and in natural tones and have the same look throughout the system. Openings should be at least forty-eight (48) inches wide. Capacity should be based on maximum passenger accumulation at the stop, with approximately five (5) square feet per person allowed to develop size requirements. Bus stops shall not obstruct pedestrian flow or be located within the appropriate sight triangle.

3.01.16 DECELERATION LANES - ARTERIAL STREETS

The need for a deceleration lane shall be determined by a traffic impact study and the City.

The required deceleration lengths, excluding stored vehicles, are based on the posted speed limit for the arterial and will be based on the current AASHTO Manual.

On some arterials it is not possible to provide the full deceleration length due to existing conditions. In such instances, it will be necessary to coordinate the design with the City.

For deceleration lanes where it is necessary to store stopped vehicles, such as at traffic signals, additional lengths shall be provided to accommodate the average number of vehicles anticipated as indicated from the most recent traffic impact analysis.

3.01.17 MEDIANS

Prior to design of any medians on public streets, the City shall be consulted for specific requirements. Generally, medians should be designed to meet the requirements of the current AASHTO "Policy on Geometric Design of Highways and Streets."

Landscaped medians shall be provided with drainage facilities to handle sprinkler runoff and nuisance flows. Medians should be constructed with outfall curb and gutter if gutters are not needed to handle drainage.

The nose of the median on arterial streets should be a minimum of twenty (20) feet behind the flowline of the intersected street and shall not encroach on pedestrian crosswalks. Turning templates or appropriate design

software (i.e., AutoTurn by Transoft, Autodesk Civil 3D Vehicle Turning Calculator, or similar) must be used to determine the shape of the median.

The minimum radius for nose curbs should be two (2) feet to flowline. The minimum width of a median shall be four (4) feet.

Median cover design shall be approved by the City.

3.01.18 SIDEWALKS

Sidewalks shall be designed to provide for the safety of pedestrians. See Standard Details (S-7 through S-10 and S-16).

Pedestrian curb ramp access shall be designed and constructed at all intersections and as required by the City. See Standard Details (S-11 through S-15).

Wider sidewalks may be required by the City where warranted by anticipated pedestrian traffic such as at or near schools and/or parks.

All sidewalks shall have a minimum thickness of six (6) inches. Drive cuts and ramp areas require minimum thickness of six (6) inches. Minimum thickness of six (6) inches is required for full-length of areas where rollcurb without driveway cuts are used. All sidewalks shall be constructed of 4,500 psi concrete.

3.01.19 CURB AND GUTTER

All intersections and approved pedestrian crossings shall be designed and constructed with pedestrian curb ramp access. See Standard Details (S-11 through S-15). All curb and gutter shall be constructed of 4,500 psi concrete.

Drive approaches will be constructed in accordance with Standard Details (S-17 and S-18). Any deviation from this requirement will be considered on an individual basis.

Minimum grade on gutter shall be 0.5% unless otherwise approved by the Director of Public Works or designee.

Refer to the Curb Return Radii Table, Table 3.01-10, for specifications on curb return radii and curb type for each type of roadway.

Table 3.01-10
Curb Return Radii

Roadway Classification	Local Curb Return Radii (ft)	Collector Curb Return Radii (ft)	Arterial Curb Return Radii (ft)	Curb Type	Optional
Gateway Arterial & Arterial	-----	30	50	Type 2 Section II-B	N/A
Major & Commercial Collector	-----	30	30	Type 2 Section II-B	N/A
Minor Collector	30	30	30	Type 2 Section II-B	Section D-1A
Local #1	30	30	-----	Type 2 Section II-B (Commercial) & MS Modified (Residential)	Section D-1A (Residential only)
Rural Local	20	20	-----	-----	-----
Alley	20	-----	-----	-----	-----
Emergency Access Curb	20	-----	-----	-----	-----

3.01.20 DRAINAGE

Drainage system design shall be in accordance with the current Stormwater Utility Master Plan and Criteria adopted by the City of Evans, as well as the MHFD standards, whichever is most restrictive.

3.01.21 CROSS PANS

Cross pans shall be a minimum of eight (8) feet wide with a maximum flowline depth of two (2) inches. Mid-block cross pans shall be a minimum of ten (10) feet wide with two and one-half (2½) inches maximum depth. Larger widths may be required by the City.

No cross pans are allowed on arterial streets.

Signalized intersections will be evaluated on a case by case basis.

Minimum flowline grade on cross pans shall be 0.6%.

Cross pan approaches shall be designed using the appropriate design speeds.

Cross pans shall be in accordance with Standard Details (S-5).

All cross pans shall be constructed with 4,500 psi concrete.

3.01.22 INLETS

Inlets shall not be installed in the curb return and shall not be in line with accessibility ramps.

Inlets shall be designed and constructed in accordance with the current Drainage Standards adopted by the City of Evans.

All inlets shall have cast or marked language similar to “Do Not Dump - Drains to River.”

All inlets shall be constructed with 4,500 psi concrete.

3.01.23 CROSS SLOPE

A minimum cross slope on all streets shall be two (2) percent as measured from the lip of gutter to the street centerline from the high side of the street.

On streets with raised medians, minimum cross slope two (2) percent shall be measured from lip of median gutter to lip of gutter at street edge.

Maximum allowable cross slope (measured as above) shall be four (4) percent on all new construction.

Cross slope for widening an existing street or for adding turn lanes shall be a straight-line grade from crown to lip of new gutter adjacent to new pavement.

3.01.24 STREET LIGHTING SPECIFICATIONS

A. STREET LIGHTING

Generally, street lighting should have a spacing of 500 feet on straight blocks when using a 250-watt equivalent LED fixture. Use a staggered pattern of 300 feet when using 100-watt equivalent LED

fixtures for Davit poles. Maximum of 300 feet on straight blocks for decorative type poles. Final spacing shall be designed by the electric company serving the area.

Street lighting shall be placed to illuminate intersection, horizontal and/or vertical alignment changes or hazards, stop sign locations and/or street and avenue signs, mailbox clusters, and on cul-de-sacs greater than 250 feet long.

Do not place light poles within five (5) feet of a fire hydrant.

Install behind sidewalks or with a minimum of two feet clearance from face of curb to roadway side of support pole. Where attached sidewalks/bikeways wider than five (5) feet are used, median lighting will be considered.

Drawings for installations will be prepared by the developer/developer with help from the local power utility and approved by the City prior to installation. New subdivisions shall incorporate the approved ornamental fixture and/or pedestrian fixture.

Luminaries for use on local streets must equal or exceed the photometry of the 100-watt equivalent LED fixture with a mounting height of nineteen feet.

B. UNIFORM LIGHTING

Uniform lighting will be used on new roadway projects involving arterial and collector streets. The guidelines of the IES Lighting Handbook, latest edition and the Roadway Design Manual of the Colorado Division of Highways, latest edition and supplemental revisions will be used with engineering and economic considerations. All fixtures, poles, and designs will be reviewed and approved by the City.

Railroad crossing lighting will conform to the Railroad-Highway Grade Crossing Handbook (FHWA), most recent addition.

Signalized intersections will be lighted using combined streetlights and mast arms. Minimum of two (2) opposite corners will be lighted; mounting will be forty-five (45) degrees to the geometrics of the intersection. At the intersection of two (2) arterial streets all four (4) corners will be lighted.

C. INSTALLATION SEQUENCE

Underground electrical installation shall not begin until after curb and sidewalk is installed. Curb returns should not be installed on any street until after utility conduit is installed.

3.01.25 TRAFFIC CONTROL

All signs shall conform to current MUTCD Standards with MUTCD Colorado Supplement.

Street name signs will include City-approved logo.

All signs shall be installed on Telespar-type perforated posts with anchors at proper heights as per current MUTCD Standards.

Sign backings shall be as follows:

- Thirty (30) by thirty (30) inch or less shall be 0.080-gauge aluminum.
- Thirty-six (36) by thirty-six (36) inch or larger shall be 0.100-gauge aluminum.
- Extruded blades shall be a minimum of 0.091-gauge aluminum.

Street name signs for post mounting shall be extruded aluminum, minimum of six (6) inches by thirty (30) inches. The City of Evans standard is reflective green background with white letters and numbers, with block numbers and arrows, and if street signs are mounted overhead, upper case letters should be used.

All signs shall be mounted with City-approved, vandal-resistant type rivets and with washers.

Telespar-type posts shall meet or exceed the following:

- Posts – one-and-three-quarters inch by one and three-quarters by one and three-quarter (1¾ x 1¾) inch, twelve (12) gauge, ASTM Specification No. A653, Grade A, drilled on one (1) inch centers.
- Anchors – two (2) inch by two (2) inch by three (3) foot, twelve (12) gauge, ASTM Specification No. A653, drilled on one (1) inch centers.
- All posts and anchors shall be galvanized to ASTM Specification A653 coating designation G90.

All signs shall be retro-reflective type sheeting, seven (7) year guarantee, or approved equal (ASTM D 4956-04) per MUTCD Table 2A.3.

Signs placed on the shoulder of a street shall have a seven (7) foot clearance (minimum) from the bottom of sign to the ground, or as approved by the City. Overhead signs shall have a seventeen (17) foot clearance (minimum) from the bottom of sign to the ground, or as approved by the City.

All signs placed, with the exception of STOP and YIELD signs, shall be near property lines; they are not to intrude on driveways, doorways, or any type of entrance.

Mountings (Caps) for street name signs shall be the type for square Telespar and for extruded blades.

Signs shall be placed a minimum of five (5) feet from fire hydrant.

Anchors (stubs) shall be no greater than three (3) inches high from ground.

3.01.26 LANDSCAPE STANDARDS FOR STREETScape AND MEDIANS

The Parks and Recreation Department will approve all tree and shrub plantings on new and existing streetscapes and medians. Refer to City of Evans Park standards.

3.01.27 BIKE PATHS OR TRAILS CROSSING UNDER ROADWAYS

Where a bike path or trail crosses under a roadway, the horizontal distance from abutment face to curb or edge of water shall be twelve (12) feet, and the vertical clearance from bike path or trail surface to underside of bridge shall be ten (10) feet.

The trail surface elevation should be at or above the high-water mark for the two (2) year storm.

See Standard Details (S-1).

SECTION 2 ROADWAY STRUCTURAL DESIGN

3.02.01 GENERAL

The design of the pavement cross-section shall be performed by a Professional Engineer registered in the State of Colorado; whose expertise is in geotechnical engineering. The engineer's report for the pavement thickness design and the soils report upon which it is based will be submitted for review and approval prior to the final approval of any construction plans.

The geotechnical engineer shall submit a letter confirming that subgrade in place immediately prior to pavement operations is still in conformance with the pavement design.

Flexible pavements are those pavements which have sufficiently low bending resistance to maintain continuous contact with the underlying structure yet have sufficient stability to support a given traffic loading condition.

Rigid pavements are those pavements which possess a high bending resistance and distribute loads over a large area of foundation soil. Examples include Portland Cement concrete pavement, or Portland Cement concrete surfaced with asphalt.

3.02.02 PAVEMENT DESIGN CRITERIA

The design of streets shall be based on the design period of twenty (20) years. If a single pavement design is used for all streets within the development, that pavement design shall be based on the worst soil encountered from the standpoint of subgrade support.

The design of pavements shall be based upon the Roadway Design Manual of the State of Colorado, Department of Transportation, as modified by these specifications.

The Colorado Department of Transportation methodology is accepted for both rigid and flexible street pavement designs.

The strength coefficients of the various layers of the pavement structure shall be determined from the Colorado Department of Transportation Roadway Design Manual

A. CONCRETE PAVEMENT

The minimum concrete structural section shall be seven (7) inches of non-reinforced Portland Cement concrete pavement placed on six (6) inches of Class 4 or Class 5 base and compacted subgrade. Construction plans for concrete pavement shall include a layout for locations of construction joints. Concrete pavement shall not be allowed on local streets.

If the minimum pavement section is to be used, the Soils Report and Pavement Design must demonstrate the adequacy of the structural section for the soil conditions encountered. The City reserves the right to require concrete or treated subgrade in locations where traffic, utilities, type of construction, or time of construction would make asphalt on aggregate impractical.

B. ASPHALT PAVEMENT

Flyash subgrade treatment shall be required with all new roads constructed in the City of Evans. A pavement design shall be submitted that includes the flyash treatment of the subgrade recommended in these specifications by a Geotechnical Engineer licensed in the state of Colorado.

Full-depth asphalt is not an accepted alternate if treated subgrade is used. When flyash is used, a bond breaker shall be used. The thickness and the type of bond breaker shall be recommended by the geotechnical engineer and approved by the City.

Table 3.02-11
Flexible Pavement Design Criteria

Road Classification	20-Year Design Traffic Information		Serviceability Index (psi)			Reliability	Aggregate Base Thickness Class 5 or 6	Asphalt Thickness (inches)	Minimum Structural Number (3)
	M in. EDLA (2)	M in. ESAL	Si Init	St Final	D psi	%	Layer, inches	Layer, inches	
							Min	Min	
Local									
Local #1 & #2	5	36,500	4.5	2	2.5	65	6	4	2.42
Rural Local	5	36,500	4.5	2	2.5	65	6	4	2.42
Collector									
Minor Collector #1	25	182,500	4.5	2.3	2.2	75	6	5	2.86
Major Collector	50	365,000	4.5	2.3	2.2	85	6	6	3.30
Comm. Collector	50	365,000	4.5	2.3	2.2	85	6	6	3.30
Blvd. Collector	50	365,000	4.5	2.3	2.2	85	6	6	3.30
Arterial									
Gateway Arterial	200	1,460,000	4.5	2.5	2	90	8	6	3.52
Arterial	200	1,460,000	4.5	2.5	2	90	8	6	3.52
Notes									
1	Wearing surface course shall be Grading S or SX for residential roadway classification and Grading S for collector, arterials, and all industrial/commercial roadways.								
2	EDLA shall be calculated based on projected traffic uses. Minimum EDLA values are as given for the design lane. The City Engineer may require greater EDLA values if warranted. The EDLA for a Roundabout shall include the cumulative EDLA for each entry leg. EDLA for arterial/collector intersections shall be for two-way traffic.								
3	Minimum structural numbers are based on subgrade R-value=5 and CDOT Calculations; Mr = 3,025 & Std. Deviation = 0.44. CDOT design calculations shall be used for resilient modulus calculations for all roads.								
4	Single lane refers to a paved surface less than 20 feet wide, including residential alleys.								
5	Min/max lift thicknesses: Grade SX: 1½”/ 2½”, Grade S: – 2”/3”.								
6	The minimum HMA section for composite pavements shall be four (4) inches for Local, five (5) inches for Collectors, and six (6) inches for Arterials. The minimum ABC sections shall be as noted in the table above.								

SECTION 3 EXCAVATION, REMOVALS, AND EMBANKMENT

3.03.01 SCOPE

The work covered by this section includes the furnishing of all labor, equipment, supplies, and materials necessary to perform clearing, grubbing, and removal of objectionable materials from the right-of-way prior to grading operations and placement of embankment to conformity with lines, grades, and typical sections as shown on the plans.

All earthwork shall be performed in compliance with the City's MS4 Permit.

3.03.02 SOIL MATERIALS

Soil materials for roadway construction shall be as recommended in the approved geotechnical soils report. Embankment and fill material shall consist of soil, granular sand, gravel, and cobble material, free from frozen material, organic material, trash, glass, broken concrete, other corrosive, or deleterious material. The developer/contractor shall import approved material as necessary. Embankment and fill material must be stable and have a liquid limit less than forty (40) and a plastic index less than fifteen (15) when tested in accordance with AASHTO T-89 and T-91, respectively.

No material shall have a particle dimension larger than six (6) inches, or two-thirds ($\frac{2}{3}$) of the minimum layer depth, whichever is lesser. Where the subgrade layer is less than six (6) inches the maximum size shall not exceed one-half ($\frac{1}{2}$) the depth of the layer. These size restrictions are contingent upon the material being evenly distributed in finer material such that uniform soil consolidation is achieved. If uniform soil consolidation is not being achieved, the City may reduce the size of materials allowed or change the embankment and fill material requirements.

Where unstable subgrade is encountered, the developer/contractor shall take steps necessary to stabilize the material by techniques such as over-excavation and backfill with approved imported material, use of geotextile fabrics, or other combinations. The developer/contractor shall notify the City of the proposed solution to stabilize the subgrade. If required by the City, the developer's design engineer will make recommendations on stabilization techniques and materials. If tests or observations reveal that material being placed is not of suitable quality and structural value, the developer/contractor shall provide other material as approved by the City.

3.03.03 CLEARING AND GRUBBING

The natural ground surface shall be cleared of all vegetation such as trees, logs, upturned stumps, roots of downed trees, brush, grass, weeds, and all other objectionable materials within the limits of construction. All surface objects, trees, roots, and other protruding obstructions not designated to remain shall be cleared and/or grubbed, except stumps and roots and nonperishable solid objects which shall be removed a minimum of two (2) feet below subgrade or slope of embankments. In streets, stumps and root systems shall be removed to below the two (2) foot level. Except in areas to be excavated, all holes resulting from the removal of obstructions shall be backfilled with suitable material and compacted in accordance with these specifications.

Trees which are to be removed shall be removed in such a manner as not to injure standing trees, plants, and improvements which are to remain. Any object that is designated to remain and is damaged shall be repaired or replaced as directed by the City at the developer/contractor's expense. Before the start of any overlot grading, stock piling of soil, or clearing or grubbing operation, the developer/contractor shall file and obtain approval for a State of Colorado permit for Erosion and Sediment Control. Erosion control measures shall always be installed and functional prior to the start of any land disturbing activities and maintained.

3.03.04 REMOVAL AND DISPOSAL OF MATERIALS

All materials removed shall be disposed of outside of the right-of-way. No accumulation of flammable material shall remain on or adjacent to the right-of-way. The roadway and related work areas shall be left with a neat and

finished appearance. In no case shall the material removed from the right-of-way and stockpiled be left in such a manner as to pose erosion, weed, or other hazard to the public. Stockpiles shall have long sloping sides and in such a manner as to accommodate the use of mechanical mowing equipment and not in excess of four (horizontal) to one (vertical) (4:1).

The developer/contractor shall make all arrangements to obtain permission from property owners for disposal or storage locations outside the limits of the project. The developer/contractor shall legally dispose of all material that is deemed unusable by the City, off the project site prior to project completion.

The developer/contractor shall remove all debris from all sidewalks, curb and gutters, pans, and driveways at the construction site and dispose of the debris in an appropriate location.

3.03.05 REMOVAL OF EXISTING IMPROVEMENTS

A. BITUMINOUS PAVEMENT

Bituminous pavement shall be removed to clean, straight lines and should be perpendicular or parallel to the flow of traffic. The developer/contractor shall remove and properly dispose of pavement and road surfaces as a part of trench excavation. If the limits of the asphalt removal are within three (3) feet of the edge of pavement, the pavement shall be removed and replaced to the edge of the pavement. The width of pavement removed along the trench for the installation of pipe shall not exceed the width of the trench specified by more than one (1) foot of each side of the trench without approval of the City.

The edge of the trench should not be closer than three (3) feet to concrete structures (i.e., curb and gutter, sidewalks, driveways, inlets, etc.). The actual distance shall be dependent upon the characteristics of the soil, the type of equipment that is used for trenching, and the methods used for excavation and backfill. If, in the opinion of the City, concrete structures are endangered by undermining of the structure or settlement, the City may require that the structure be replaced, or special construction methods may be required, or the distance of the trench from the structure will be increased.

The developer/contractor shall use such methods such as cutting, drilling, or others that will ensure the breaking of pavement in a straight line. The face of the remaining pavement shall remain approximately vertical. If the edge is damaged during construction, it shall be re-cut prior to final bituminous patching. All saw-cutting shall not extend past the construction limits by more than three (3) inches and such over-cut shall be sealed in the same manner as cracks, or as directed by the City Engineer.

B. CONCRETE PAVEMENT AND STRUCTURES

Concrete to be removed shall be cut vertically with square edges such that each edge of the finished patch will be parallel or perpendicular to the direction of traffic. The edge for removal will be in a straight line set by a string line, chalk line, or other means to ensure a straight removal line deviating no more than one (1) inch in twenty (20) feet.

Cross pans, alley intersections, and concrete pavement shall be removed to the nearest construction joint or saw-cut to a minimum depth of two (2) inches. Sections shall be saw-cut in straight lines either parallel to the curb or perpendicular to the alignment of the sidewalk or curb. All other sawing shall not extend more than the depth of the cut past the construction limits and shall be sealed in the same manner as joints. If the removed portion falls within less than five (5) feet of a construction joint, cold joint, expansion joint, or edge, crack, or existing patch, the concrete shall be removed to the joint, crack, edge, or patch.

The developer/contractor shall avoid breaking away the edges of the existing pavement or damaging the remaining pavement with heavy construction equipment. The sawing of concrete shall be done carefully, and all damages due to developer/contractor's operations to concrete to remain in place shall

be repaired at the expense of the developer/contractor. The limits of removal of damaged concrete shall be determined in the field by the City or an authorized representative.

On sidewalks, bikeways, curb and gutters, valley gutters, driveways, and alley approaches, the minimum removal section shall be the entire panel, unless otherwise approved by the City Engineer.

Where monolithic curb, gutter, and sidewalk is encountered and only removal of curb and gutter is specified, a straight, full depth saw-cut will be required to separate the curb and gutter from the sidewalk.

Where designated for replacement, removed concrete shall be replaced within three (3) days from the time it was removed (weather permitting). In no case shall the developer/contractor be allowed to remove additional concrete until the three (3) day replacement schedule has been re-established.

In order to allow for forming and patch-back when removing curb and gutter or sidewalk abutting asphalt pavement, the developer/contractor shall remove the adjacent asphalt pavement and base course twenty-four (24) inches wide and six (6) inches deep. Asphalt removal shall be performed prior to concrete forming and then saw-cut for a neat, clean edge immediately prior to asphalt paving/restoration.

If a sidewalk or curb and gutter section is removed and replaced without the removal of the adjacent asphalt, the concrete must be placed such that no voids exist between the concrete and asphalt. The fall between the asphalt and lip of the gutter section must also meet the required cross-section within $\pm 1/4$ inch.

3.03.06 TREE REMOVAL

The Parks Division shall be notified, and their approval obtained prior to excavation of, removal, or trimming of any trees or shrubs within the public rights-of-way.

3.03.07 EXCAVATION

Excavation of all materials shall be performed in conformity to the lines and grades indicated on the drawings. Suitable material removed from the excavations may be used in the formation of embankments and backfilling or any other areas within the right-of-way as permitted by the City. Where material encountered within the limits of the work is considered unsuitable by the City, such material shall be excavated as directed by these standards, the plans, or the City, and replaced with suitable material.

Foundations and the pavement structure shall be placed on original, undisturbed soil or on structural backfill extended to the undisturbed soil. Foundations and the pavement structure shall not be founded on existing fill if encountered at the project site. If existing fill is encountered at the subgrade, the developer/contractor shall excavate to original undisturbed soil and bring the grade to the required elevation with approved material. Existing fill material, if encountered at the site, shall be removed. Existing fill may be stockpiled for reuse in backfills and embankments if it meets the requirements of the specifications. The developer/contractor shall remove unsuitable soil material as directed by the City. The disposal of unsuitable soil material is the responsibility of the developer/contractor.

Rock that is encountered at the site shall be excavated to a minimum depth of six (6) inches below subgrade within the limits of the roadbed.

The developer/contractor shall blend the intersection of cut slopes with the slopes of adjacent natural ground surfaces in a uniform manner. The tops of cut slopes shall be flattened and rounded in accordance with the approved plans.

All excavated material shall be stockpiled in a manner that does not endanger the work or workers, and does not obstruct sidewalks, streets, alleys, or driveways. The work shall be done in a manner that will minimize

interference with traffic and drainage of the street. The developer/contractor at the end of each day shall barricade all excavations and ditch lines, remove excess excavated material from travel ways, and thoroughly clean all streets, alleys, and sidewalks affected by the excavation.

Materials encountered during excavation such as trash, organic, or frozen material, and any other material which is unsatisfactory for use as backfill shall be removed from the site and appropriately disposed of at the developer/contractor's expense. Stones, concrete or asphalt chunks larger than six (6) inches, or frozen material shall be considered unsatisfactory backfill and removed by the developer/contractor, prior to project or phase completion. Frozen material, however, may be thawed out and used later.

3.03.08 EMBANKMENT

This work shall consist of the construction of embankments by depositing, placing, and compacting material of acceptable quality and structural value above the natural ground or other surface in conformance with the lines, grades, and cross-sections shown on the drawings or as established. Before any embankment is placed, clearing, tree removal, sod and topsoil removal over the entire area shall be performed in accordance with these specifications.

When an embankment is to be placed on slopes, it shall be continuously benched in horizontal layers to key into the existing slope. Each layer of the embankment material shall not exceed eight (8) inches in loose depth. The developer/contractor shall thoroughly mix and ensure uniform density and moisture for proper compaction.

Whenever material is encountered that is wet or otherwise unstable and is incapable of supporting structures or the roadbed, the material shall be over-excavated to a depth suitable for construction of a stable subgrade. The developer/contractor shall backfill over-excavated areas with a stabilization material approved by the City. An approved geotextile fabric shall be used where required by the City around the stabilization material and on the subgrade to stabilize the subgrade and prevent fines from migrating into the stabilization material.

Cut areas shall be thoroughly compacted for a depth of eight (8) inches below finished subgrade. Each layer in fill and cut areas shall be prepared, graded, and thoroughly compacted by static roller or vibratory equipment, as detailed in these specifications. The base of fill areas should be scarified to a depth of not less than six (6) inches and compacted to not less than ninety-five (95) percent of maximum density $\pm 2\%$ of optimum moisture content as determined by AASHTO T99 or as recommended by a geotechnical engineer, prior to placement of embankment material. Each layer shall be wetted or aerated, if necessary. No embankment material shall be placed upon soft, spongy, or frozen material or other material, the stability of which is, in the opinion of the City, unsuitable for the placement thereof.

SECTION 4 BACKFILL

3.04.01 SCOPE

This section includes the material and construction specifications for backfill and filter materials.

3.04.02 MATERIAL

A. STRUCTURAL BACKFILL

Structural Backfill shall comply with CDOT Standard Specifications Section 703.08.

Class 1 Structural Backfill shall be used on all bridges, box culverts, or where otherwise specified. In addition, this material shall have a liquid limit not to exceed thirty-five (35) and a plasticity index of not over six (6) when tested in accordance with AASHTO T 89 and T 90, respectively.

Class 2 Structural Backfill shall be composed of suitable materials developed on the project. To be suitable for use under this classification, backfill shall be free of frozen soil, wood, or other organic material. If the material contains rock fragments or other materials that, in the opinion of the City, will be injurious to the structure, the native material shall not be used for backfilling, and the developer/contractor shall be required to furnish Class 1 Structural Backfill material.

B. FLOWABLE-FILL

Flowable-fill meeting the requirements in CDOT Standard Specifications Section 206 and 703, should be used to backfill all open cuts in portions of public right-of-way beneath existing paving, curb, gutter, or sidewalk improvements. Alternate backfill methods for large excavations will be considered on an individual review basis with the City. Flash fill may be used in some location with prior approval of the City Engineer.

The amount of water shall be such that the flowable-fill flows into place properly without excessive segregation.

C. FILTER MATERIAL

Filter material shall consist of free draining sand, gravel, slag, or crushed stone. The grading requirements are set forth in CDOT Standard Specifications Section 703.09 and Table 703-5.

During progress of construction, the developer's design engineer will determine the class of filter material to be used. The selected class will be submitted to the City Engineer for approval.

3.04.03 STRUCTURAL EXCAVATION

Unsuitable foundation material shall be removed and disposed of in a manner acceptable to the City. Unsuitable foundation material which is suitable for embankments and suitable surplus excavated material shall be used in the construction of embankments. Unsuitable material removed below designed elevation shall be replaced with approved material.

Rock, hardpan, or other unyielding material encountered in trenches for culvert pipe or conduit shall be removed below the designed grade for a minimum depth of twelve (12) inches. This extra depth excavation shall be backfilled with loose structural backfill (Class 1) or other approved material. The base of structural backfill shall be scarified to a depth of six (6) inches and compacted to a density of not less than ninety-five (95) percent of maximum density $\pm 2\%$ of optimum moisture content as determined by AASHTO T99 or as recommended by a geotechnical engineer, prior to placement of any structural element or structural backfill. The type of compaction shall be the same as that required for structural backfill (Class 2), as specified below.

3.04.04 STRUCTURAL BACKFILL

Backfill shall consist of approved materials uniformly distributed in layers brought up equally on all sides of the structure. Each layer of backfill shall not exceed twelve (12) inches before compacting to the required density and before successive layers are placed. Structural backfill (Class 1) shall be compacted to a density of not less than ninety-five (95) percent of maximum density $\pm 2\%$ of optimum moisture content as determined by AASHTO T99 or as recommended by a geotechnical engineer.

Required density for structural backfill (Class 2) shall conform to the requirements of these specifications.

Compaction methods that produce horizontal or vertical earth pressures, which may cause excessive displacement or overturning, or may damage structures, shall not be used.

Backfill material shall not be deposited against newly constructed masonry or concrete structures until the concrete has developed a compressive strength of eighty (80) percent of the field compressive strength. Shape the surface of the subgrade under structures such that they are not above or more than one and one-quarter inch ($1\frac{1}{4}$) below the required subgrade elevation. Unless otherwise indicated in the contract or directed by the City, all sheeting and bracing used in making structure excavation shall be removed by the developer/contractor prior to backfilling.

3.04.05 FLOWABLE-FILL

Flowable-fill should be placed on top of a minimum of twelve (12) inches of squeegee material in all utility potholes in the right-of-way. The maximum layer of flowable-fill shall be twelve (12) inches.

Compaction of flowable-fill will not be required. Any damage resulting from placing flowable-fill in lifts that are too thick or from not allowing sufficient cure time between lifts shall be repaired at the developer/contractor's expense.

3.04.06 FILTER MATERIAL AND PLACEMENT

Construction requirements for filter material for subsurface drains shall conform to the applicable requirements of CDOT Standard Specifications Section 206.05.

Filter material shall be placed behind bridge abutments, wing walls, and retaining walls as recommended by the developer's design engineer and as provided in the design/construction plans. Wall drain outlets shall be backed with sacked filter material conforming to the gradation requirements for coarse aggregate No. 3 or No. 4 set forth in CDOT Standard Specifications Table 703-1. Filter material shall be placed in horizontal layers along with and by the same methods specified for structural backfill.

SECTION 5 SUBGRADE AND UNIMPROVED AREA PREPARATION

3.05.01 SCOPE

The work covered by this section concerns the furnishing of all labor, equipment, supplies, and materials needed to perform preparation of subgrade within the public right-of-way.

3.05.02 MATERIALS

A. GEOTEXTILE

Geotextile reinforcement shall be as recommended by an experienced geotechnical engineer retained by the owner, developer or developer/contractor and who is a registered PE in the State of Colorado.

B. FLYASH

This item shall consist of treating the subgrade, existing subbase or existing base by pulverization, adding Class "C" flyash, mixing and compacting of the mixed material to the required density. This item applies to natural ground or embankment and shall be constructed as specified herein and in conformity with the typical sections, lines and grades as shown on the Drawings or as established by the Engineer.

Flyash shall meet ASTM Specification 618, Section 3.2, when sampled and tested in accordance with Sections 4, 6 and 8, unless otherwise shown on the plans. Flyash shall be of the Class "C" designation containing a minimum of twenty-five (25) percent calcium carbonate.

The water used in the stabilized mixture shall be clean, clear, and free of sewage, vegetable matter, oil, acid and alkali. Water known to be potable may be used without testing. All other sources shall be tested in accordance with AASHTO T- 26 and approved by the Materials Engineer.

Flyash shall be stored and handled in closed weatherproof containers until immediately before distribution on the road.

If storage bins are used, they shall be completely enclosed.

If flyash is furnished in trucks, each truck shall have the weight of flyash certified on public scales or the developer/contractor shall place a set of standard platform truck scales or hopper scales at a location approved by the City Engineer.

3.05.03 EQUIPMENT

The machinery, tools and equipment necessary for proper prosecution of the work shall be on the project site prior to the beginning of construction operations.

3.05.04 CONSTRUCTION METHODS

It is the primary purpose of this specification to secure a completed course of treated material which contains a uniform flyash/soil mixture with no loose or segregated areas; has a uniform density and moisture content; is well bound for its full depth; and, has a smooth surface for placing subsequent courses. It shall be the responsibility of the developer/contractor to regulate the sequence of his work; to process a sufficient quantity of material to provide full depth as shown on plans; to use the proper amounts of flyash; to maintain the work; and, to rework the courses as necessary to meet the above requirements.

A. PREPARATION OF SUBGRADE

Before other construction operations are begun, the subgrade shall be graded and shaped to enable the flyash treatment of materials in place, in conformance with the lines, grades, and thickness shown on the plans. Unsuitable soil or materials shall be removed and replaced with acceptable material.

The subgrade shall be firm and able to support, without displacement, the construction equipment and the compaction hereinafter specified. Soft or yielding subgrade shall be corrected and made stable by scarifying, adding flyash, and compacting until it is of uniform stability.

If the developer/contractor elects to use a cutting and pulverizing machine that will remove the subgrade material accurately to the secondary grade and pulverize the material at the same time, he will not be required to expose the secondary grade nor windrow the material. However, the developer/contractor shall be required to roll the subgrade, as directed by the Engineer, before using the pulverizing machine and correct any soft areas that this rolling may reveal. This method will be permitted only where a machine is provided which will ensure that the material is cut uniformly to the proper depth and which has cutters that will plane the secondary grade to a smooth surface over the entire width of the cut. The machine shall be of such design that visible indication is given at all times that the machine is cutting to the proper depth.

B. APPLICATION

The flyash shall be spread by an approved spreader at the rates shown on the plans or as directed by the Engineer. A motor grader shall not be used to spread the flyash.

The flyash shall be distributed at a uniform rate and in such manner as to reduce the scattering of flyash by wind to a minimum. Flyash shall not be applied when wind conditions, in the opinion of the Engineer, are such that blowing flyash becomes objectionable to traffic or adjacent property owners.

C. MIXING

The soil and flyash shall be thoroughly mixed by approved rotary mixers or other approved equipment, and the mixing continued until, in the opinion of the Engineer, a homogeneous, friable mixture of soil and flyash is obtained, free from all clods or lumps. Initial mixing after the addition of flyash will be accomplished dry or with a minimum of water to prevent flyash balls. Water required to achieve the specified moisture content for the mixture should be added after initial mixing.

If the soil flyash mixture contains clods, they shall be reduced in size by raking, blading, disking, harrowing, scarifying or the use of other approved pulverization methods so that when all nonslaking aggregates retained on the No. 4 sieve are removed, the remainder of the material shall meet the following requirements when tested at the field moisture condition or dry by laboratory sieves:

- Minimum Passing one and three-quarter (1¾) inch sieve – 100 percent
- Minimum Passing No. 4 sieve – 60 percent

During final mixing, water shall be added to the materials as directed by the Engineer, until the proper moisture content has been secured. Water shall be added through the pulverizing machine or other method acceptable to the engineer to develop a uniform, controlled rate addition of the needed moisture. Final moisture content of the mix, prior to compaction, shall not exceed the optimum moisture content of the mix by more than two (2) percent nor by less than the optimum by more than four (4) percent. Should the natural moisture content of the soil be above the specified range, aeration of the soil may be required prior to addition of the flyash.

D. COMPACTION

Compaction of the mixture shall begin immediately after final mixing of the flyash and be completed within one (1) hour following addition of flyash and water. The material shall be sprinkled as necessary to maintain the optimum moisture. Compaction of the mixture shall begin at the bottom and shall continue until the entire depth of mixture is uniformly compacted to a specified density.

All non-uniform (too-wet, too dry, or insufficiently treated) areas which appear shall be corrected immediately by scarifying the areas affected, adding or removing material as required and reshaping the area by sprinkling and rolling. The surface of the course shall be maintained in a smooth condition, free from undulations and ruts, until other work is placed thereon, or the work is accepted.

The stabilized section shall be compacted to the extent necessary to provide the density specified below:

Description:

For flyash treated subgrade, existing subbase or existing base that will receive subsequent subbase or base courses	Not less than 95 percent maximum dry density (ASTM D-698)
For flyash treated subbase or base that will receive surface course	Not less than 96 percent maximum dry density (ASTM D-698)

In addition to the requirements specified for density, the full depth of the material shown on the plans shall be compacted to the extent necessary to remain firm and stable under construction equipment. After each section is completed, tests as necessary will be made by the Engineer. If the material fails to meet the density requirements, the Engineer may require it to be reworked as necessary to meet those requirements or require the developer/contractor to change his construction methods to obtain required density on the next section. Throughout this entire operation the shape of the course shall be maintained by blading, and the surface, upon completion, shall be smooth and in conformity with the typical section shown on the plans and to the established lines and grades. Blading should be terminated within two (2) hours after blending of the flyash. Should the material, due to any reason or cause, lose the required stability, density and finish before the next course is placed or the work is accepted, it shall be reprocessed, recompact, and refinished at the sole expense of the developer/contractor. Reprocessing shall follow the same pattern as the initial stabilization, including the addition of flyash.

E. FINISHING, CURING, AND PREPARATION FOR SURFACING

After the final layer or course of the treated subgrade, subbase or base has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections.

The resulting base surface shall be thoroughly rolled with a pneumatic tire roller and "clipped", "skinned" or "tight bladed" by a power grader to a depth of approximately fourteen (14) inch, removing all loosened stabilized material from the section. Recompaction of the loose material should not be attempted. The surface shall then be thoroughly compacted with the pneumatic roller, adding small increments of moisture as needed during rolling. If plus No. 4 aggregate is present in the mixture, one complete coverage of the section with the fat wheel roller shall be made immediately after the "clipping" operation. When directed by the Engineer, surface finishing methods may be varied from this procedure provided a dense, uniform surface is produced. The moisture content of the surface material must be maintained within the specified range during all finishing operations. Surface compaction and finishing shall proceed in such a manner as to produce, in not more than two (2) hours, a smooth, closely knit surface, free of cracks, ridges or loose material conforming to the crown, grade, and line shown on the plans.

After the flyash treated course has been finished as specified herein, the surface shall be protected against rapid drying by any of the following curing methods for a period of not less than three (3) days or until the surface or subsequent courses are placed:

- Maintain in a thorough and continuously moist condition by sprinkling.
- Apply a two (2) inch layer of earth on the completed course and maintain in a moist condition.
- Apply an asphalt membrane to the treated course, immediately after same is completed. The quantity and type of asphalt approved for use by the Engineer shall be sufficient to completely cover and seal the total surface of the base between crown lines and all voids. If the developer/contractor elects to use this method, it shall be the responsibility of the developer/contractor to protect the asphalt membrane from being picked up by traffic by either sanding or dusting the surface of same. The asphalt membrane may remain in place when the proposed surface or other base courses are placed. Asphaltic emulsions are not acceptable for the asphaltic membrane.

3.05.05 SUBGRADE COMPACTION

Field compaction densities for embankments and subgrade soils for improved areas shall be as indicated in the soil report but not less than ninety-five (95) percent of maximum density $\pm 2\%$ of optimum moisture content as determined by AASHTO T99.

Field compaction densities for embankments and soils for unimproved areas shall be not less than ninety (90) percent of maximum density $\pm 2\%$ of optimum moisture content as determined by AASHTO T99.

Do not compact topsoil.

The developer/contractor shall, when requested by the City, furnish the necessary equipment to proof-roll the subgrade even though density tests may indicate compliance with density requirements. Soft and yielding material and other portions of the subgrade which will not compact when rolled or tamped shall be removed as directed by the City and replaced with suitable material. If, based on proof-rolling, the City determines that the subgrade exhibits visible deflection in the form of weaving or pumping and/or the soil cracks, the developer/contractor shall be required to correct the problem to the satisfaction of the City.

Subgrade surfaces below excavated areas such as cut areas and undisturbed areas requiring additional preparation shall be scarified to a minimum depth of six (6) inches, moisture adjusted as needed and compacted until the required density and stability is obtained unless otherwise approved by the City. Scarification shall be done in such a manner as to achieve a uniform mixture of the subgrade soils. Pockets of clay, sand, dry, wet, or stratified soil layers are to be thoroughly mixed, creating a soil blend of uniform consistency.

Scarification shall mean a thorough mixing of the subgrade soils to the required depth either by equipment-mounted ripper teeth or turning the soil with a construction disc. If the scarified soil does not exhibit sufficient subgrade strength for roadway construction, the developer's geotechnical engineer shall be consulted, and alternate methods of construction may be approved by the City. Application of geotextile reinforcement may be accepted if recommended by the developer's geotechnical engineer.

If the required compaction is not obtained, it shall be the responsibility of the developer/contractor to re-compact the material. In cases where there is a failure to achieve the required compaction, the City may require that the backfill be removed and replaced with approved backfill material.

If the developer/contractor's scheduling of work, methods, or inclement weather caused a naturally suitable subgrade to become unstable, the area shall be sub-excavated and stabilized as described above at the developer/contractor's expense.

Acceptable compaction test results shall not relieve the developer/contractor from correction or repairing of any substandard work before or during the two-year (2) warranty period.

3.05.06 GEOTEXTILES

Geotextile reinforcement shall be used in areas of unstable subgrade if recommended by the developer's geotechnical engineer.

3.05.07 SUBGRADE TREATMENT

The surface of the roadbed shall be bladed to the established lines, grades, and cross sections as shown on the plans. The prepared roadbed shall be scarified to the depth and width required for the subgrade stabilization. The material thus obtained shall be pulverized. Application, mixing, and finishing shall be in accordance with CDOT Standard Specifications, Section 307.05 through 307.07. Hydrated Lime shall conform to the requirements of ASTM C 207, Type N. In addition, the residue retained on a #200 mesh sieve shall not exceed ten (10) percent when determined in accordance with ASTM C 110 (drying of the residue in an atmosphere free from carbon dioxide will not be required).

Use of a pozzolan material to treat the subgrade requires a mix design to be submitted by the developer's geotechnical engineer for approval. The pozzolan-treated subgrade will be tested upon completion to verify projected "R" values were achieved.

If any subgrade treatment is placed in the subgrade, a layer of road base shall be placed as a bond breaker before the placement of asphalt.

3.05.08 SUBGRADE SURFACE TOLERANCE

The excavation and embankments for the street, intersections, and driveways shall be finished to a reasonably smooth and uniform surface. Variations from the subgrade shall not exceed more than one-quarter ($\frac{1}{4}$) inch above or one-half ($\frac{1}{2}$) inch below the required subgrade elevation in soil and shall be sub-excavated to a minimum depth of six (6) inches in rock.

3.05.09 COMPACTION IN UTILITY TRENCHES, CULVERTS, ETC.

Utility trenches within the street right-of-way and easements (including service lines) must be mechanically compacted as indicated in the soils report but not less than ninety-five (95) percent of maximum density $\pm 2\%$ of optimum moisture content, as determined by AASHTO T99. All water and sewer services, including water and sewer main stub-outs, shall be installed prior to street construction. Compaction of service trenches shall extend to the street right-of-way line as a minimum. Water settlement and/or jetting of trenches shall not be permitted.

SECTION 6 SUB-BASE

3.06.01 GENERAL

The sub-base, when required for stabilization of the subgrade, shall consist of a foundation course composed of granular material. The sub-base shall be placed on the prepared subgrade in accordance with these specifications and in conformance with the lines and grades and typical cross sections as shown on the plans or established.

3.06.02 MATERIALS

Sub-base material must meet the limits set forth in the CDOT Standard Specifications Table 703-2 for Class 1 material.

The material supplied shall be a well graded mixture, consisting of sound aggregate particles and sufficient filler or other proper quality binding material which, when placed and compacted, will result in a firm, dense, unyielding foundation. Balls of clay within the graded mixture will not be accepted.

3.06.03 PLACEMENT AND COMPACTION

Each layer of sub-base material shall be placed in layers not to exceed twelve (12) inches in compacted depth. Each layer shall be wetted or aerated, if necessary, and compacted to ninety-five (95) percent maximum density $\pm 2\%$ percent of optimum moisture as determined by AASHTO T99 or as recommended by a Geotechnical Engineer. No sub-base material shall be placed upon a soft, spongy, frozen, or otherwise unacceptable subgrade or other unsatisfactory subgrade, the stability of which is unsuitable for the placement thereof.

3.06.04 SUB-BASE SURFACE TOLERANCE

The prepared surface of the sub-base shall not vary by more than one-quarter ($\frac{1}{4}$) inch above or one-half ($\frac{1}{2}$) inch below the required subgrade elevation.

SECTION 7 BASE COURSE

3.07.01 GENERAL

The base shall consist of a foundation course composed of crushed gravel or crushed stone and filler, constructed on the prepared sub-base or subgrade in accordance with these specifications and in conformance with the lines and grades as shown on the plans or established. This work shall be completed in accordance with CDOT Standard Specifications Section 304 except as modified herein.

3.07.02 MATERIALS

A. BASE COURSE MATERIAL

A design mix shall be submitted to the City for review and approval. Aggregates for bases shall be crushed stone, crushed slag, crushed gravel, natural gravel, or crushed reclaimed concrete or asphalt material which conforms to the quality requirements of AASHTO M 147 except that the requirements for the ratio of minus #200 sieve fraction to the minus #40 sieve fraction, stated in 2.2.2 of AASHTO M 147, shall not apply. The requirements for the Los Angeles abrasion test (AASHTO T 96) do not apply to Class 1, 2, and 3 aggregates.

Crushed gravel or crushed stone base course material shall consist of hard durable particles or fragments of stone or gravel crushed to required size and a filler of sand or other finely divided mineral matter. The portion of the material retained on a No. 4 sieve shall be known as coarse aggregate, and that portion passing a No. 4 sieve shall be known as filler. When produced from gravel, not less than sixty (60) percent by weight of the coarse aggregate particles, shall be particles having at least one fractured face, and if necessary, to meet this requirement, or to eliminate an excess of filler, the gravel shall be screened.

The composite base course material shall be free from vegetation and lumps or balls of clay and shall meet the grading requirements for the class specified for the project. The liquid limit shall be per CDOT Standard Specifications Table 703-2 in accordance with AASHTO T 89, and the plasticity index shall not exceed six (6) when the aggregate is tested in accordance with AASHTO T 90.

The Soils Report shall identify areas that in the developer's geotechnical engineer's opinion need to be treated with mineral filler or hydrated lime.

For approved aggregate base course classifications see CDOT Standard Specifications Table 703-2.

B. COMMERCIAL MINERAL FILLERS

Portland cement shall conform to CDOT Standard Specifications subsection 701.01. Hydrated lime shall conform to CDOT Standard Specifications subsection 712.03.

C. PLANT MIXED-BITUMINOUS BASE COURSE

Plant mixed bituminous base may be substituted for the combination of asphalt and untreated base on an equivalent strength basis. This material consists of aggregate and bituminous material mixed in a central plant, spread and compacted on a prepared surface as specified in the CDOT Standard Specifications Section 301.

3.07.03 PLACEMENT AND COMPACTION OF BASE COURSE

A. PLACING

If the required compacted depth of the aggregate base course exceeds six (6) inches, it shall be constructed in two (2) or more layers of approximately equal thickness. The maximum compacted thickness of anyone (1) layer shall not exceed six (6) inches. When vibratory or other types of special compacting equipment are used, the compacted depth of a single layer may be increased to eight (8) inches upon request, provided that specified density is achieved and is approved by the City Engineer.

B. MIXING

The developer/contractor shall mix the aggregate by methods that produce a thorough and homogenous mixture.

C. SHAPING AND COMPACTION

Compaction of each layer shall continue until a density of not less than ninety-five (95) percent of the maximum density $\pm 2\%$ of optimum moisture content as determined by AASHTO T180 has been achieved or as recommended by a geotechnical engineer. The surface of each layer shall be maintained during the compaction operations so that uniform texture is produced and the aggregates are firmly keyed. Water shall be uniformly applied during compaction in the quantity necessary for proper consolidation of the material, or the material shall be harrowed, disked, bladed, or otherwise worked to ensure a uniform moisture content.

The subgrade and base course shall be free from standing water during construction. Remove any water encountered during construction to the extent necessary to provide a firm and stable subgrade and base course. Divert surface runoff or use other means necessary to accomplish the above. Do not deposit, tamp, roll or otherwise mechanically compact the aggregate base course in water. Do not construct aggregate base course with frozen material or on frozen subgrade.

The prepared surface upon which the surface course is to be placed will be tested with a ten (10) foot straight edge, or another approved device. The surface shall be tested prior to the application of any primer or pavement. The variation above or below the testing edge of the straight edge between any two (2) contacts with the surface shall not exceed one-quarter ($\frac{1}{4}$) inch. Any areas not complying with these tolerances shall be reworked to obtain conformity.

The in-place compacted thickness of aggregate base course shall be no more than one-quarter ($\frac{1}{4}$) inch less than the thickness shown on the approved drawings.

Immediately prior to paving, the aggregate base course shall be proof-rolled as described in these specifications to verify the base course stability. Areas that are found to be unstable shall be removed and replaced.

3.07.04 TESTING OF AGGREGATE

The developer/contractor shall sample and test the subgrade, sub-base, and base material prior to being used on the project site. Written results of the tests will be submitted to the City within ten (10) working days after the results of the tests are known.

The developer/contractor is responsible for the quality control testing and protection of work until the work is accepted by the City. The developer/contractor will provide acceptance testing. Acceptance testing may include but is not limited to tests associated with the base course subgrade preparation and trench compaction. See the Material Sampling and Testing Schedule in Appendix B for additional requirements.

The City may conduct additional testing. The developer/contractor shall provide access to allow for the City's testing representative, his operations, and materials.

SECTION 8 ASPHALTIC PAVING

3.08.01 GENERAL

These specifications include general requirements that are applicable to all types of plant-mix bituminous pavements, irrespective of gradation of aggregate, kind and quantity of bituminous material, or pavement use.

Paving consists of one (1) or more courses of bituminous mixture constructed on a prepared foundation in accordance with these specifications and the specific requirements of the type proposed for the project, and in conformity with the lines, grades, thicknesses, and typical cross-sections shown on the plans or established. This work shall be completed in accordance with CDOT Standard Specifications Division 400 except as modified herein.

The design engineer shall recommend the appropriate mix designations for a specific pavement design based upon:

- Traffic analysis
- Serviceability
- Drainage/environmental considerations
- Evaluation of the subgrade, sub-base, base, and surface course materials

Reclaimed Asphalt Pavement (RAP) material will be accepted in bituminous plant mixes provided that all the requirements for hot bituminous pavement are met, except that the mix shall not contain more than twenty (20) percent RAP material.

3.08.02 MIX DESIGN

A. GENERAL

The bituminous plant-mix shall be composed of a mixture of aggregate, filler, or additives (if required and approved), bituminous material, and reclaimed material if permitted.

Mix designs can either be general or site specific. All general mix designs shall be in accordance with CDOT Section 411 (asphalt materials) and Section 702 (bituminous materials).

Approved CDOT designations shall be Grading S (three-quarter ($\frac{3}{4}$) inch maximum) for new street construction. Grading SX (one-half ($\frac{1}{2}$) inch maximum) may be used for overlay or, in special cases, as authorized by the City. Grading SG (one-and-one-half inch by seven-eighths ($1\frac{1}{2} \times \frac{7}{8}$)) may be used as a bottom lift of asphalt on newly constructed streets.

B. SITE SPECIFIC

The developer/contractor proposed job-mix formula for each hot bituminous pavement grading will be tested utilizing materials actually produced and stockpiled for use on the project.

The job-mix formula for each mixture shall establish a single percentage of aggregate passing each required sieve size, a single percentage of bituminous material to be added to the aggregate, and a single temperature for the mixture at the discharge point of the plant.

Should a change in sources of materials be made, a new job-mix formula shall be established before the new material is used. This new job-mix formula shall be in effect until modified by the City. Requests made in writing by the developer/contractor for changes in the job-mix formula will be considered. A change in the job-mix formula will require a revised mix design to be furnished to the City.

C. QUALITY CONTROL

Quality control of the production of the mixture shall be the sole responsibility of the developer/contractor. All field and laboratory testing shall be performed by a qualified laboratory acceptable to the City. All test results shall be submitted to the City upon completion of the testing.

The City shall have the authority to perform additional acceptance testing at the City’s discretion. The cost of re-testing due to failed acceptance shall be borne by the developer/contractor. The developer/contractor shall cooperate with the quality assurance personnel representing the City without delay and shall make the work and materials available for testing at all times.

Typically, quality control testing during production of the mix typically is as shown in Quality Control Test Table, Table 3.08-12.

Table 3.08-12
Quality Control Test

TEST	METHOD	FREQUENCY
Gradation	AASHTO T27	a minimum of one for each mix design
Asphalt Content	AASHTO T164, ASTM D4125	a minimum of one for each mix design
Hveem Stability	AASHTO T246	a minimum of one for each mix design
Lottman	CPL 5109	a minimum of one for each mix design
Rice Value and VMA	Asphalt Institute Methods	a minimum of one for each mix design
Asphalt Oil Certificate of Compliance	---	one from each asphalt oil supplier

Where mixes contain polymerized asphalt, gradation samples shall be obtained from the cold feed. Where mixes contain AC-10F, samples shall be obtained at the construction site at appropriate locations. Where mix gradations exceed the tolerances shown for two consecutive tests, a new mix design shall be formulated prior to proceeding with any work.

3.08.03 SUBMITTALS

The developer/contractor shall submit the following to the City:

A. GENERAL MIX DESIGN

If the mix design conforms to CDOT Standard(s), a certificate of conformance shall be provided to the City.

B. SITE-SPECIFIC MIX DESIGN

No paving shall begin prior to the submittal and approval by the City of such mix designs. Prior to beginning paving each calendar year, the developer/contractor shall submit to the City for review and approval a mix design for each mix.

If a site-specific mix design is proposed, one (1) mix design shall be submitted to the City for each aggregate source and for each pavement type intended for use in constructing public streets.

Aggregate source mix design shall be submitted to the City and shall include the gradation and percentage by weight of each element proposed.

C. SUPPLIER

The name, address, and contact information for the plant supplying asphalt.

3.08.04 MATERIALS

A. AGGREGATES FOR PLANT-MIX HOT BITUMINOUS PAVEMENT

Aggregates for plant-mix hot bituminous pavement shall be of uniform quality, composed of clean, hard, durable particles of crushed stone, crushed gravel, natural gravel, or crushed slag. Excess of fine material shall be wasted before crushing. The natural sand content shall not exceed twenty (20) percent of the weight of the total aggregate blend for Gradings S and SX and fifteen (15) percent for Grading G. Natural sand is unprocessed, naturally occurring fine aggregate composed mostly of round particles. All aggregates shall be non-plastic when tested in accordance with AASHTO T 90.

Reclaimed material shall be of uniform quality. The maximum size of the reclaimed asphalt pavement shall be three-quarter ($\frac{3}{4}$) inch prior to introduction into the mixer.

The material shall not contain clay balls, organic matter, or other deleterious substances. The aggregate for Gradings S and SX shall have a percentage of wear of forty-five (45) percent or less when tested in accordance with AASHTO T 96.

B. MINERAL FILLER

Mineral filler shall conform to the requirements of AASHTO M 17 and shall consist of rock dust, slag dust, hydrated lime, hydraulic cement, flyash, or other suitable mineral matter. It shall be free of organic impurities and agglomerations. When used, it shall be dry enough to flow freely. Mineral filler shall be graded according to CDOT Standard Specifications Section 703.06. Mineral filler shall have a plasticity index not greater than four (4) excluding hydrated lime and hydraulic cement.

C. HYDRATED LIME

As per CDOT Standard Specification Section 712.03.

D. BITUMINOUS MATERIALS

Bituminous materials for paving shall be per CDOT Standard Specifications Section 702.01, meeting performance graded bitumen PG 64-22, unless otherwise approved by the City.

The City may require the developer/contractor to take a sample of the material for testing at any time.

3.08.05 WEATHER LIMITATIONS

Weather limitations shall be as per CDOT Standard Specification Section 401.07 and Section 407.04.

When it is in the public interest and approved by the City, minimum temperature requirements may be waived for placing tack coats and layers of bituminous mixtures below the top layer of the completed pavement. However, pavement operations will be suspended if density requirements are not met.

3.08.06 ASPHALT MIXING PLANT

The bituminous mixing plant shall be capable of producing a uniform material, have adequate capacity, and be maintained in good mechanical condition. Defective parts shall be replaced or repaired immediately if they adversely affect the proper functioning of the plant or plant units, or adversely affect the quality of the hot bituminous plant-mix.

Acceptable safety equipment, approved by the City, shall be provided by the developer/contractor or the supplier to accommodate sampling and testing.

Hot bituminous plant-mix shall not be stored longer than nine (9) hours, unless additional protective measures are used and pre-approved by the City.

When hot bituminous plant mix is obtained from a commercial plant, the developer/contractor shall make arrangements for approved laboratory facilities at the plant site for testing hot bituminous paving mixtures. The plant laboratory shall meet the requirements of CDOT Standard Specifications subsection 620.04.

3.08.07 HAULING EQUIPMENT

Trucks used for hauling bituminous mixtures shall have tight, clean, smooth metal beds thinly coated with a minimum amount of paraffin oil, lime solution, or other approved release agent. Petroleum distillates such as kerosene or fuel oil will not be permitted. Each truck shall have a cover of canvas or other suitable material to protect the mixture from the weather.

Any hauling and/or paving equipment that is leaking oil, fuel, or any other type of liquid, will be removed from the project and will be required to be inspected by the City before it will be allowed back on the project. If the piece of equipment is not fixed and continues to leak on the project, the City may reject the asphalt and require the asphalt to be removed at the developer/contractor's expense.

3.08.08 ASPHALT PAVERS

Self-propelled asphalt pavers shall be provided and equipped with an activated/vibrating screed assembly, heated, capable of spreading and finishing the bituminous plant-mix material in lane widths applicable to the typical section and thicknesses given for the project. Pavers used for shoulders and similar construction shall be capable of spreading and finishing courses of asphalt plant-mix material in widths given for the project.

The paver's receiving hopper shall have sufficient capacity for a uniform spreading operation and shall have an automatic distribution system that will place the mixture uniformly in front of the screed.

The screed or strike-off assembly shall produce the specified finished surface without tearing, shoving, rippling, or gouging the mixture.

The pavers shall be equipped with automatic screed controls with sensors capable of sensing grade from an outside reference line and maintaining the screed at the specified longitudinal grade and transverse slope. The sensor shall be constructed to operate from either or both sides of the paver and shall be capable of working with a ski-type device at least thirty (30) feet in length, or a short ski or short shoe.

The type of devices to be furnished shall be as provided in the specifications for the project.

The controls shall be capable of maintaining the screed at the specified transverse slope within $\pm 0.1\%$.

Manual operation will be permitted for constructing irregularly shaped and minor areas.

If the automatic controls fail or malfunction, the equipment may be operated manually for the remainder of the normal working day, provided specified results are obtained.

If the developer/contractor fails to obtain and maintain the surface tolerances as specified in these specifications, the paving operations shall be suspended until satisfactory corrections, repairs, or equipment replacements are made.

Placement of hot bituminous pavement on a waterproofed bridge deck shall be accomplished with equipment that will not damage the membrane or protective covering.

3.08.09 TACK COAT

Whenever new asphaltic pavement is placed on existing bituminous pavement, or against existing concrete surfaces (including gutter pans, curbs, manholes, and valve boxes) a bituminous tack coat shall be applied to the existing pavement prior to placing the new pavement. When the new pavement abuts the old pavement, the developer/contractor shall cut the old pavement as described in the Street Cut and Excavation Repair section of these Specifications, and spray the edge of the old pavement with a tack coat. The tack coat material shall conform to requirements for bituminous materials found in CDOT Standard Specifications Section 407, latest edition.

The surface to receive the tack coat shall be dry and cleaned by an approved method until all dust, debris, and foreign matter are removed. The tack coat material shall be applied at a rate of between 0.05 and 0.10 gal/yd² and at a temperature which will provide a very thin coating uniformly distributed over the entire area to be covered. The tack coat shall not be applied at temperatures outside the requirement in CDOT Standard Specifications Standard 407.04. At the City's direction, the developer/contractor shall provide adequate means of calibrating or measuring the rate of application which should not exceed 0.10 gal./yd².

3.08.10 SURFACE CONDITIONING

Before starting the paving, the developer/contractor shall ensure that utility lines, piping, general grading, and heavy trucking are complete so such operations will not damage paving work.

Prior to placing the pavement, the developer/contractor shall adjust manholes, valve boxes, and other fixtures to below pavement grade. These fixtures shall be adjusted to final grade after paving. See Standard Details (S-20, S-36 and S-37).

Irregularities in the existing pavement or base shall be brought to uniform grade and cross section. Prior to placing tack coat and beginning overlay work, the surface shall be swept to remove accumulations of loose gravel and debris in those areas where this is applicable. Contact surfaces of curbing, gutters, manholes, and other structures shall be sprayed with a uniform coating of bituminous material prior to placing asphalt mixture against them.

3.08.11 PREPARATION OF ASPHALT CEMENT

The bituminous material shall be heated to the specified temperature without local overheating and shall be continuously supplied to the mixer at a uniform temperature within the specified range.

3.08.12 PREPARATION OF AGGREGATES

Heating and drying of the aggregates shall be accomplished without damaging the aggregate.

When hydrated lime is used it shall be added to the aggregate in accordance with one of the following methods:

A. Lime Slurry Added to Aggregate

The hydrated lime shall be added to the aggregate in the form of slurry and then thoroughly mixed in an approved pugmill. The slurry shall contain a minimum of seventy (70) percent water by weight.

B. Dry Lime Added to Wet Aggregate

The dry hydrated lime shall be added to wet aggregate (a minimum of three (3) percent above saturated surface dry) and then thoroughly mixed in an approved pugmill.

The lime-aggregate mixture may be fed directly into the hot plant after mixing or it may be stockpiled for not more than ninety (90) days before introduction into the plant for mixing with the bituminous material. The hydrated lime may be added to different sized aggregates and stockpiled, by adding seventy-five (75) percent of the lime to the aggregate passing the No. 4 sieve and twenty-five (25) percent to the aggregate retained on the No. 4 sieve.

3.08.13 BITUMINOUS PAVEMENT MIXING

Mixing shall be in accordance with CDOT Specification 401.15 unless otherwise approved by the City.

3.08.14 SPREADING AND FINISHING

Spreading and finishing of hot bituminous pavement shall be in accordance with CDOT Specification 401.16, except as noted herein.

A. Asphalt Pavers and Other Equipment

Asphalt pavers shall be used to distribute the mixture to the established grade and required thickness over the entire width or partial width as practicable.

The developer/contractor shall protect the asphalt (both existing and new) from solvents and oils. Any piece of equipment leaking any fluid shall be removed from the work site immediately and shall not return to the work site until all leaks are repaired. If any piece of equipment leaks any fluid a second time, it shall be removed from the work site immediately and shall not be allowed on the work site again for the remainder of the project. The developer/contractor shall not use diesel or other solvents to remove or prevent the sticking of asphalt to the wheels of rubber-tired rollers or other equipment used on the asphalt.

B. Courses/Layers

The asphaltic surfacing shall be placed in at least two lifts on all street types.

The first lift shall be a minimum (not an average) of two (2) inches finished thickness on arterials and collectors. On local streets, the first lift (or base course) shall be a minimum of one and one-half (1½) inches and a maximum of two (2) inches. The top lift (or wear course) shall be a minimum of two (2) inch finished thickness. A tack coat between lifts is required if the top lift is not immediately placed on the first lift.

C. Surface Tolerance

For surface courses, the finished surface of the bituminous pavement when tested with a ten (10) foot straight-edge parallel to the centerline or perpendicular across joints will show variations as measured from the testing face of the straight-edge to the surface of the pavement, which shall not exceed three-sixteenths (3/16) of an inch or as per CDOT Specification Section 401.20. There shall be no allowance for standing water on the final pavement surface. After compaction, the asphalt pavement adjoining the curb and gutter shall be between one-quarter (¼) inch and one-half (½) inch higher than the lip of the gutter pan. Areas that do not meet the required surface accuracy shall be clearly marked, and, if the City requires repair, the developer/contractor shall correct the area by removing defective work and replacing it with new material as directed.

D. Thickness Tolerance

Any deficiency in the total thickness of the asphaltic pavement shall not exceed ten (10) percent for any one (1) sample with the average deficiency for all samples not to exceed seven and one-half (7½) percent. Final decision for correction of deficiencies shall not be made until a pavement evaluation is made by an independent testing laboratory retained by the developer/contractor.

E. Longitudinal Joints

The longitudinal joint in both new pavement and overlay pavement layers shall offset the joint in the layer immediately below by six (6) inches. The joints in any pavement layer shall not fall in a wheel track. The joints in the top layer of new pavement not built on top of an existing pavement shall be located at the centerline of the pavement and at the outside edge of the travel lanes for two lane roadways and at the lane lines and at the outside edge of the travel lanes for roadways of more than two lanes.

Where paving operations are on the present traveled roadway, the developer/contractor shall arrange paving operations so there will be no exposed longitudinal joints between adjacent travel lanes at the end of a day's run. With the approval of the City, the developer/contractor may be permitted a vertical or tapered exposed longitudinal joint when the thickness of pavement course being placed is one (1) inch or less, or a tapered exposed longitudinal joint when the thickness of pavement course being placed is greater than one (1) inch. Minimum width of taper shall be three times the thickness of the pavement course.

On areas where the use of mechanical spreading and finishing equipment is impracticable, the mixture shall be dumped, spread, raked, screeded, and luted by hand tools to the required compacted thickness. All oversized aggregate accumulating during hand raking shall be removed from the roadway surface and disposed of properly.

Production of the mixture shall be maintained so pavers can be used in echelon to place the wearing course in adjacent lanes.

F. Segregation of Asphalt

The bituminous mixture shall be transported and placed on the roadway without segregation. All segregated areas behind the paver shall be removed immediately upon discovery. The segregated material shall be replaced with specification material before the initial rolling has taken place. If more than fifty (50) square feet of segregated pavement is ordered removed and replaced in any continuous 500 linear feet of paver width lay-down, operations shall be discontinued until the source of the segregation has been found and corrected.

The City will determine the extent of segregated areas. The developer/contractor shall correct all segregated areas at his own cost.

3.08.15 HAND PLACEMENT

In narrow, deep, or irregular sections; intersections; turnouts; or driveways where it is impractical to spread and finish the mixtures by machine methods, the developer/contractor may use acceptable hand methods as accepted by the City.

When the mixture is to be spread by hand, upon arrival on the work site, it shall be dumped on the area on which it is to be spread. Immediately thereafter it shall be distributed into place by means of hot shovels and spread with hot rakes in a loose layer of uniform density and correct depth. Tines of the rakes shall be not less than one-half ($\frac{1}{2}$) inch longer than the maximum diameter of aggregate particles and in no case should the space be less than one (1) inch. Loads shall not be dumped any faster than they can be properly handled by the raker.

The raker will not be permitted to stand in the hot mixture while raking it, except where necessary to correct errors in the first raking. The raking must be carefully and skillfully done in such a manner that after the first passage of the roller over the raked mixture, a minimum amount of back patching will be required.

Placing mixture shall be as continuous as possible and the roller shall pass over the unprotected edge of the freshly laid mixture only when the laying of this course is to be discontinued for such intervals of time as to permit the mixture to become chilled.

In locations where vibratory plate compactor is required/used for hand placed materials, the existing/adjoining pavement shall be saw-cut and removed a minimum of one and one-half (1½) times the plate width to achieve compaction.

3.08.16 **COMPACTION**

The plant-mix bituminous pavement shall be compacted by rolling. Both steel wheel and pneumatic tire rollers will be required. The number, weight, and type of rollers furnished shall be that which is sufficient to obtain the required density while the mixture is in a workable condition. Compaction shall begin immediately after the mixture is placed and be continuous until the required density is obtained. When the mixture surface temperature falls below 185° Fahrenheit, no further compaction effort will be permitted unless approved.

All roller marks, ripples, or other surface defects shall be removed with the finish rolling. Use of vibratory rollers with the vibrator on will not be permitted during surface course final rolling and will not be permitted on any rolling on bridge decks covered with waterproofing membrane.

Pavement shall be compacted to a density of ninety-two (92) percent to ninety-six (96) percent of the maximum theoretical density, determined according to AASHTO T 209. Along forms, curbs, headers, walls, and all other places not accessible to the rollers, the mixture shall be thoroughly compacted with mechanical tampers.

Any mixture that becomes loose and broken, mixed with dirt, or is in any way defective, shall be immediately removed and replaced with fresh hot mixture, and compacted to conform with the surrounding area.

3.08.17 **JOINTS**

Placing of the bituminous paving shall be continuous, and rollers shall not pass over the unprotected end of a freshly laid mixture. Transverse joints shall be formed by cutting back on the previous run to expose the full depth of the course. A coat of bituminous material shall be applied to contact surfaces of all joints just before additional mixture is placed against the previously compacted material. Location and configuration of longitudinal joints shall be in accordance with CDOT Standard Specification subsection 401.16.

3.08.18 **QUALITY CONTROL**

A. **SITE SPECIFIC MIX DESIGN**

If a site-specific mix design is used, the City may obtain samples from the hot bituminous pavement supplier for analysis by an independent laboratory.

B. **TESTING AGGREGATE SPECIMENS**

Tests for cleanliness, abrasion loss, and percent of fractured faces will be made on representative samples of aggregate taken during production or from the stockpiles. These tests are the responsibility of the developer/contractor.

C. **TESTING ASPHALT SPECIMENS**

Production sample testing shall be done in accordance with Materials Sampling and Testing Schedule found in Appendix B.

The developer/contractor shall furnish the bituminous paving mixture necessary for quality control testing. A qualified testing laboratory acceptable to the City shall sample and test the specimens. All

test results shall be submitted to the City within ten (10) working days of the completion of testing. The developer/contractor shall be responsible for the quality control tests.

The primary purpose for sampling and testing fresh bituminous paving mixtures is to determine conformity with the job-mix formula for acceptance. Results of these tests may be used by the producer to control uniformity of the mixture at the place of manufacture. It is, therefore, very important that the samples of bituminous mixture represent, as nearly as possible, what the manufacturer is producing. A typical quality control testing program is as follows:

- One density test per 1,000 linear feet of pavement per day with a minimum of three (3) tests per project.
- Obtain one (1) sample for each 500 tons or fraction thereof of mix produced on a project, but not less than one (1) sample per project.
- One (1) Marshall/Rice test and gradation and extraction test per day of paving operation, unless the paving for the day is less than one hundred (100) tons.

3.08.19 ACCEPTANCE TESTING

The developer/contractor will provide production sample testing and acceptance testing.

Cores will be taken at the City's discretion to determine specific density, depth thickness of the asphaltic pavement, and compliance with the design mix. Core samples should be taken after the final lift, or as directed by the City. Where the core samples have been taken, new material shall be placed and compacted into the holes by the developer/contractor to conform with the surrounding areas.

Testing the in-place pavement for compliance with the requirements for surface smoothness may be required by the City. The City may perform additional acceptance testing if it is necessary to determine that the pavement is acceptable or to determine the extent of unacceptable pavement. The developer/contractor shall repair or remove and replace any unacceptable pavement as required by the City.

The developer/contractor shall be responsible for the costs associated with re-testing due to failed acceptance tests. The developer/contractor may contract with a qualified engineer to evaluate the unacceptable pavement and propose a remedy for review and approval by the City.

SECTION 9 STREET CUT AND EXCAVATION REPAIR

3.09.01 GENERAL

The purpose of this section is to provide guidelines for cutting and replacement of street surfaces in a manner that shall not degrade the existing improvements and shall be accomplished with minimum inconvenience to the users.

A. PROJECT INSPECTION

All construction and installations shall be subject to inspection by the City or its authorized representative. See Section 1.02.07 of these Specifications for additional information.

B. TRAFFIC CONTROL

The developer/contractor shall be responsible for all types of traffic, including pedestrians, in the construction area.

C. LICENSES AND PERMITS REQUIRED

See Section 1.02.02 of these Specifications.

D. COORDINATION

Except for emergencies, no excavation or street repair shall be undertaken without a permit. In the case of emergencies, obtain a permit for the excavation as soon as possible. The permit process is intended to identify problems with proposed work before it begins, as well as to maintain a record of construction in the public right-of-way.

No excavation or street repairs shall be allowed in new pavements (whether new construction or overlays) for the first five (5) years of the pavements' life. Street cuts in new pavements will be approved only as a last alternative, when boring or jacking for the proposed street crossing are not possible.

Traffic control plans shall be submitted forty-eight (48) hours in advance of construction and/or excavation permit.

E. PAVEMENT MANAGEMENT

The pavement condition shall be surveyed with the City prior to and after the work is completed.

In the case of minor repairs, these pavement surveys can be made by visual observation. However, in the case of a major project which involves excessive haul of materials or unusually heavy construction equipment or activity, non-destructive testing of the pavement condition before and after construction may be appropriate.

Street repairs for a particular section should be consistent with the pavement management strategy for that pavement.

3.09.02 MATERIALS

A. HOT BITUMINOUS PAVEMENT PATCHING

Patching materials shall conform to the requirements of these Specifications. New material used during infrared patching shall be hot bituminous pavement (Grading SX). Conventional patching shall be performed with hot bituminous pavement (Grading S).

This work consists of constructing one or more courses of bituminous pavement on a prepared base in accordance with these specifications, and in conformity with the lines, grades, thicknesses, and typical cross-sections shown on the plans or established. Work in this section shall be completed in accordance with CDOT Standard Specifications Section 403 except as modified herein.

Asphalt pavement for patching shall be composed of a mixture of aggregate, filler if required, and bituminous material.

B. CONCRETE PAVEMENT PATCHING

Patches for concrete pavement shall consist of Portland cement concrete Class D in accordance with CDOT Standard Specifications Section 601.

C. CONCRETE STRUCTURES

The concrete materials shall conform to the requirements of these Specifications.

D. FLOWABLE-FILL

Non-shrinkable trench backfill shall meet the requirements of these Specifications and CDOT 206.02(a), Structure Backfill, Class 2. Flowable-fill shall not exceed 100psi compressive strength and may be provided with zero (0) air entrainment (as per Weld County mix design.)

3.09.03 REMOVAL OF EXISTING IMPROVEMENTS

Whenever practical, existing pavements should be removed to clean, straight lines, parallel and perpendicular to the flow of traffic. Patches with angled sides and irregular shapes are not accepted.

Avoid patches within existing patches. If this cannot be avoided, make the boundaries of the patches coincide.

On arterial and collector streets, do not leave strips of pavement less than one-half (½) lane in width from the edge of the new patch to the edge of an existing patch or the lip of the gutter. In the case of residential streets, do not leave strips less than eight (8) feet in width from existing patches.

The City of Evans reserves the right to require overlays in areas determined by the City to have excessive patching.

Removals shall be in accordance with Section 3.03.05 of these Specifications.

3.09.04 TRENCH EXCAVATION AND BACKFILL

A. EXCAVATION

The developer/contractor shall protect the street and alley surfaces, drainage facilities, and all existing improvements from excavated materials, equipment operations, and other construction operations. Any damaged improvements shall be the responsibility of the developer/contractor. Adequate provisions must be made to assure that traffic and adjacent property developers experience a minimum of inconvenience.

Boring of utilities, whether service lines or main utility lines, shall be done in such a manner as to ensure there is no settlement of the soil or surface improvements. The developer/contractor is responsible for all settlement and damage that occurs due to boring or jacking operations. Tunneling shall not be permitted.

Trenches shall be excavated along the lines and grades established, and in no case shall more than 200 feet of trench be opened in one place without the completion of backfill and compaction prior to advancing. The trench shall be adequately supported, and the safety of workers provided for as required by the most recent standards adopted by the Occupational Safety and Health Act. The City reserves the right to inspect construction sites for compliance to OSHA regulations. The City is not responsible for the safety of any party or parties constructing the project.

All excavated material shall be stockpiled in a manner that does not endanger the work or workmen and that does not obstruct sidewalks, streets, and driveways. Hydrants under pressure, valve pit covers, valve boxes, electrical apparatus, manholes, inlets, and other utility controls shall be left unobstructed and accessible during construction, unless otherwise approved by the City. If emergency access is needed to any utility which is blocked, whether approved or not, the developer/contractor shall be responsible for removing the obstruction. Gutters shall be kept clear or other satisfactory provisions made for street drainage, and the natural water course shall not be obstructed. Stockpiles shall include appropriate stormwater protection measures (BMPs) in accordance with the City's MS4 Program.

The work shall be executed in a manner minimizing interference with traffic. The developer/contractor, at the end of each day, shall barricade all excavations and ditch lines, remove excess excavated material from travel ways, and thoroughly clean all streets, alleys, and sidewalks affected by the excavation.

Materials encountered during excavation such as rubbish, organic or frozen material, and any other material which is not satisfactory for use as backfill in the opinion of the City, shall be removed from the site and disposed of regularly by the developer/contractor at his expense. Stones, concrete, or asphalt chunks larger than six (6) inches, or frozen material shall be considered unsatisfactory backfill and removed by the developer/contractor. See Standard Details (S-32).

B. BACKFILL

Backfill in existing or proposed streets, curbs, gutters, sidewalks, bikeways, and alleys is divided into three categories: Initial Layer, Intermediate Layer, and Final Layer as defined below. See Standard Details (S-32).

1. Initial Layer

The initial layer consists of the section from the bottom of the excavation to a point six (6) to twelve (12) inches above the top of the installation. Placement and compaction of the initial layer shall be as specified by the utility to protect their installation. If compaction is not specified by the applicable utility, it shall be compacted to a minimum dry density of ninety-five (95) percent throughout the initial layer. All compacted backfill shall be $\pm 2\%$ of the optimum moisture content as determined by AASHTO T99 or as recommended by a geotechnical engineer. See Standard Details (S-32).

2. Intermediate Layer

The intermediate layer consists of the section above the initial layer to a point within twelve (12) inches of the ground level or the bottom of the pavement section, whichever is greater.

When the type of backfill material is not indicated on the drawings or specified, the developer/contractor may backfill with the excavated material, provided that such material consists of loam, clay, sand, gravel, or other materials that, in the opinion of the City, are suitable for backfilling. Excavated material to be used for backfilling shall be free of all rocks, stones, or boulders having a dimension greater than six (6) inches, and be free of all frozen earth, organic materials, cinders or other corrosive material, broken asphalt and concrete, debris and roots.

If excavated material is indicated on the drawings or specified for backfill and there is a deficiency due to a rejection of part thereof, the developer/contractor shall furnish the required amount of sand, gravel, or other approved material. Rocks or stones which are larger than three (3) inches, in any dimension, shall not be placed within one (1) foot of pavement subgrade or within one (1) foot of the finished surface of unpaved areas.

The intermediate layer in existing or proposed streets, curbs, gutters, valley gutters, sidewalks, bikeways, and alleys shall be placed in uniform, horizontal lifts not to exceed eight (8) inches loose and shall be compacted to a minimum dry density of ninety-five (95) percent throughout the intermediate layer. All compacted backfill shall be $\pm 2\%$ of the optimum moisture content as determined by AASHTO T99 or as recommended by a geotechnical engineer.

The intermediate layer within the right of way, but not below improvements shall be placed in uniform, horizontal lifts not to exceed twelve (12) inches loose and shall be compacted to a minimum dry density of ninety (90) percent throughout the intermediate layer. All compacted backfill shall be $\pm 2\%$ of the optimum moisture content as determined by AASHTO T99.

3. Final Layer

The final layer consists of that section above the intermediate layer, to the finished elevation or the bottom of the pavement section.

The final layer shall be Class 4, 5, or 6 aggregate base course, as defined in CDOT Standard Specifications Section 703.03, and shall be placed in uniform lifts no greater than six (6) inches in compacted depth and compacted to minimum of ninety-five (95) percent of maximum dry density, $\pm 2\%$ of optimum moisture content as determined by AASHTO T99 or as recommended by a geotechnical engineer. See Trench Excavation & Backfill Detail (No. S-32) for additional specifications.

No ponding or jetting of trenches or use of a hydrohammer or any impact-type compaction is allowed. Compaction shall be done by mechanical methods.

4. Compaction Testing – Sanitary Sewer and Storm Sewer

A compaction test shall be performed for every lift, maximum lift depth of twelve (12) inches, every 200 feet along the trench or as directed by the Engineer.

Two compaction tests shall be performed on every lift, maximum lift depth of twelve (12) inches, at each manhole on either side of the manhole along the trench.

5. Compaction Testing – Waterlines

A compaction test shall be performed for every lift, maximum lift depth of twelve (12) inches, every 200 feet along the trench or as directed by the Engineer.

Two compaction tests shall be performed on every lift, maximum lift depth of twelve (12) inches, at each valve cluster on either side of the cluster along the trench.

C. FLOWABLE-FILL

The use of flowable-fill (non-shrinkable trench backfill) is considered an acceptable alternative to backfilling and compacting with native or imported soils. Flowable-fill shall be in accordance with Section 3.04.06.

3.09.05 SURFACE RESTORATION

A. GENERAL

All persons working, obstructing, or making excavations in streets or public rights-of-way shall restore the street or public place to a condition at least as good as the condition prior to the work, obstruction, or excavation, with minimum inconvenience to the users.

Proof-rolling is required on subgrades and base courses prior to placement of subsequent courses. Proof-rolling shall be performed with equipment and in a manner acceptable to the City. The developer/contractor shall provide any equipment required for proof-rolling. Areas found to be weak and those areas which fail, shall be corrected and brought into compliance with these specifications by the developer/contractor.

Completed street repairs should have a rideability at least as good as, if not better than, the pavement prior to the repairs.

Do not place overlays with feathered edges and ends along curb and gutter or pans. Overlays on collectors and arterials should be placed by first removing the existing pavement to the desired depth by grinding and then replacing the pavement flush with the adjacent surfaces.

Due to delamination concerns it is the City's preference to mill and overlay versus feathering to assure pavement bonding. On some residential streets, overlays with feathered transitions may be acceptable with prior City approval. All overlays, regardless of thickness, shall provide smooth transitions and avoid problems with drainage or access at the edges of gutters.

Do not allow the edges of patches to fall in existing wheel paths. The edges of patches parallel to the direction of traffic should be limited to the boundaries of lanes or to the centerline of travel lanes. Patches should have a smooth longitudinal grade consistent with the existing roadway. Patches should also have a cross-slope or cross-section consistent with the design of the existing roadway.

Surface tolerances for street repairs shall not pond water nor deviate more than one-quarter (1/4) inch.

Avoid weakening or destroying the existing pavement around an excavation with heavy construction equipment, stockpiling, delivery of materials, etc. When damage does occur, remove the damaged pavement to a saw-cut line, extending the limits of the street repair, immediately prior to replacing the pavement.

Scarring, gouging, or other damaged pavement adjacent to a patch shall be removed and the pavement repaired.

In the case of older pavements where the likelihood of cracking and potholes next to the patch is greater, it may be necessary to extend the limit of the pavement patch and reinforce this area with a geotextile as specified in CDOT Standard Specifications Section 420.

For patches in asphalt, a tack coat shall be applied to all edges of the existing asphalt before placing the new pavement.

If the final surface is not immediately installed, place a temporary asphalt surface on any street cut opening with either a hot mix or cold mix paving material. Temporary surfaces shall be compacted and sealed to prevent degradation of the repair and existing structures during the temporary period.

Any temporary repair that fails to provide a smooth nonhazardous riding surface shall be removed and replaced immediately by the developer/contractor. As soon as conditions allow, the developer/contractor shall remove the temporary patch and install a permanent patch in accordance with these specifications. The developer/contractor shall be responsible for maintaining temporary patches in

a manner satisfactory to the City until they are replaced. In case of an emergency the City may elect to repair the temporary patch and back charge the developer/contractor for the repair of the patch.

All permanent patches and repairs shall be appropriate to the surface; for example, concrete patches in concrete surfaces, concrete base with asphalt overlay patches will be expected in permanent "overlaid" concrete streets, etc. In no case is there to be an asphalt patch in concrete streets or concrete patch in asphalt streets. Any repair not meeting these requirements will be removed and replaced by the developer/contractor at their expense.

All patches shall be made within the time frame stipulated in the street cut permit. Repair shall be made as rapidly as is consistent with high quality workmanship and materials. Use of fast setting concrete and similar techniques is encouraged when possible, without sacrifice of the quality of repair. Completion of the job including replacement of pavement and cleanup shall normally be accomplished within two (2) days after the repair work or activity involving the cut is done. Extension of time for completion shall be with the approval of the City. If the repairs are not completed in the allotted time the City will repair the street at the developer/contractor's expense.

Removal and replacement of unsatisfactory work shall be completed within thirty (30) days of written notification of the deficiency.

Upon completion of repair activities on shouldered roads, the developer/contractor will be responsible for restoring the roadside shoulder.

B. TRENCHING UNDERMINING EXISTING IMPROVEMENTS

Where trench excavations undercut existing pavements, curb and gutter, sidewalks, and/or existing utilities, the trench section shall be backfilled with flowable-fill unless otherwise approved by the City.

C. BORE HOLES

Bore holes (openings less than six (6) inches in diameter) shall be sealed with asphalt patching material to prevent entry of moisture. Subgrade shall be replaced and compacted to provide necessary support to the surface using flowable-fill to a minimum of six (6) inches below grade. Concrete patching material used shall, in all cases, be compatible with the existing surface.

All cut edges shall be cleaned and then painted with a tack coat of bitumen cement.

The sealing of bore holes is the responsibility of the developer/contractor or persons making the bore. The completed job shall be flush with the surrounding pavement and have no indentations, pockets, or recesses that may trap and hold water.

D. REPLACING GRAVEL SURFACES

When trenches are excavated in streets or alleys that have a gravel surface, the developer/contractor shall replace such surfacing with Class 6 backfill material conforming to CDOT Standard Specifications Section 703.03. Gravel replacement shall be one (1) inch greater in depth than that which originally existed, with a minimum of seven (7) inches and shall be adequately compacted. The surface shall conform to the original street grade. Where the completed surface settles, additional gravel base shall be placed and compacted by the developer/contractor immediately after being notified by the City to restore the roadbed surface to finished grade.

E. REPLACING CONCRETE

Replace concrete in accordance with Section 3.12 of these Specifications, Concrete Structures.

F. REPLACING BITUMINOUS PAVEMENT

Place and compact the full-depth asphaltic concrete pavement in layers with the maximum thickness of three (3) inches having a minimum depth of five (5) inches or one (1) inch greater than the original pavement, whichever is greater, and shall not to exceed seven (7) inches. Overlaying layers of asphaltic concrete pavement shall not be placed until the lower layer has cooled sufficiently to provide a stable material which will support the equipment without rutting, shoving, or moving in any manner. The temperature of the lower asphalt layer shall be less than 150° Fahrenheit before placing the second asphalt layer.

The transverse joint at each end of the overlay shall be milled a minimum of one and one-half (1½) inches or removed to provide a smooth transition from the overlay to the existing pavement.

Newly patched areas may not be opened to traffic earlier than two (2) hours after the completion of the patching work so that the asphalt has adequate time to cool before being subjected to traffic loads.

Patching materials and construction requirements for bituminous pavement shall meet the requirements for plant-mix hot bituminous pavement as detailed in these specifications.

Patching work adjacent to new concrete may not commence until the concrete has cured for a minimum of five (5) days. This time may be reduced if test results verify that field-cured test cylinders have attained an average compressive strength of 2,500 psi during a shorter curing time.

No patching may commence until the exposed subgrade at the base of the patch has been compacted adequately.

Apply a tack coat prior to paving with plant-mix hot bituminous pavement to the contact edges of previously constructed bituminous layers, aggregate base course, subgrade, concrete surfaces, and metal surfaces abutting or projecting into the bituminous pavement.

Patching may be performed by either conventional or infrared methods. Infrared patching, if used must conform to the following requirements:

- The infrared heating unit must be equipped with adjustable height controls and heating chambers capable of heating the existing bituminous pavement to a workable temperature without oxidizing or burning the oils. There shall be no flame in direct contact with the existing pavement surface.
- The heating unit must operate within six (6) inches of the existing pavement surface and be capable of heating an area that extends a minimum of thirty (30) inches beyond the face of the new pavement.
- Heat shall be continuously applied to the patch area until the existing pavement material can be manually raked and shaped to a depth of two (2) inches below the surface. The heated surface material located within twenty-four (24) inches of the new pavement shall be immediately raked off of the roadway surface, mixed with an approved rejuvenating agent, and placed into the void adjacent to the new pavement. The rejuvenating agent shall be applied at the rate of 0.20 gal./yd² (0.044 gallons per linear foot for a twenty-four (24) inch width). Mechanized compaction equipment shall be used to compact this material. Excess material shall be disposed of by the developer/contractor.
- New hot bituminous pavement material shall be added as necessary to fill the remaining void. This patch area shall be raked and luted as necessary to match the elevation of the adjacent pavement and concrete and provide positive drainage. A self-propelled, vibratory roller shall be used to provide complete compaction of the patch area and a smooth texture which matches the elevation of the surrounding surfaces. All oversized rocks shall be removed from the roadway surfaces.

G. FULL-DEPTH ASPHALT PATCHING

Full-depth asphalt patching shall be a minimum thickness of six (6) inches or one (1) inch greater than the existing asphalt, whichever is greater.

H. BITUMINOUS PAVEMENT WITH CONCRETE BASE

The concrete base shall be replaced with not less than six (6) inches of 4,500 psi concrete to a line one (1) inch lower than the bottom of the bituminous pavement. The bituminous finish layer shall not be placed on top of the concrete base for a period of two (2) days or until the compressive strength of the concrete is 2,000 psi or greater. Apply a tack coat of bitumen cement prior to application of the bituminous surface material.

I. CONCRETE STREETS

The pavement shall be removed back to the nearest contraction or expansion joint. Minimum patch shall be one-quarter (¼) panel section but no less than six (6) feet by five (5) feet with the six (6) foot dimension in the longitudinal direction. The concrete shall be replaced with 4,500 psi concrete to match the finish of the existing pavement.

To increase the load transfer and protect the pavement against differential settlement, the developer/contractor shall drill the existing concrete pavement and provide expansion dowels (No. 4 or No. 5 epoxy-coated rebar), at twenty-four (24) inches, minimum, distance on center at the mid-depth of the concrete. To facilitate this movement, the part of the dowel that protrudes into the patch shall be painted and covered with a one-sixteenth (1/16) of an inch coating of grease.

Concrete construction shall be protected from vehicular traffic, including developer/contractor vehicles for a period of not less than seven (7) days. This time may be reduced if test results verify that field cured test cylinders have attained an average compressive strength of 3,000 psi. Concrete shall be coated and sealed with a uniform application of membrane curing compound as outlined in CDOT Standard Specifications Section 412.14.

The use of high early-strength concrete shall be used on all arterial and collector streets. High, early strength concrete repairs may be opened to traffic within two (2) days unless "Quick Strength" concrete is used. Regardless of the type of concrete used, repairs may not be opened to traffic until the average compressive strength of field-cured test cylinders is at least 3,000 psi when tested.

J. JOINT FILLING

Following placement of the concrete surface, the joints shall be thoroughly cleaned of all foreign material, and then filled with hot-poured elastic type joint filler conforming to CDOT Standard Specifications subsection 705.01. Joint material shall be filled to within one-quarter (¼) inch of the surface. Excess material shall be scraped off to provide a smooth riding surface.

3.09.06 MATERIAL TESTING

The developer/contractor is responsible for the quality control testing and protection of work. Testing may include but is not limited to tests associated with placing of concrete, asphalt and base course subgrade preparation, and trench compaction.

The developer/contractor shall be responsible for the costs associated with re-testing due to failed acceptance tests. Additional testing for construction quality control, such as establishing roller patterns, compaction tests, etc., is considered for the developer/contractor's convenience and shall be provided by the developer/contractor at his discretion.

SECTION 10 MANHOLE AND VALVE BOX ADJUSTMENT

3.10.01 GENERAL

The developer/contractor shall adjust all manholes, valve boxes, survey monument boxes, and other fixtures encountered within the area to be paved to conform to the finished surface of the pavement to be built as per the street plans and details and in accordance with all requirements outlined in these specifications.

3.10.02 MATERIALS

Concrete or steel grade rings shall be used for adjusting manhole frames and covers, valve boxes, and other similar devices to proper grade and alignment. An acceptable non-shrink grout shall be used for resetting manhole frames and grade rings. Concrete used around manholes and valves boxes in landscaped areas shall be in accordance with Class D concrete as defined in CDOT Standard Specifications Section 601.02. When reinforcing steel is used it shall conform to CDOT Standards Specifications Section 602. See Standard Details (S-20, S-33 and S-34).

3.10.03 PROJECT INSPECTION

Manhole frames and covers and valve boxes and all other similar devices which must be accessed from the surface shall be raised to final grade. After adjustment, the developer/contractor shall notify the City for an inspection to check for cleanliness, proper alignment, and elevation.

All valve boxes shall be inspected by applying a valve key to each operating nut to ensure an acceptable alignment.

3.10.04 SAFETY

To provide proper protection to the public, manhole frames and covers and valve boxes shall be accessible no later than twenty-four (24) hours after they have been buried by the work in progress and brought to final grade within one week.

In order to provide safety for the traveling public, proper traffic controls shall be utilized and maintained at all times.

3.10.05 ASPHALT PAVEMENT LOCATIONS

Prior to installation of the final lift of asphalt pavement, final grading adjustments shall be made for all manhole frames and covers, and water valve boxes. Final grading adjustments shall be made within a one (1) week period following placement of the final wearing surface. The pavement shall be removed in clean straight lines, final grading adjustments of the manhole frame or water valve box shall be completed using approved materials, and the concrete collars shall be eight (8) inches thick and one (1) foot wide with No. 3 rebar as reinforcement. For additional specifications, see Standard Details (S-20, S-33 and S-34).

The City will neither install nor maintain Portland cement concrete collars outside of public right-of-way.

3.10.06 ADJUSTMENT FOR CONCRETE PAVEMENT

After placement of the concrete and jointing has begun, a transverse joint will be placed at each manhole frame and water valve box or other similar device. In the event that a manhole frame, water valve box, or other similar device should be covered up during construction, the developer/contractor will be responsible for raising the manhole frame or water valve box up through the concrete. This work will take place no later than twenty-four (24) hours after completion of the work. The concrete edges will be full depth saw-cut and be a minimum of twelve (12) inches from the manhole frame or water valve box.

After removal of the old concrete, the existing slab will be drilled at mid-depth (a minimum of three (3) inches from pavement surface) for a minimum depth of eight (8) inches. Sixteen (16) inch long #4 reinforcing bars will be placed at twelve (12) inches on center and epoxied into existing concrete. Concrete pavement shall be replaced to the existing depth plus one (1) inch, or a minimum of six (6) inches, whichever is greater. Concrete shall be replaced in accordance with concrete paving Specifications.

The concrete shall be protected from weather and rapid loss of moisture. Concrete shall be protected for vehicular traffic of a period not less than seven (7) days (three (3) days with high/early or quick strength concretes). The above installation procedure shall apply to this method and shall occur prior to the application of the final wearing surface around these appurtenances.

SECTION 11 PAVEMENT MARKING STANDARDS

3.11.01 SCOPE

All pavement marking installations shall be in compliance with the current Manual on Uniformed Traffic Control Devices (MUTCD).

At intersections and 150 feet back in all directions, all markings shall be thermoplastic, preformed plastic, or other permanent type marking, to include without limitation: crosswalks, stop bars, arrows, text, channelization lines, center line, etc.

3.11.02 GENERAL

The following requirements govern the placement of all pavement markings. When the term “full compliance” is used, it means pavement markings shall meet the requirements of the MUTCD.

A. PAVEMENT MARKING PLAN

When pavement marking location details are not provided in the design, the developer/contractor shall submit a layout of existing conditions to the City for approval or modification. This layout is to be used as the final pavement marking plan.

B. ROADWAYS CLOSED TO TRAFFIC DURING CONSTRUCTION

Full compliance pavement markings shall be in place on all roadways prior to opening for traffic.

C. ROADWAYS CONSTRUCTED UNDER TRAFFIC

Full compliance final pavement markings shall be placed within ten (10) working days after final surfacing is completed. Full compliance pavement markings shall also be placed on any roadways open to traffic when the project pavement work is discontinued for more than two (2) weeks.

D. TEMPORARY PAVEMENT MARKINGS AND CONTROL POINTS

Temporary pavement markings and control points for the installation of those pavement markings for roadways that are being constructed under traffic are as follows:

- When one (1) roadway of a normally physically divided highway is closed, and a crossover is constructed, full compliance pavement marking shall be placed along the tapers and through the median crossovers to the two (2) way traffic section. Pavement marking through the two (2) way traffic section shall be as shown on the plans. Removal of these markings shall not leave a scar which conflicts with permanent markings.

The following criteria apply to all construction and maintenance on roadways:

- All temporary broken line pavement markings shall be installed daily as needed and shall be at least eighteen (18) inches long with a maximum gap of thirty-eight (38) feet. An eighteen (18) inch stripe with a maximum gap of eighteen (18) feet may be used on curves for roadways with severe curvature. A severe curve is defined as a curve whose safe speed is ten (10) mph or more below the approach posted speed limit.
- Temporary pavement markings for no passing zones shall be full compliance.
- For short term situations (three (3) calendar days or less) where temporary broken center lines are installed, no passing restrictions may be identified by appropriate signs including R4-1 and R4-2 until final markings are installed.
- Temporary pavement stencils (school, railroad, etc.) are not required unless detailed on the plans.

- Temporary pavement markings shall be installed per manufacturer's recommendations in such a way that the markings adequately delineate the desired alignment.
- Control points, temporary pavement markings, and developer/contractor pavement marking plans will not be paid for separately but shall be included in the work.

3.11.03 PAVEMENT MARKINGS WITH PAINT - WATERBORNE

Low VOC, ready mixed, one component, 100% acrylic waterborne traffic paints per CDOT Specification 708.05 and glass beads in accordance with CDOT Specification 713.08.

All paints shall be suitable for application to asphaltic or Portland cement concrete pavements when applied with or without glass beads.

Waterborne pavement marking paint application shall conform to CDOT specification section 627.04. Striping shall be done when the air and pavement temperatures are at least 50° Fahrenheit and rising. The pavement surface and weather conditions shall be conducive to satisfactory results.

All stripes shall be protected until dry. Paint and beads shall be applied as per CDOT Specification Section 627.04.

3.11.04 EPOXY PAVEMENT MARKINGS

The epoxy pavement marking compound shall conform to CDOT Specification Section 713.17 and applied per CDOT Specification 627.05.

3.11.05 THERMOPLASTIC PAVEMENT MARKING

The thermoplastic pavement marking compound shall conform to CDOT Specification Section 713.12 and applied per CDOT Specification 627.06.

3.11.06 PAVEMENT PRIMERS

If required, pavement primer prior to painting shall be per CDOT Specification 708.07 and applied per CDOT Specification 627.06.

3.11.07 PRE-FORMED PLASTIC PAVEMENT MARKING

The pre-formed plastic pavement marking compound shall conform to CDOT Specification Section 713.13, applied per CDOT Specification 627.08, and shall have a minimum thickness of 60 mils.

3.11.08 PAVEMENT MARKING TAPE

The removable pavement marking tape shall conform to CDOT Specification Section 713.15 and applied per CDOT Specification 627.10.

3.11.09 RAISED PAVEMENT MARKERS

Temporary raised pavement markers shall be per CDOT Specification 713.18 and applied per CDOT Specification 627.11.

SECTION 12 CONCRETE STRUCTURES

3.12.01 GENERAL

Curbs, gutters, sidewalks, valley gutters, bikeways, driveways and alley approaches constructed within the City of Evans shall be concrete unless approved otherwise by the City.

Construction requirements for concrete sidewalks and bikeways shall conform to CDOT Standard Specifications subsection 608.03 except as modified by these specifications. Construction requirements for concrete curb shall conform to CDOT Standard Specifications subsection 609.03 except as modified by these specifications.

Where a section of concrete sidewalk, curb and gutter, valley gutter, bikeway, driveway, or alley approach has been disturbed, it shall be removed to a joint if the joint is situated within five (5) feet of the proposed or existing cut, otherwise a straight line shall be saw-cut prior to replacement. Where new construction abuts existing, the work shall be accomplished so that the variance in grade between the old and new work does not exceed one-quarter (1/4) inch.

3.12.02 MATERIALS

A. REFERENCES

Materials shall meet the requirements of the following CDOT Standard Specifications subsections:

- Fine Aggregate 703.01
- Coarse Aggregate 703.02
- Portland Cement 701.01
- Water 712.01
- Air Entraining Admixtures 711.02
- Joint Filler 705.01
- Curing Materials 711.01
- Reinforcing Steel 709.01
- Chemical Admixtures 711.03
- Dowel Bars and Tie Bars 709.03

B. CLASSIFICATION

Use the following classes of concrete as per CDOT Standard Specifications subsections 601.02 and 601.03 for the following items:

- Sidewalks and bikeways Class D
- Curb and gutters, and valley gutters Class D
- Driveway and alley approaches Class D

C. FLYASH

Flyash may be used in concrete for sidewalks, curb and gutters, valley gutters, bikeways, driveways, alley approaches, and storm drainage structures.

Flyash for concrete shall conform to standard CDOT Specification Section 701.02. A maximum of fifteen (15) percent flyash by weight may be accepted in any mix design. For any source of flyash, the developer/contractor shall provide complete test results indicating that the material meets all the above material specifications.

The flyash may also be subject to sampling and testing by the City. Test results that do not meet the physical and chemical requirements may result in suspending the use of flyash until necessary

corrections have been taken to ensure that the material meets the specifications. The flyash intended for use on the project shall have been tested and accepted prior to its use.

D. MIX DESIGN

1. All concrete shall be ready mixed concrete. No concrete shall be field mixed. Concrete mix design consists of selecting the aggregates appropriate for the concrete application. The proposed mix shall be tested in accordance with ACI code requirements. The developer/contractor must submit one (1) mix design per each concrete type intended for use within the public rights-of-way at the start of each calendar year. No concrete shall be placed prior to the submittal of such mix designs.
2. Mix designs for Portland cement concrete bikeways shall include a minimum of 1.5 lbs/CY of Polypropylene fibers (1" fiber length or equivalent) as reinforcement. Reinforcing steel (rebar or welded wire mesh fabric) may be used as an alternate upon approval by the City.

E. ADDITIVES

1. Additives for concrete, other than those specified in the mix design, shall not be used without prior approval of the City. When approved for use, chemical admixtures or additives shall comply with applicable ASTM or AASHTO standards. Application of admixtures shall be as per manufacturer's specifications. Calcium chloride or admixtures containing chloride shall not be allowed in reinforced concrete and is strictly prohibited in the production of high early strength concrete. The maximum amount of high early additive is two (2) percent.
2. Coloring for colored concrete shall be accomplished by the addition of an approved commercially pure or synthetic mineral pigment as specified in the contract documents.
3. Air entraining admixtures shall conform to AASHTO M-154 latest edition.
4. Pozzolans can be used with the approval of the City, after the following requirements have been met:
 - its use is justified;
 - tests have been made to determine the suitability with regard to water requirements, strength development, shrinkage, heat of hydration and durability; and
 - additional curing requirements have been specified.
5. Water-reducing and set-controlling admixtures shall conform to AASHTO M-194 according to the following types:
 - Type A - Water Reducing
 - Type B - Retarding

F. STEEL REINFORCEMENT

Bikeways and oil and gas access points shall be reinforced according to the design engineer recommendation. Steel reinforcement shall conform to CDOT Standard Specification Section 709.

3.12.03 PREPARATION OF SUBGRADE

Subgrade preparation shall be completed in accordance with these specifications.

No pea gravel, sand, or other material with greater than ten (10) percent passing the #100 sieve will be allowed as bedding beneath any concrete within the City's right-of-way.

If, in the opinion of the City, the foundation soil is of such character that it will swell or shrink with changes in its moisture content to such an extent that the concrete may be damaged, the soil shall be excavated as directed by the City and refilled and compacted with material which meets the requirements of these specifications.

The subgrade and/or sub-base shall be brought to a firm and unyielding condition with a uniform density. All soft and yielding material and other portions of the subgrade that will not compact readily when rolled or tamped shall be removed and replaced with suitable material. Concrete shall not be placed on a soft, spongy, frozen, or otherwise unsuitable subgrade.

Before placing any concrete, the subgrade shall be tested for conformity with the cross-section shown on the plans, using an approved template, or other approved method. The finished subgrade shall be kept smooth, damp, and compacted prior to placing concrete.

All subgrade areas shall be proof rolled before placement of concrete.

3.12.04 PLACING CONCRETE

A. ALIGNMENT AND GRADE

The alignment and grade elevations of the forms shall be checked by the developer/contractor prior to concrete placement and necessary corrections will be made. Any forms that have been disturbed or subgrade that has become unsuitable shall be corrected, and forms reset and rechecked. Any variations in grade and alignment shall be subject to approval by the City prior to placing the concrete. Forms shall be oiled prior to placement of concrete. The subgrade shall be moist but not wet prior to placing concrete. After the Inspector has approved the forms and subgrade, the concrete shall be deposited on the subgrade to the required depth and width in successive batches and in a continuous operation. The concrete shall be placed as uniformly as possible to minimize the amount of spreading necessary. While being placed, the concrete shall be spaded or vibrated with suitable tools to prevent the formation of voids or honeycomb. Vibration shall not be used to move concrete. All curves shall be constructed with flexible forms. Curb ramps shall not have a lip greater than one-quarter ($\frac{1}{4}$) inch between the flowline of the gutter and the ramp approach.

The flowline of all new valley gutters shall be a straight-line grade between the gutter at each end of the new valley gutter. The developer/contractor is required to set finishing screed points at minimum intervals of ten (10) feet along the flowline to control the finished elevation. The screed points shall be removed or driven through the plastic concrete into the subgrade after the concrete has been finished to the required elevation. The use of timber screed points is expressly prohibited.

No low spots which cause water to pond will be acceptable. Sidewalks, curb and gutters; valley gutters, bikeways, driveways, and alley approaches shall be formed and placed true to line, grade, and cross section. The finished surface must be straight and true to within one-quarter ($\frac{1}{4}$) inch along any ten (10) foot length of the new concrete in the vertical or horizontal plane. Forms for sidewalks (attached or detached) shall be so set that the sidewalk shall have a slope toward the street of two (2) percent. Bikeways shall have a side slope of two (2) percent. The maximum extended running slope of sidewalks (attached or detached) and bikeways shall not exceed five (5) percent.

B. CONSTRUCTION STAKES

The developer/contractor shall provide all construction stakes required for curbs, gutters, sidewalks, and structures, and will furnish all necessary information relating to lines and grades. The developer/contractor shall be held responsible for the reasonable preservation of all such stakes. The developer/contractor shall not remove stakes until three (3) working days after placement of the concrete unless approved by the City.

C. VIBRATION

Concrete shall be thoroughly compacted or vibrated. Care shall be taken in vibrating concrete to bring only a continuous film of mortar to the surface. Vibration shall stop before any segregation of the concrete occurs. Any evidence of lack of consolidation or over-consolidation shall be regarded as sufficient reason for requiring the removal of the section involved and its replacement with new concrete at the developer/contractor's expense.

D. LIMITATIONS OF PLACING CONCRETE

Limitations on the placing of concrete shall conform to CDOT Standard Specifications subsections 601.12 (b) and (c), and 412.15.

3.12.05 BATCHING

Batching of concrete shall conform to CDOT Standard Specification Section 601.06

The developer/contractor shall submit to the City the ready-mix delivery ticket for each load upon request by the City indicating the following:

- Supplier's name and date
- Truck number
- Project number and location
- Concrete class designation
- Cubic yards batched
- Mix design identification
- Type, brand, and amount of cement
- Brand and amount of all admixtures
- Weight of the fine and coarse aggregates
- Moisture content of fine and coarse aggregates
- Gallons of batch water
- Time at which water was added
- Elapsed time between when water was added and concrete load was in place
- Amounts of initial and supplemental water added
- Name of individual authorizing supplemental water
- Numerical sequence of delivery by indicating cumulative yardage delivered on each ticket
- Record discharge time, water-cement ratio, air content, slump, and revolutions of the drum

3.12.06 MIXING

Mixing of concrete shall be required to conform to CDOT Standard Specification Section 601.07.

3.12.07 TEST REQUIREMENTS

The developer/contractor shall provide quality control testing of concrete including the testing of concrete cylinders for compression testing, and air and slump tests. Copies of quality control test results shall be furnished to the City within ten (10) days of testing. The developer/contractor will provide for acceptance testing associated with placing of concrete, base course and subgrade preparation, and trench compaction. See the Material Sampling and Testing Schedule in Appendix B. The developer/contractor shall be responsible for the costs associated with re-testing due to failed acceptance tests.

Concrete acceptance testing to be completed by the developer/contractor will follow these procedures:

- One (1) cylinder will be broken at seven (7) days, two (2) cylinders will be broken at twenty-eight (28) days, and one (1) held on reserve for test if there is a failure on one of the twenty-

eight (28) day tests. If the twenty-eight (28) day cylinders do not meet the specified minimum compressive strength, then a representative number of concrete cores, as determined by the City, shall be taken by the developer/contractor to determine if the in-place concrete meets the specified strength.

- Concrete cylinders for strength tests will be molded and cured in accordance with the "Practice for Making and Curing Concrete Test Specimens in the Field", ASTM C31 and tested in accordance with "Test Method for Compressive Strength of Cylindrical Concrete Specimens", ASTM C39.
- Air, slump, and temperature tests will be conducted when cylinder sets are taken or whenever consistency of concrete appears to vary.
- Each sample of compression test cylinders will be marked or tagged with the date and time of day the cylinders were made. The location in the work site will be identified where the concrete represented by the cylinders was placed. The delivery truck or batch number will be identified, and the air content and slump measured and recorded. Copies of each test result will be furnished to the City.
- Concrete shall meet the following minimum acceptance standards:
 - Maximum slump shall not exceed four (4) inches for any class of concrete.
 - Air content shall not deviate from the design air content by more than $\pm 1\%$.
 - Strength of concrete shall not be more than 500 psi below the required field compression strength on any single break and the average of any three consecutive breaks shall not be more than 250 psi below the required field compression strength. Concrete that does not meet the acceptance criteria of this section shall be removed and replaced.

3.12.08 FINISHING CONCRETE

A. FINISHING

After the concrete has been placed and consolidated in the forms, it shall be finished. A wood float shall be used to bring the surface of the concrete to its final form; excessive working of the surface will not be permitted. Surface skim patching of spalled concrete will not be allowed. These areas will be removed and replaced.

The final texture of all exposed surfaces shall be obtained by light brooming. For sidewalks, bikeways, and driveway, broom the surface in the direction perpendicular to the main traffic flow. For all concrete surfaces that are designed to carry storm water such as curbs and gutters, valley gutters, and crosspans, broom the surface in the direction of flow. After completion of brooming and before the concrete has taken its initial set, all edges in contact with the forms shall be tooled with an edger having a one-quarter ($\frac{1}{4}$) inch radius. No dusting or topping of the surface or sprinkling with water to facilitate finishing will be permitted.

B. REMOVE FORMS

Face forms for concrete curb, if used, may be removed for finishing curb face and fillets as soon as the concrete will retain its shape. Concrete curbs must be in place for at least six (6) hours before the forms are removed.

3.12.09 JOINTS

A. TRANSVERSE JOINTS

See Concrete Transverse Joint Detail (No. S-4) for details on transverse joints. Transverse joints (contraction joints) shall be located as per Transverse Joint Location Table, Table 3.12-13. When combination curb, gutter, and walk are used, the joint shall be continuous through all three elements or as designed. Joint depth shall be a minimum of one-third (1/3) the thickness of the concrete. Joint width shall be one-eighth (1/8) inch wide and a maximum of one-quarter (1/4) inch wide except at expansion joints. For tooled joints, the edges adjacent to joint shall be rounded with an edge of one-quarter (1/4) inch radius. Joints for bikeways shall be removable plastic dummy joint strips or saw-cut at ten (10) foot intervals. Tooled joints shall not be allowed on any bikeway except at expansion joints. See Bike Path Detail (No. S-1), for additional specifications. Saw-cutting of joints shall be performed as soon as the concrete surface is hard enough to allow the sawing operation without otherwise marring the concrete surface, prior to any development of shrinkage cracks. Saw-cutting shall proceed around the clock if necessary, to meet these requirements.

Table 3.12-13
Transverse Joint Location

Concrete Apparatus	Distance Between Transverse Joints (ft)
Curb & Gutter, Cross Pan	10'
Sidewalk - Greater than or equal to 8' Wide	10'
Sidewalk - Less than 8' Wide	10'

B. EXPANSION JOINTS

Expansion joints shall be required as shown on Concrete Transverse Joint Detail (No. S-4). Expansion joints where required shall be filled with one-half (1/2) inch thick, full depth, preformed expansion joint material as per CDOT Standard Specifications Section 705.01. Expansion joint material must be set vertical and with the top edge three-quarter (3/4) inch below the finished surface. The joint shall be edged with a one-quarter (1/4) inch radius edging tool. All expansion joints shall be caulked as per Concrete Transverse Joint Detail (No. S-4).

3.12.10 CURING

Concrete for sidewalks, curb and gutters, valley gutters, bikeways, driveways, and alley approaches shall be cured in the same manner as Portland Cement Pavement as per CDOT Standard Specifications Section 412.14 except as modified herein.

Concrete shall be cured by protecting it against loss of moisture, rapid temperature change, freezing, rain or hail, flowing water, and mechanical injury for a period of not less than five (5) days after placement. Immediately after finishing operations have been completed, the entire surface of the newly poured concrete shall be covered by the curing medium. The edge of concrete exposed by the removal of forms shall be protected immediately to provide these surfaces with continuous curing treatment. The coating shall be protected against marring for a period of at least five (5) days after application. Any coating marred, or otherwise disturbed, shall be given an additional coating. White pigmented, liquid, membrane-forming curing compound conforming to AASHTO M-148, Type II, Class B shall be used unless another method is approved by the City. If the use of a curing compound results in streaked or blotchy appearance, the method shall be stopped and a suitable means of curing used. The developer/contractor may request permission to use an additional concrete sealing agent to protect his concrete work which will be exposed to salts, chemicals, or other elements. All concrete, regardless of temperature, weather or season, shall be protected from premature drying for a period of not less than five (5) days after the concrete is poured. Curing will not be required longer than seventy-two (72) hours if high-early strength concrete is used. It shall be the developer/contractor's responsibility to protect the concrete being cured from the elements, traffic, and vandalism. The developer/contractor shall have the equipment needed for adequate curing available before commencing concrete placement. Inadequate protection by the

developer/contractor shall be cause for suspension of concreting operations and damaged concrete shall be removed and replaced at the developer/contractor expense.

3.12.11 DRIVEWAY INSTALLATIONS

See Standard Details (S-17 and S-18) for specifications on driveway approaches for attached and detached sidewalks, respectively. All driveways constructed of concrete within public right-of-way shall conform to the requirements of these specifications. The width of the driveway shall be twenty (20) feet at the intersection of the back of curb for detached sidewalks, and at the intersection of the back of the sidewalk for attached sidewalks. When constructed of concrete, the thickness shall not be less than six (6) inches. Driveways abutting a curb, gutter, and sidewalk combination or drive-over curb and gutter or driveway gutter pan or any cross gutter shall have a strip of non-extruding expansion joint material one-half (½) inch thick, conforming to the cross-sections of the driveway, placed between the driveway and the sidewalk or curb or cross gutter so as to provide for the expansion of the concrete driveway. See Standard Details (S-4) for specifications on expansion joints. Oil and gas facility entrances shall have a minimum of eight (8) inch thick driveways with steel reinforcing.

3.12.12 ALLOWABLE CURB CUTS

Curb cuts will be evaluated based on acceptable access control requirements by the City.

3.12.13 PROTECTION/DEFACED/DAMAGED OR DEFECTIVE CONCRETE

The developer/contractor shall be responsible for taking adequate steps to protect concrete placed during inclement weather. Limitations on the placing and protecting concrete shall conform to CDOT Standard Specifications Sections 601 and 412. Any concrete damaged by precipitation or extreme temperatures or otherwise defective shall be removed and replaced at the developer/contractor's expense.

3.12.14 BACKFILLING

Immediately upon removal of side forms, the space adjoining the concrete shall be backfilled with suitable material, properly compacted, and brought flush with the surface of the concrete and adjoining ground surface. In embankments, the backfill shall be level with the top of the concrete and the maximum slope shall be four to one (4:1). Where detached sidewalks occur, the space between the curb and walk shall be backfilled on a straight line from the top of walk to the top of curb, not to exceed a four to one (4:1) slope.

3.12.15 OPENING TO TRAFFIC

Walks and bikeways shall not be opened to pedestrian or bicycle traffic for at least twenty-four (24) hours after placement; driveways, curb & gutters, and valley gutters shall not be opened to vehicular traffic for at least seven (7) days after placement or until field-cured test cylinder breaks show an average compressive strength of 2,500 psi. Exception may be made where high early-strength cement is used and a compressive strength of 3,000 psi is attained. In cases where high early-strength cements are used, the developer/contractor shall request a variance from the City for opening to traffic sooner. The developer/contractor shall maintain suitable barricades to comply with the foregoing requirements.



**CITY OF EVANS
PUBLIC WORKS DEPARTMENT
AUGUST 2019**

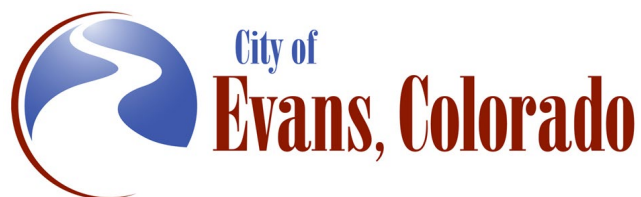


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SECTION 1 SYSTEM DESIGN AND LAYOUT

4.01.01 GENERAL

All water distribution systems shall comply with the requirements of these Standards and Specifications for water main and service line construction and may include special criteria established by the City for the overall hydraulics of the water utility system. Special criteria shall be outlined at pre-design meetings scheduled, as determined necessary, by the Director of Public Works or designee. All water distribution systems shall be designed by or under the direct supervision of a Registered Professional Engineer licensed to practice in the State of Colorado.

4.01.02 DESIGN FLOW REQUIREMENTS

The design of the water distribution system shall be based on the following:

Table 4.01-1
Unit Water Demands for Future Land Use

Land Type	Avg. Day Demand	Max. Day:Avg. Day Flow Ratio	Max. Hr.:Max. Day Flow Ratio
Residential	145 GPCD*	3.05	1.9
Commercial	1651 GPD/Acre	2.00	1.9
Industrial	1651 GPD/Acre	1.32	1.9
Park	3060 GPD/Acre	2.85	1.9

*Gallons Per Capita/Day

Fire flows may be calculated from more than one hydrant, providing the hydrants used are directly accessible to all possible fire locations in the area served. Fire flows, per Fire District, shall be:

- A. Available fire flow must be twenty (20) psi residual minimum.
- B. Minimum fire flow (two (2) hour duration) for any newly developed areas:
 - 1. 1 and 2 family units: 1,500 gpm
 - 2. Multi-family units: 1,500 gpm
 - 3. Institutional development: 2,000 gpm
 - 4. Commercial development: 2,500 gpm
 - 5. Industrial development: 3,500 gpm

Note: above fire flow requirements may be increased due to type of construction and size of building, per direction of the Fire Marshall.

4.01.03 OPERATING PRESSURE REQUIREMENTS

All areas shall be designed to provide a maximum static head of 254 feet (110 psi), and a minimum static head of ninety-two (92) feet (forty (40) psi).

Distribution systems shall also be designed to maintain a twenty (20) psi residual pressure during required fire flow. The maximum pressure drop from static head to either fire flow or peak residential flow shall not exceed thirty (30) psi.

Fire hydrant flow tests must be performed in order to determine existing system pressures. Flow testing must be performed by licensed and insured testing companies and shall be accompanied by City personnel when operating valves and hydrants on City water mains. The Evans Fire Rescue District and the Public Works Department shall review flow data and comment on system pressures, and safety factors that are applied.

4.01.04 SIZING OF DISTRIBUTION MAINS

Mains shall be sized large enough to provide for domestic, irrigation, and fire protection flows to the area requesting service but not so large as to cause water quality issues. The maximum acceptable head loss for eight (8) and twelve (12) inch mains is two (2) feet per 1,000 feet of main for the maximum hour flow using a C-value of 130; however, this does not apply under fire flow conditions. Distribution mains shall also be sized for fire protection utilizing maximum day flows and needed fire flow resulting in a minimum residual pressure no less than twenty (20) psi in the localized area of interest. The City reserves the right to size mains to accommodate future needs.

New mains shall be eight (8) or twelve (12) inch as set by the City. If approved by the City in writing, mains smaller than eight (8) inches may be used in some cul-de-sacs without a fire hydrant or blow-off. Dead-end mains in cul-de-sacs will be evaluated to determine if the appropriate number of services exist to maintain water quality turnover.

Fire flow evaluations with one side of the loop out of service (i.e., worst case scenarios) are a normal part of the distributions system's main size evaluation. Consideration will be given wherever water quality problems are caused by an upsizing of the main. Exceptions to looping are subject to the City's discretion and additional requirements. The City will analyze the water system for developing areas to determine their adequacy. Parallel mains are not allowed.

4.01.05 FIRE PROTECTION SYSTEMS

A. Fire Hydrants

The fire hydrant branch line shall be set at a ninety (90) degree angle to the street main. The hydrant shall be set at the end of the branch line facing the branch line. Horizontal bends, vertical bends, or reducers shall not be used in the fire hydrant branch line unless specifically approved in writing by the City of Evans. Under no circumstances shall any size or manner of tap be made on a fire hydrant branch line.

A dead-end main may only have one (1) fire hydrant connected to it in cases where looping is not an alternative, except as specifically approved in writing by the City of Evans.

Redundant hydrant installation and the unnecessarily high density of fire hydrants should be avoided where existing hydrant function would be duplicated. These types of hydrant requests will be reviewed by the City and approved at its discretion. The review will be based on the number of fire hydrants in proximity, hydraulic analysis, and correspondence with Fire District.

B. Fire Hydrant Spacing

In single-family residential areas, fire hydrants shall be spaced a maximum of 500 feet apart as measured along street curb line and at an overall spacing that will average not less than one (1) hydrant to 200,000 square feet accessible to the fire hydrant throughout an individual subdivision. Fire hydrant locations shall be approved by Evans Fire Protection District.

In business, industrial, and high-density residential areas, hydrants shall be spaced not greater than 300 feet apart, or as approved by Evans Fire Protection District.

C. Fire Lines

Connections made to existing mains that run to the property line and provide water for fire protection systems are known as fire lines. Fire line sizes must be approved by Evans Fire Protection District.

The fire line shall be installed at a right angle to the distribution main and shall run straight from the main to the property line. Horizontal or vertical bends shall not be installed in the line; however, bends may be installed when making a wet tap where the tap location conflicts with an existing pipe joint or where interference prohibits a straight-line installation. Such horizontal or vertical bends shall be used only when specifically approved in writing by the City of Evans.

Multiple fire protection appurtenances, including any combination of fire hydrants and fire lines for any single project site, are not allowed on a dead-end main. Additional consideration will be given in the case of single-family residential homes on a cul-de-sac where fire lines are required.

The property owner shall maintain all fire lines extending from the valve on the City watermain. Valves on newly constructed fire lines shall be located on the tee at the main line. Fire lines are to be used exclusively for fire protection. Domestic water taps and/or irrigation taps shall not be allowed on the fire line. Fire lines valve boxes will have “FIRE” printed on the valve lid instead of “WATER”.

No service taps shall be permitted on fire lines.

4.01.06 CROSS-CONNECTION CONTROL AND BACKFLOW PREVENTION

A. Cross-Connection Control

The City is responsible for protecting its public water system from contamination due to backflow occurrences through residential, multi-family, irrigation, and/or commercial property water service connections (i.e., cross-connections). The City may request access to property or facility to conduct an on-site cross-connection control survey.

A properly designed airgap is the most effective method of protecting the public water supply from high hazard cross-connections. Airgaps shall be twice (2x) supply pipe diameter and never less than one (1) inch. When an airgap cannot be used, a Reduced Pressure Backflow Protection Assembly (RP BFPA) shall be installed. The City requires the installation of a containment assembly on commercial property service lines.

Failure to comply with the installation and annual testing requirements will result in suspension of service.

B. Approved BFPA is manufactured in accordance with AWWA C510 and C511 and meets USC FCCCHR specifications.

A listing of approved assemblies can be found online at the Foundation for Cross-Connection Control and Hydraulic Research School of Engineering website: <http://fccchr.usc.edu/>

C. Requirements for Approved USC FCCCHR BFPA Installations Based on the Degree of Hazard.

1. A Commercial Domestic Service Line Tap requires an approved BFPA to be installed on the domestic water service line five (5) feet downstream from the meter pit or immediately upon entry into a heated part of the building five (5) feet (maximum) from the wall or floor before any connections.
2. A commercial fire line service tap: Installed as a wet pipe with the use of chemical additives or pumps requires an approved RP BFPA to be installed on the fire line downstream from the tapping valve and immediately upon entry into a heated part of the building five (5) feet (maximum) from the wall or floor before any connections.

Installed as a wet or dry pipe system without the use of chemical additives or pumps, requires a Double-Check (DC) BFPA to be installed on the fire line downstream from the tapping valve

and immediately upon entry into a heated part of the building five (5) feet (maximum) from the wall or floor before any connections.

Branch lines and taps are not allowed on fire lines downstream from the designated containment BFPA for any purpose other than fire protection (additional protection may be required).

3. A Commercial Irrigation Service Line Tap requires an approved RP BFPA to be installed on the irrigation water service line five (5) feet downstream from the meter pit; the line must be above ground before any connections.

Branch lines and taps are not allowed on dedicated irrigation water service lines for domestic (potable) use.

4. A commercial drinking fountain domestic service line tap requires an approved DC BFPA to be installed on the domestic water service line above ground, five (5) feet downstream from the meter pit in a properly securable box, either standard or heated, depending on need.
5. A multi-family domestic service line tap requires an approved BFPA (RP or DC) acting as containment if:
 - a) the premises are over three stories (taller than thirty (30) feet);
 - b) the premises have a fire protection system;
 - c) the premises have a common boiler; or has only one (1) service connection feeding multiple units.

The BFPA shall be installed on the domestic water service line five (5) feet downstream from the meter pit or immediately upon entry into a heated part of the building five (5) feet (maximum) from the wall or floor before any connections.

6. A single-family domestic service line tap with a dual water supply agreement. It is at the sole discretion of City of Evans Public Works Department to determine that existing auxiliary water supply poses a high risk to City of Evans potable distribution system. The installation of a RP will be required five (5) feet downstream from the meter pit in an above ground, heated enclosure before any connections.

It is at the sole discretion of City of Evans Public Works Department to approve the proposed BFPA installation. The approved BFPA shall not be removed, relocated, or altered without approval by City of Evans.

D. Examples of BFPA Installations

The following facilities represent high hazard commercial applications that must be contained from City of Evans distribution system by a USC FCCCHR approved containment RP BFPA. This list is not all-inclusive. The City reserves the right to designate a site high hazard as warranted:

1. Amusement parks
2. Autopsy facilities
3. Auxiliary water supply
4. Battery shops
5. Car wash facilities
6. Chemical plants
7. Cooling towers
8. Community gardens
9. Dental clinics
10. Dry cleaners

11. Electrical and electronic component manufacturers
12. Firefighting systems
13. Food and beverage processing plants
14. Gas stations
15. Green courts
16. Golf courses
17. Greenhouses
18. Health spas
19. Hospitals
20. Hotels
21. Hydraulic testing facilities
22. Irrigation systems
23. Jewelry manufacturers
24. Kennels
25. Laboratories
26. Laundromats
27. Manufacturing facilities
28. Medical facilities
29. Metal plating industries
30. Mobile home parks
31. Morgues
32. Mortuaries
33. Motels
34. Multistory buildings (higher than 30 feet above the ground line)
35. Packing plants
36. Parks and recreation centers
37. Petroleum refineries
38. Pet shops
39. Photographic film processing facilities
40. Printing or screen-printing shops
41. Radiator shops
42. Radioactive material processing plants
43. Recycled water systems (chemical injection, booster pumps, or high-risk scenarios)
44. Rendering plants
45. Recreational vehicle dump sites
46. Salons
47. Schools
48. Sewage treatment plants or facilities
49. Solar water heating units
50. Steam generating facilities
51. Stock yard facilities
52. Swimming pools
53. Tanneries
54. Tattoo parlors
55. Taxidermy shops
56. Warehouses
57. Water features
58. Water play features
59. Waterfront facilities
60. Zoos

- E. A USC FCCCHR approved RP BFPA is required when:
1. High-level security or restricted commercial properties do not allow City of Evans to gain access to conduct a cross-connection control survey of the property and/or facility. An

- approved RP assembly shall be installed five (5) feet downstream from the existing meter pit in an above ground, heated enclosure.
2. A landscape irrigation system is designed for the direct injection of chemical additives into the system. An approved RP assembly shall be installed on the designated service line to the premises downstream from the meter pit or before any valves or branching.
 3. All containment assemblies shall be tested and the test report sent to City of Evans Public Works Department annually.
 4. A RP BFPA is required for irrigation system installations that are two (2) inches in diameter or less:
 - a) An approved USC FCCHR RP BFPA shall be installed on the irrigation water service line downstream from the meter pit; the line must be above ground before any connections.
 - b) Branch lines or taps are not allowed on dedicated irrigation water service lines for domestic (potable) use.
- F. A Dual Check Backflow Prevention Assembly (DC BFPA) is required when Fire protection systems are installed without chemical additives or pumps. An approved DC or RP BFPA shall be installed on the designated water service line entering the building (i.e., the Mechanical Room or the Pump Room).
- G. Testing Requirements for Backflow Prevention Assemblies Installed on potable Water Services.
- The developer and/or applicant is required to have a certified ABPA or ASSE tester inspect and test an existing or newly installed containment BFPA on dedicated water service lines, if applicable, upon installation and annually thereafter. Tests shall be conducted at the expense of the developer and/or applicant. BFPAs shall be repaired or replaced at the developer and/or applicant's expense when found to be defective. Records of tests, repairs, and replacements shall be kept by the developer and/or applicant and a copy of the annual test provided to City of Evans. The use of video inspection is permitted with designated potable water only equipment in accordance with City of Evans operating rules.
- H. The tester is required to:
1. Complete BFPA testing and submit test reports within forty-eight (48) hours of City of Evans setting of the meter and turning on of the water service.
 2. Submit a copy of the official ABPA or ASSE certification to City of Evans Public Works Department each time the certification is renewed.
 3. Submit a copy of the test kit calibration certification annually.
 4. Complete the BFPA test report and submit a copy of the containment BFPA report to City of Evans Public Works Department within five (5) days.
 5. Indicate containment or containment by isolation on the test report.
 6. The submission of isolation test results to City of Evans is not required by the CDPHE.
 7. Indicate the type of usage (i.e., domestic, irrigation, or fire line) on the test report.
 8. Confirm the premises ID, City of Evans service address, location of assembly on premises, BFPA serial number, and record the values on the test report with a clearly marked pass or fail indication.
 9. Contact City of Evans Public Works Department for discrepancies regarding the meter or BFPA.
 10. Sign, date, and include the time of the test on the report.
- I. Required test reports shall be submitted to City of Evans cross-connection control office.
Mailing Address:
City of Evans Public Works Department
1100 37th Street
Evans, CO 80620

J. Failed Assemblies

If the BFPA fails and cannot be repaired on the day of its failure, the Public Works Department must be notified by the certified ABPA or ASSE tester within twenty-four (24) hours. After twenty-four (24) - hours by calling (970) 475-1110. A copy of the failed test report must be submitted to the Public Works Department within three (3) days.

The property owner is responsible for coordinating the necessary repairs to the BFPA and retesting the unit within five (5) days. The owner must submit a passing test report to the Public Works Department. Failure to comply may result in the suspension of water service.

If the premises have a high health hazard BFPA and is deemed a threat to public health (via the private plumbing system), it is at City of Evans discretion to suspend the dedicated water service line immediately. The customer shall repair or replace the BFPA before water service will be restored.

K. Exemptions

Single-family residential customers are exempt from City of Evans cross-connection control requirements if the premises are served by an auxiliary water supply (e.g., raw water, a well, a lake, a pond, or a ditch) or has a dedicated city metered service line for irrigation only. Auxiliary water supply conditions require a dual water supply agreement to be in effect between City of Evans and the property owner. Multi-family residential customers are exempt from City of Evans cross-connection control requirements if each unit has an independent service line.

For questions or concerns related to cross-connection control, please contact City of Evans Public Works Department.

4.01.07 PRESSURE REDUCING STATIONS

PRV installations are used to control pressures within the distribution systems. When main extensions are submitted for review, the need for a PRV installation will be determined based on existing pressure zones and the existing distribution system layout. PRV settings are to be included on plans with the elevation and the upstream and downstream hydraulic grade line and pressure.

The City will make pressure settings and field adjustments.

4.01.08 DISTRIBUTION SYSTEM LAYOUT

A. General

Mains shall be installed in dedicated public streets or easements. Main layout shall be of such grade, alignment, curvature, and other characteristics as to permit installation and maintenance in the usual manner. Distribution systems shall be designed so that no critical pipes exist. A critical pipe is any length of pipe, excluding private services, that when damaged, shut off, or otherwise taken out of service, isolates more than one service connection.

Only easements in accordance with the terms of the City standard Utility Easement Form(s) located in Appendix B and these Standards will be accepted. Easements granted for water mains near the perimeter of a lot or property line must abut the lot or property line to provide for future domestic and/or fire protection service from the water main to the adjoining lot or property, except as specifically approved in writing by the City of Evans.

B. Location (Typical)

Water mains will typically be located ten (10) feet north or east of the centerline to provide ten (10) foot separation from sewer on centerline of the street unless otherwise approved by the Director of Public Works or designee.

In all instances, the water mains shall extend to the boundary line of the property or subdivision served. A main serving one lot shall extend the entire way across the frontage for that lot. Mains serving a subdivision shall extend to the center of boundary streets, to boundary lines or to the outside of paved areas as may be noted on the accepted plans.

C. Landscape Separation

Landscape and utility plans shall be coordinated. Tree/utility separations shall not be used as a means of avoiding planting required street trees. The following list sets forth minimum dimension requirements for the most common tree/utility separations:

1. Forty (40) feet between street trees and streetlights. Fifteen (15) feet between ornamental trees and streetlights.
2. Ten (10) feet between trees and water or sewer lines unless a wider separation is required by the City in consideration of unusually deep utility installations.
3. Four (4) feet between trees and gas, telephone, electric and other underground utilities.
4. A minimum clearance of three (3) feet on each side of a fire hose connection must be maintained. No vegetation other than turf or low-growing ground covers may be planted between the fire hose connection and the sidewalk or street.

D. Pipe Deflection

Deflection of PVC pipe and ductile iron pipe may be achieved by deflection according to manufacturer's recommendations only. For design purposes pipe deflection may not be greater than eighty (80) percent of the allowable manufacturer's recommendations. Changes in direction greater than allowable deflection of waterline pipe shall require bends.

Pipe sections (sticks) shall be full-length to the greatest extent practicable. Installation of short segments to achieve deflection is not permitted. No pipe shall be shorter than ten (10) feet in length.

E. Minimum Depth

All pipe shall be installed with a minimum of four (4) feet six (6) inches of cover from finished grade of street to the top of the pipe barrel. See Section of this Chapter for pipe installation Specifications.

F. Fire Hydrants

Fire Hydrants shall be installed within public streets or in easements. When the City determines it is not feasible for a hydrant to be installed in this manner, it shall be installed in an easement adjacent to the street. The fire hydrant easement shall have a minimum width of ten (10) feet if the length of the easement is twenty-five (25) feet or less. Fire hydrant easements shall have a minimum width of thirty (30) feet when the length of the easement is more than twenty-five (25) feet. The easement shall extend a minimum of five (5) feet beyond the center of the hydrant.

Fire hydrant gate valves shall be placed at swivel tee. All fire hydrants shall have a restrained connection directly to the tee off the main per Standard Details (WA-6).

Fire hydrants shall only be installed at locations authorized by the Evans Fire Protection District.

G. Line Valves

Valves shall be placed with a maximum spacing of 500 feet in all distribution mains and lateral lines. Valves shall also be placed to ensure that only one hydrant will be out of service in the event of a line break.

Main-line valves are required at the ends of temporary dead-end mains which have been installed to the Site boundary or Limits of Construction for phased work (stubbed-out). These valves shall be located with a short section of pipe, less than five (5) feet in length, between the valve and end cap/blow-off. The entire assembly of cap and valve shall be independently and fully restrained as required by the site (including soil type, pipe bedding, and cover over pipe) to enable future extension of the water distribution system with “live pressure” against the valve.

Tees shall require two (2) valves. Crosses shall require three (3) valves. For a succession of short blocks perpendicular to the direction of the distribution main and without residential or commercial services between, one (1) or more intersection(s) shall have the valve in that direction omitted but must maintain the 500-foot maximum spacing requirement.

At street intersections, valves will be located at tees or crosses with five (5) feet of separation between valves.

Valves shall also be placed at each end of a line running through an easement on private property, on each side of a major creek or channel crossing, and on each side (at property lines extended) of a distribution line that provides service to a hospital, school or large industrial user.

H. Air and Vacuum Relief Valves

Combination air and vacuum relief valves shall be installed at each high point in all distribution mains and at high points of lateral lines. Relief valves shall be sized and located appropriately.

Relief valves shall be installed in precast manholes or vaults fitted with air vents open to the atmosphere and in accordance with the Standard Details (WA-1).

I. Blow-off Valves

Provisions shall be included in the design to allow for the flushing of distribution mains and lateral lines at any low point in the system, or at any point noted on the accepted plans. The blow-off assembly shall be installed perpendicular to and on the downhill side of the main or line and shall drain to the nearest gutter line or drainage channel.

Dead ends, either permanent or temporary, including temporary dead ends due to phasing within a development, shall have a blow-off per Standard Details (WA-2). Fire hydrants at temporary dead-end streets proposed for future extension may be accepted provided their location is consistent with the final road section.

SECTION 2 SERVICE LINES, FIRELINES, METERS, AND APPURTENANCES

4.02.01 GENERAL

Water is conveyed from mains to consumers by service lines and their associated appurtenances. Except for fire line services, water delivered to customers must be metered. In the context of these standards, the service line includes pipe, fittings, and appurtenances that belong to the developer and/or applicant that are used to convey and measure water from the distribution system to the consumer for domestic, industrial, or irrigation use. The service line extends from the corporation stop or tee on the water main to the first valve inside the premises after the water meter or BFPA, if present. Water pipe beyond service lines shall be controlled by local plumbing codes.

4.02.02 LAYOUT OF SERVICE LINES

A. General Layout

The service line shall be arranged to provide convenient access to the curb stop and meter pit or vault for meter reading, operation, and maintenance. Wherever possible, the pit or vault shall be accessible from a paved street or the City easement that is accessible to maintenance vehicles and shall have line-of-sight to a public street. The curb stop or property line valve shall be located behind the curb line of the street as close to the curb as possible, in a landscaped or grassy area.

The water meter pit or vault shall be located in a landscaped area that is two (2) to five (5) feet after the curb stop or property line valve. If there is a tree lawn between the curb and the sidewalk, the stop box and meter setting shall be installed in the tree lawn. The public ROW or easement is preferred over private property. The meter setting shall be within five (5) feet of the public ROW or the City easement. Curb stops and meter settings shall not be placed behind existing or future fences or walls that may block access from the public ROW or easement. The area around the stop box and meter vault shall be kept free of vegetation, structures, or other objects that may interfere with access.

At no time shall stop boxes or pits be located in pavement or concrete.

Stop boxes and meter pits or vaults shall be located to provide a minimum of five (5) feet of clearance from any building, retaining wall, fence, transformer pedestal, fire line, or other permanent obstruction. The distance shall be measured from the outside wall of the valve box or the meter pit or vault.

B. Location

The premises to be served shall have a minimum frontage of ten (10) feet on the street or easement containing the water main to be tapped. The tap and service line shall be located entirely on or in front of the premises to be served.

C. Setbacks

The service line, to a point five (5) feet past the meter pit or vault, shall be a minimum of five (5) feet from any side property line. In the case of corner lots with frontage on two (2) streets with water mains, the property may be served from either the front or the side of the lot.

The tap at the main shall be at least five (5) feet from the side property lines extended to the main and at least three (3) feet from any pipe joint or fitting or from the end of any pipe segment.

D. Alignment

The service line shall be installed in a continuous straight line, perpendicular to the property line or

curb, from the tap to a point five (5) feet past the back wall of the meter pit or vault. The tap, stop box, and meter pit or vault, shall be in a straight line.

No couplings allowed between curb stop and meter pit. If the meter pit has to be moved outside of a driveway after installation, only compression couplings are allowed. Flares are NOT allowed.

E. Cul-de-Sacs

If service is requested for lots at the end of a cul-de-sac, the main to be tapped shall be within fifty (50) feet of the front property line of each lot to be served in the cul-de-sac.

F. Depth of Service Line

Service lines shall be installed four and one-half (4½) to six (6) feet below the ground line. If the water main is less than four and one-half (4½) feet, or more than six (6) feet below grade, the service line shall be brought to an acceptable depth as close to the main as possible. The depth from ground line to the curb stop or property line valve-operating nut shall not exceed six (6) feet.

If the grade of the surface is raised or lowered after a service line is installed, the developer and/or applicant is responsible for the lowering or relocation of the service to maintain cover between four and one-half (4½) and six (6) feet.

G. Identifications Tags

In cases where there may be confusion as to the property or building serviced by a service line, an engraved plastic tag shall be attached to the meter yoke in the pit or vault using a stainless-steel braided wire. The tag shall be a minimum of 1½ by 4 inches, 1/16-inch-thick, with no more than three lines of text and a hole to accept the wire. The top and middle lines shall display the assigned service address and the building identification, if appropriate; the bottom line shall display the City tap number. The tag shall have white letters engraved in a solid color. Tags for domestic services shall be blue, irrigation-only services shall be green, recycled water services shall be purple, and fire lines shall be red.

H. Paved Areas

Care shall be taken to ensure that service lines do not enter the property at a driveway or walkway. Service lines installed prior to the layout of property improvements may require reconstruction or relocation prior to activation to avoid driveways and other paved areas. Bends, offsets, and similar modifications of the straight-line layout requirements are not permitted. In cases where a landscaped area does not exist between the building and the street or easement, the curb stop and meter may be installed in the sidewalk or in a similarly paved surface provided the installation is not subject to vehicle traffic, with the written approval of the City of Evans.

Special construction details shall be required, and curb stops shall be placed under road boxes instead of curb boxes.

I. Deviations

The City of Evans may authorize deviations to the service line standards contained in this Section. Deviations shall be requested in writing by the applicant or the applicant's authorized representative. Each request shall be considered on a case-by-case basis and shall not be considered a precedent for any other location. Requests shall include sufficient information to justify the need for deviation from these Standards and may include site plans, proposed service, meter configurations, or other information requested by the City of Evans.

J. Stub-ins

When a stub-in connection is installed to permit street paving or in advance of future development, it shall be located to provide a future connection that is in accordance with applicable standards at the time of activation. There is no assurance that any stub-in will meet the requirements for conversion to a service line at the time of activation. A developer and/or applicant that installs a stub-in does so with the understanding that it shall be the responsibility of the developer and/or applicant to modify, reconstruct, relocate, replace, or remove the stub-in, as necessary, prior to converting it to a service line to meet current Standards. Stub-ins and converted service lines may not be located in a manner wherein the stop box and meter setting are beneath a driveway, sidewalk, street, parking area, or within specified limits of side lot lines and permanent obstructions. Water may not be taken from a stub-in for any purpose.

K. Compaction

Backfill material around service lines, stop boxes, and meter settings shall be carefully compacted in accordance with the requirements of these Standards and Specifications.

4.02.03 SEPARATE TRENCHES

Service lines may be installed in trenches containing pipes that carry potable water; they may not be installed in trenches with pipes carrying other substances. A service line shall be separated laterally from foreign pipes by a minimum of ten (10) feet. However, a service line may be placed in the same trench with another pipe when:

- A. The adjacent foreign pipe is ductile iron.
- B. The bottom of the service line is at least twelve (12) inches above the top of the adjacent pipe and is placed on a shelf excavated on one side of the common trench with a minimum horizontal clearance of five (5) feet.

4.02.04 PUMPS

Pumps are not allowed for the sole purpose of decreasing the size of the tap/meter and service line.

4.02.05 TANKS

Tanks are not allowed for the sole purpose of decreasing the size of the tap/meter and service line.

4.02.06 CONNECTIONS FOR WATER

A. Small Taps, Two (2) Inches and Smaller

Connections for domestic, irrigation, or fire service taps that are two (2) inches and smaller will be made by the contractor and witnessed by a Public Works Inspector. The connection shall be made using a corporation stop of the same size as the service line through a bronze tapping saddle, both of which shall be supplied by the developer and/or applicant.

Taps shall be made only after satisfying the following conditions:

1. The main has been released by City of Evans following the completion of the conditions and tests of inspections.
2. Appropriate fees and charges have been paid to the City of Evans.
3. Underground utilities near the tap are located and marked.
4. Tapping materials are on-site.
5. Front property corners are clearly staked and the service address visibly posted.
6. Water main valves are marked or staked.

7. Safety equipment and procedures are in place including trench shoring.
8. The service line, curb stop, meter pit, and meter yoke are installed and ready for connection to the corporation stop.
9. The tapping location on the main is excavated and the water main surface is exposed and clean.

B. Large Taps, Three (3) Inches and Larger

Service connections to the main for service lines three (3) inches and larger shall be made by a tee connection. Domestic service taps three (3) inches and larger may be installed by the contractor and witnessed by a Public Works Inspector. For the City installed connections, the contractor shall excavate the ditch and around the water main exposing it on all sides. The City will provide and install the tapping saddle, tapping sleeve, or cut-in tee at cost. The contractor shall connect to the outlet, install the piping, set the valve boxes, and backfill the trench.

C. Insulators

Domestic service lines of dissimilar metals shall be electrically insulated by means of City of Evans approved insulating fittings or gaskets. Care shall be taken to properly install corporation stops and provide enough slack in the service lines to protect against pullout.

D. Tapping Polyethylene Encased Pipe

When tapping mains, dig out bedding material and apply two (2) to three (3) wraps of adhesive tape completely around the polyethylene-encased pipe to cover the area where the tapping saddle and machine is to be mounted. After the tapping machine is mounted, install the corporation stop directly through the tape and polyethylene. After the tap is complete, the entire area shall be inspected for damage and repaired if necessary. Any bedding material removed during excavation shall be replaced in kind and compacted in accordance with these Standards and Specifications.

E. The Spacing of Service Taps

Multiple taps on the same side of the main shall be a minimum of five (5) feet apart, measured longitudinally along the centerline of the main. Multiple taps on opposite sides of the main shall be staggered by a minimum of two and one-half (2½) feet, measured longitudinally along the centerline of the main.

Taps shall not be made within three (3) feet of any main line pipe fitting.

4.02.07 TAPS AND SADDLES

Tapping saddles with a tap size of two (2) inches and smaller for ductile iron and asbestos-cement pipe shall consist of a bronze body with two bronze straps. Saddles for PVC pipe shall be single strap bronze saddle. Existing steel mains that are twenty (20) inches in diameter or smaller shall be tapped using a method approved by City of Evans.

4.02.08 SIZE

A. General

Taps and service lines shall be of a size that is adequate to supply the requirements of the property being served while not being so large as to cause inaccuracies in metering low flows. The minimum size allowable for a service line shall be three-quarters (¾) inch.

The tap, corporation stop, meter, and that portion of the service line between the corporation stop and five (5) feet past the meter shall be the same size. The service line may be increased in size to the next approved larger diameter beginning five (5) feet downstream of the meter. This is permitted to satisfy maximum pressure loss criteria; it is not for achieving greater flow using a smaller tap.

Taps and services shall be sized to produce a water velocity that is no greater than ten (10) feet per second at peak demand as estimated by an accredited fixture unit count methodology. Additionally, the total pressure drop in the service line from the main to the building shall not exceed twenty-five (25) psi without backflow prevention or thirty (30) psi and a minimum residual pressure of twenty (20) psi at the building beyond any backflow prevention under peak domestic demand flow. Additional fire flow demand and service sizing shall be the responsibility of the developer and/or applicant or the developer and/or applicant’s Professional Engineer.

B. Multi-Family Buildings

In addition to the general requirements, the minimum tap size for domestic service shall be based on the number of units in the building:

Table 4.02-2
Minimum Tap Size for Domestic Service

Units	Tap Size (Inches)
1-2	¾
3-5	1
6-25	1½
26-50	2

These estimates are for minimum estimated tap, service, and meter sizing. Actual sizing should be based on flow that is calculated from an accredited fixture unit count methodology that varies dependent on the actual number of fixtures within each unit and within the overall building supplied. Buildings with more than fifty (50) units will be evaluated on an individual basis. In special circumstances, City of Evans may require a larger minimum tap size. Additional flow demands required to meet NFPA 13R shall be evaluated by the developer and/or applicant or the developer and/or applicant’s Professional Engineer and services sized accordingly.

C. NFPA 13D Residential Sprinkler Services

For residential services meeting NFPA 13D, the tap, corporation stop, meter, and that portion of the service line between the corporation stop and five (5) feet past the meter shall be the same size. The service line may be increased in size to the next approved larger diameter beginning five (5) feet downstream of the meter. The appropriate design of the NFPA 13D fire sprinkler system shall be the sole responsibility of the developer and/or applicant.

D. Irrigation Service (Potable Sourced Water)

For irrigation services, the tap, corporation stop, meter, and that portion of the service line between the corporation stop and the valve before the BFPA shall be the same size. The service line may be increased in size to the proper design size for the BFPA beginning at least five (5) feet downstream of the meter pit or vault. Additional pipe increases are permitted after the BFPA to satisfy the maximum design water velocity in the irrigation system.

4.02.09 PIPE MATERIAL

Pipe material is dependent on the size of the service line:

- A. Seamless Copper Tube: Shall be used for service lines three-quarter ($\frac{3}{4}$) through two (2) inches.
- B. Ductile Iron Pipe: Shall be used for service lines 3 inches and larger.

4.02.10 CURB STOPS, VALVES, AND VALVE BOXES

A curb stop or gate valve of the same size as the service line shall be installed on every service line.

Buried valves and curb stops shall be equipped with a cast iron valve box and large oval base. When a three-quarter ($\frac{3}{4}$) or one (1) inch curb stop is placed in paved areas, a roadway box shall be used.

All fittings, couplings, etc., from main to meter, including those to extend or relocate service lines two (2) inch diameter and smaller shall be compression-type fittings. Flared-end fittings shall not be used in the City of Evans.

4.02.11 METERS

A. General

Meters shall not be installed until the proposed installation is approved, and the meters tested and numbered by City of Evans. Meter installations will be inspected by City of Evans upon completion of the installation and prior to backfilling.

Service meters are used to record usage by the retail customer. Master meters are used by wholesale customers and supply water to service meters. Other temporary meters exist in the system for testing and measuring water usage from fire hydrants.

Accuracy, sensitivity, durability, low pressure loss, life-cycle cost, ease of use, and low cost of maintenance are important characteristics of meters. As such, City of Evans will determine acceptable meter manufacturers and models.

B. Size of Meter

Meters shall be the same size as the corporation stop or service tee and that portion of the service pipe between the meter and the corporation stop. A meter that is smaller than three-quarter ($\frac{3}{4}$) inch shall not be installed unless it is to serve as a replacement for an existing small meter.

In cases where the full capacity of a previously used service pipe is not required, City of Evans may allow for the installation of a meter that is smaller than the service pipe provided the service pipe is reduced to the size of the meter for a distance of no less than ten (10) times the larger pipe diameter on the inlet side of the meter, or five (5) feet, whichever is longer.

4.02.12 OUTSIDE METER SETTING

Outside meters shall be installed with the inlet and outlet spuds in a horizontal position and housed in a concrete or approved composite meter pit or vault in accordance with these Standards. The meter shall be installed in an approved copper setter or yoke. Copper setters for meters one (1) inch and smaller shall be installed with the meter spuds located eighteen (18) inches below the meter pit lid to facilitate maintenance and replacement. The meter shall sit vertically with the meter register up.

Larger meters shall be installed in vaults in accordance with these Standards. Deviations in installation height, spacing, pipe location, mounting supports, and other details (Reference detail WA9 A-D) must be approved in advance in writing by the Public Works Director.

4.02.13 METER BYPASS LINES

A bypass line is required for one and one-half (1½) inch and larger meters, except those used for irrigation-only service, whether installed in an outside or inside setting. Bypass lines shall contain an independent control valve and shall not contain tees, plugs, or other outlets through which water could be withdrawn. Bypass lines permit the customer to have water while the meter is being repaired or replaced and may only be activated by City of Evans. Bypass lines for one and one-half (1½) and two (2) inch meters shall be integral to the meter yoke with an appropriately sized ball valve. Bypass lines for three (3) inch and larger meters shall be connected to the main line at tees before and after the meter and shall include a gate valve with wheel operator. Bypass lines shall be locked in the closed position when not in use.

4.02.14 ABANDONMENT OR REMOVAL OF SERVICE LINES AND TAP CUTS

It may become necessary to remove or abandon a service line or stub-in due to redevelopment, and changes in water requirements for the premises or to relocate a service due to changes in the configuration of the premises. An abandoned or relocated service line shall have the tap cut at the main to ensure that it cannot be used to remove water from the system. Service line tap cuts shall be witnessed by a City of Evans Inspector. Tap cuts shall be coordinated through the Utility Department. Taps that are three (3) inches and larger shall require water plans for review. Service lines must be metered until disconnected from the main in the presence of a City of Evans Inspector.

A. Services, Two (2) Inch and Smaller

The service connection shall be excavated where the corporation stop is inserted into the water main. The corporation stop shall be closed, the service tubing or piping shall be removed from the corporation stop, the threads shall be scarred on the corporation stop, and a section of the water service line at least twelve (12) inches long shall be cut out. The curb or valve box over the curb stop shall be removed in its entirety or cut off at least eighteen (18) inches below the ground line. The meter shall be delivered to City of Evans Municipal Operations Center (1800 40th Street, Evans, Colorado, 80620) for a final test and reading. The meter may not be used again in the City of Evans system. The meter pit, if present, may be removed in its entirety. If it is left in place, it shall be cut off at least eighteen (18) inches below the ground line and filled with sand or another fill material.

B. Services, Three (3) Inch and Larger

The service connection shall be excavated over the service tee on the water main. The valve at the main shall be removed and the connecting fitting (tee or tap) plugged. The property line valve box shall be removed or cut off at least eighteen (18) inches below the ground line. The meter shall be delivered to City of Evans Municipal Operations Center (1800 40th Street, Evans, Colorado, 80620). For a final test and reading. The meter may not be used again in the City of Evans system. The meter vault, if present, may be removed in its entirety. If it is left in place, it shall be cut off at least eighteen (18) inches below the ground line and filled with sand or another fill material.

SECTION 3 MATERIALS

4.03.01 GENERAL

Furnished materials shall be new, undamaged, and the latest standard product of a manufacturer regularly engaged in the manufacture of the product for at least five (5) years. Everything necessary to complete installations in accordance with these Standards shall be furnished and installed including items not shown on plans and Standard. Installations shall be finished as fully operable, functioning parts of the City of Evans system.

Approved developers and/or applicants shall provide the materials necessary for installation when mains are extended; City of Evans will not supply materials. Acceptance of the materials or the waiver of an associated inspection shall in no way relieve the approved developer and/or applicant from the responsibility of furnishing materials that meet the requirements of the materials specifications.

New water industry products or materials will be tested if, in the opinion of the City of Evans, a product or material has some merit. City of Evans will establish the criteria for the testing and evaluation of products. City of Evans reserves the right to accept or reject any product or material regardless of test results.

4.03.02 SIZE OF MAINS

Standard acceptable nominal diameters of distribution mains are eight (8) and twelve (12) inches. Standard acceptable nominal diameters of transmission mains are sixteen (16) and twenty (20) inches. Standard acceptable nominal diameters for conduits are twenty-four (24) inches and larger.

4.03.03 PIPE CLASSES

City of Evans has established minimum design safety factors for system piping considering working pressures of 150 psi concurrent with a water hammer surge pressure of 110 psi for four (4), six (6), eight (8), twelve (12), and sixteen (16) inch pipe, and seventy (70) psi for twenty (20) inch and larger pipe.

Based upon these considerations, the following minimum AWWA Standard pressure classes for acceptable types of pipe are required:

Ductile Iron (DI)	Special Thickness Class 50 (6, 8, 12, 16, and 20-inch) Special Thickness Class 51 (3, 4, 24-inch)
Plastic (PVC)	C 900 DR 14 (4-inch through 12-inch) C 905 DR 18 (16-inch through 24-inch) C 909 Pressure Class 305 (4-inch) C 909 Pressure Class 235 (6, 8, and 12-inch)

4.03.04 SELECTION OF PIPE

In general, the selection of the type of pipe shall be left to the discretion of the Professional Engineer in charge of the design. However, City of Evans reserves the right to deny the use of certain types of materials in specific circumstances.

Where joint restraint is required, the designer shall select a pipe along with an approved system of restraint. Installation of metallic pipe and fittings in corrosive soil areas requires corrosion protection systems.

The installation of mains through hazardous areas, at depths greater than ten (10) feet, and in the roadways of State and Federal highways may require the selection of pressure classes in excess of the minimums. Special comprehensive studies of applicable laws, regulations, and detailed engineering calculations shall be submitted

by the approved developer and/or applicant to City of Evans for review in these instances.

When the installation of metallic pipe is contemplated, a soil resistivity survey of the construction area shall be performed. The survey data and calculations coupled with the service history of other existing pipes in the area shall be submitted by the approved developer and/or applicant to City of Evans. Resistivity surveys shall utilize the Wenner four (4) pin method.

When water mains are to be constructed in soils that have a resistivity of less than 1,000 ohm-centimeters or where stray current corrosion is expected to be severe, an approved nonmetallic pipe system shall be selected. When water mains are to be constructed in soils that have a resistivity of more than 1,000 ohm-centimeters, metallic or nonmetallic pipe material may be selected. Metallic pipe, fittings, and appurtenances shall be protected against corrosion by polyethylene wrap in accordance with these Standards and Specifications.

Soil contamination that consists of hazardous substances or materials or toxic substances will be determined on a case-by-case basis by City of Evans. Pipe materials used in contaminated soils shall be approved by the City Engineer.

When a metallic pipe must be used in a low resistivity soil, additional cathodic protection may be required, the design of which shall be specific to the project and subject to City of Evans approval.

4.03.05 PIPE FITTINGS

A. Joints

Joints and fittings shall be in accordance with applicable AWWA Standards and bear the pressure rating of the straight pipe involved at a minimum. Acceptable types for straight lengths of pipe are push-on, mechanical joint, and bell spigot restraint systems. Mechanical joints for straight lengths of pipe will be allowed under specific situations with City of Evans approval.

Fittings shall be furnished with mechanical joint ends. The use of wyes is prohibited. Fittings shall be fusion bonded epoxy coated.

B. Closure Fittings

Bolted sleeve-type couplings, in accordance with AWWA C219, shall be of a gasketed, sleeve-type with a diameter that properly fits the pipe. Tolerance on the pipe and coupling together with proper bolt and gasket arrangements shall be sufficient to ensure permanent watertight joints under all conditions. Couplings shall be sufficiently wide so that each type of pipe joined has as much pipe end inserted in the couplings as is provided by the standard push-on or mechanical joint for the pipe size and type involved.

The following table contains the minimum center sleeve dimensions for bolted sleeve-type couplings:

Table 4.03-3
Sleeve-Type Couplings

Pipe Diameter (In)	Center Sleeve Thickness (In)	Center Sleeve Width (In)
4	0.250	5
6	0.250	5
8	0.250	5
12	0.375	7
16	0.375	7
20	0.375	7
24	0.375	7

Ductile iron sleeves shall have mechanical joints of the proper size and tolerance to ensure a watertight fit.

Split sleeve couplings in accordance with AWWA C227 are acceptable.

Long bell closure pieces shall be equal in strength, at a minimum, to the straight pipe being joined and shall contain push-on joints of the proper tolerance to ensure watertight connections.

Where pipes of different types are connected together or where pipe is connected to fittings or valves of different materials, great care shall be taken to ensure the proper ring, insulating gasket, or adapter is selected.

C. Miscellaneous Pipe Fittings

Flanged adapters, plugs, end caps, bulkheads, cut-in sleeves, anchor couplings, repair fittings, and other appurtenances shall be used where appropriate throughout the system subject to City of Evans approval. Written requests for the approval of deviating items shall be made in advance through City of Evans.

D. Mechanical Joint Restraint Devices

The harnessing of joints may be accomplished using one of the mechanical joint restraint systems or using one of the several proprietary joint restraint systems supplied by pipe manufacturers. Proprietary systems will require City of Evans approval prior to use. Regardless of the system used, restrained lengths of pipe for various fittings where harnessing is utilized or required shall be at least equal to the lengths shown on these Standards.

Where joint restraint is required on PVC pipe, the designer may use a joint restraint system of the type supplied by pipe manufacturers and approved by City of Evans or switch to a metallic pipe. The use of rods and clamps on PVC pipe are not allowed.

4.03.06 LINE VALVES

Line valves shall be resilient seat gate valves. Valves shall be the same size as the main and shall open counterclockwise. Valves with operators that open clockwise shall not be used unless they are required by, or approval is obtained from, the City of Evans.

4.03.07 PRESSURE REGULATING VALVES (PRV)

A PRV is used to keep downstream pressure uniform and less than that in the upstream main.

They shall be sized so that the velocity through the valve at maximum demand does not exceed twenty-five (25) feet per second. If a wide range of flow rates is anticipated, more than one (1) valve may be required. Care shall be taken to ensure an adequate pressure differential across the valve under all ranges of flow to accomplish hydraulic throttling. When pressure differentials greater than forty-five (45) psi are expected or when the downstream pressure are low relative to the differential, special valve materials or a special valve design may be required.

PRVs shall be properly supported and have adequate clearance above and below the valve to facilitate servicing. A manual bypass is required for single valve installations. Telemetry of data may be required. Each PRV shall have a gate valve on both sides for isolation purposes.

4.03.08 TAPPING VALVES AND SLEEVES

Tapping valves and sleeves shall be used concurrently to tap an existing main that is in service and under pressure without interrupting service. A tapping valve does not replace a property line valve; however, a property line valve may not be required if the out-distance of the main is fifteen (15) feet or less.

Connections to the main that are two (2) inches and smaller shall be made by a corporation stop that is the same size as the service line.

Connections to mains that are larger than two (2) inches shall be made with an existing tee, cutting a tee into a dewatered line (if authorized by City of Evans), or a tapping valve and a tapping sleeve. Whichever method is used, care shall be exercised to select sleeves and gaskets that are properly sized to fit the type and class of pipe to be tapped. Where tapping sleeves are used that are larger than two (2) inches, a thrust block shall be placed behind the tapping sleeve to prevent possible damage to the main from pressure shocks that develop as valves are first opened.

4.03.09 CHECK VALVES

A check valve permits flow in one direction only; it closes when the flow stops so reversal cannot occur. They are required for meter installations one and one-half (1½) inches and larger where there is no BFPA downstream. Check valves are not a substitute for BFPAs; however, they may be omitted from the meter installation in cases where a BFPA is within 150 feet of the meter with approval by the City.

4.03.10 STOP AND WASTE VALVES

Service lines shall have a stop and waste valve on the service line inside the residence (near where the line enters the residence). The stop and waste valve shall have a drain plug located on the valve body so that when the valve is shut off the drain plug can be removed and the water above the valve drained out.

4.03.11 VALVE BOXES

Buried gate valves that are twelve (12) inches and smaller shall be provided with a six (6) inch cast iron valve box and large oval base. The valve box shall be of a design that shall not transmit shock or stress to the valve and shall have sufficient extension capability to be raised flush to the ground line per Standard Details (WA-19 and WA-20).

4.03.12 VALVE REFERENCE MARKER POSTS

When valves are installed where adequate physical reference points are not available, as determined by City of Evans, a valve reference marker post may be required. Marker posts shall be 4x4 pressure-treated lumber set with a minimum forty-eight (48) inches buried into ground and minimum forty-eight (48) inches above ground.

4.03.13 WATER METERS

Water meters used in City of Evans system shall be pre-approved in accordance with the approved manufacturer and model. City of Evans will determine the type of meter to be installed at the time of the application based upon size, service requirements, location, and other conditions that may exist. City of Evans may change the type of meter at any time based on the water usage patterns of the developer and/or applicant.

A. Magnetic Drive Displacement Meters

Displacement meters five-eighths (5/8) through three (3) inch, known as nutating-disc or oscillating piston meters, they are positive in action. The pistons and discs displace or carry over a fixed quantity of water for each nutation or oscillation when operated under positive pressure. Displacement meters are generally used for residential, industrial, and commercial applications requiring a three (3) inch or smaller service and for irrigation services one and one-half (1½) inches and smaller. The one (1) inch and smaller magnetic drive displacement type water meter shall be furnished with a cast iron frost bottom.

B. Compound Meters

Compound meters consist of two meters in a single case, one to measure small flows and the other to measure large flows. Compound meters are designed for the small meter to operate during low flows. As flows begin to increase, the large meter takes over. When the large meter is in operation, the small meter may or may not be in operation. Compound meters are generally used for residential, industrial, and commercial applications requiring a service larger than three (3) inches, except for irrigation and certain industrial uses where flow rates are relatively constant.

C. Turbine Meters

Turbine meters are designed to measure primarily large, fairly constant flows and should not be used where possibilities of small flows exist below the manufacturer's stated minimum. Turbine meters are used for irrigation applications requiring a service two (2) inches and larger for certain industrial applications with relatively constant, high flows; they are not for domestic use.

D. Fireline-Type Meters

Fireline-type meters, which are specialized types of compound meters, shall be used on any service that includes fire sprinklers, fire hydrants, or other fire protection behind the meter and in other cases as determined by City of Evans. Single family residences and duplexes with a limited number of sprinkler heads may be exempt from this requirement.

4.03.14 METER APPURTENANCES

A. Valves for Use with Meters:

Valves for two (2) inch and smaller meters depend on the size and type of setting as follows, in accordance with these Standards. Services shall have a curb stop or valve that is the same size as the tap and service line installed as close behind the curb line as possible.

1. Outside settings, one (1) inch or smaller: Install a curb stop two (2) to five (5) feet before the meter pit. The meter setting shall include an angle valve or ball valve on the inlet side of the meter.
2. Outside settings, one and one-half (1½) or two (2) inch: Install a curb stop two (2) to five (5) feet before the meter vault. The meter setting shall include angle valves or ball valves on the

inlet and the outlet sides of the meter. The bypass line shall have a ball valve that may be locked in the closed position.

3. Detector check valve assemblies on two (2) inch and smaller firelines: Install a curb stop two (2) to five (5) feet before the DC vault. The DC setting shall include angle valves or ball valves on the inlet and outlet sides of the meter. Valves for the 5/8 or 3/4-inch meter on the DC shall be included in the meter-mounting kit from the DC manufacturer. The DC is required in addition to a required BFPA.

Valves shall be in accordance with AWWA C800.

B. Meter Couplings:

Meters one and one-half (1½) inches and larger shall be installed with a coupling to allow for the removal of the meter without disturbance to the pipe.

C. Copper setters:

A copper setter is a metal pipe frame that is inserted in the copper service line piping to support and convey water to the meter. Copper setters for meter sizes that are one (1) inch and smaller shall include a lockable angle valve on the meter inlet. Copper setters for meter sizes that are one and one-half (1½) and two (2) inch shall include lockable angle valves or ball valves on the meter inlet and outlet and a lockable ball valve on the bypass per Standard Details (WA-7 and WA-10).

D. Valve and Meter Supports

Meter supports shall be a solid concrete block as shown on these Standards. Fabricated metal supports or jack stands shall be used to support three (3) inch and larger valves and shall be in accordance with the Standard Details (WA-9A and WA-9B).

E. Electrical Continuity

To ensure safety, meter settings shall provide for electrical continuity in the event the meter is removed from the setting. For meters that are two (2) inches and smaller, this is normally accomplished by installing the meter in a copper setter that provides a continuous electrical path from the metallic piping on the downstream side of the meter setting to the metallic piping on the upstream side. For larger meters and for installations where a copper setter is not used, there shall be an electrical continuity wire or strap connecting the pipe on either side of the meter setting.

The wire shall be made of copper with fittings suitable for bonding jumper and water pipe material. The meter setting installation shall be in compliance with the NEC.

4.03.15 METER PITS AND LIDS FOR ¾ AND 1-INCH METERS

Meter settings for three-quarter (¾) and one (1) inch meters shall be installed in meter pits with a twenty-four (24) inch nominal diameter and a total depth of fifty-two (52) inches minimum from grade. The pit shall consist of a twenty-four (24) inch nominal diameter by forty-eight (48) inch high cylinder of concrete or composite with a dome or bell housing holding an internal frost lid and a locking top lid. The base unit shall have two doghouse cutouts that are three (3) inches wide by four (4) inches high and 180 degrees apart to accommodate service line tubing. The top unit shall have a shelf or tapered design to support a standard dome or bell housing with a twenty (20) inch nominal diameter. Lids shall have a one and seven-eighths (1-7/8) inch hole in the center for AMR antenna.

- A. The pit shall be installed plumb and at sufficient depth for the top of the dome to sit at ground line or up

to one (1) inch below ground line. Grade adjustment rings from the same manufacturer shall be used to raise the top of the pit or to accommodate the plumb pit to an angled ground surface.

- B. The cap-type meter pit top lid shall be constructed of cast iron or an approved composite material. Lids shall be of the cap-type with a locking screw and bolt that provides a tight locking of the cover to the dome or bell housing of the meter pit. Lids shall be capable of withstanding HS-20 traffic loading. Composite lids shall withstand HS-20 traffic loading applied to a nine (9) inch square plate with no permanent deformation. When set in place of the dome, the top of the meter pit lid shall be set at ground line.
- C. The inner frost lid shall be high-density polyethylene.

4.03.16 METER VAULTS FOR METERS 1½-INCH AND LARGER

Meter vaults shall be precast concrete from approved manufacturers. Cast-in-place vaults maybe used in special circumstances with prior approval of the structural design by City of Evans. Precast vaults shall be designed so that joints and corners are waterproof. The roof and the walls of precast and cast-in-place vaults shall be made waterproof after construction using sealants, membranes, or other approved methods. Access manholes shall be adjusted to be flush with the finished landscape grade or surrounding pavement. All lids shall be aluminum or cast iron with a recessed area for the meter radio and a one and seven-eighths (1-7/8) inch hole for AMR antenna.

- A. Circular Vaults for One and One-Half (1½) and Two (2) Inch Water Meters:

Vaults shall be forty-eight (48) inches in diameter and of sufficient depth to extend below the four and one-half (4½) to six (6) feet bury depth of the service line. The wall thickness shall be at least six (6) inches. The vault shall have a flat top with concrete grade rings supporting the manhole ring and twenty-four (24) inch diameter manhole cover at ground line. Vaults shall sit on reinforced concrete manhole beams when subject to traffic loads.

- B. Rectangular Vaults for Water Meters Larger than two (2) Inches:

Vaults to be used for water meters larger than two (2) inches shall be of a size and configuration in accordance with these Standards and approved by the Public Works Director. Vaults shall be precast concrete from an approved manufacturer; however, vaults may be cast-in-place with prior approval of the structural design by City of Evans. Vaults shall be designed to support the street fill and HS-20 traffic loading in accordance with AASHTO Standards. Meter vault lids shall be cast iron manhole covers with a twenty-four (24) inch lid set into a thirty-six (36) inch outer diameter ring. See Standard Details (WA-9B, WA-9C, and WA-9D).

- C. Steps

Meter vaults shall include copolymer “manhole-type” steps cast into the side of the vault evenly spaced at twelve (12) inch centers, minimum.

4.03.17 CONCRETE STRUCTURES

Structures shall be designed to support applicable loads. Design calculations, drawings, and contract specifications shall be submitted to City of Evans for review.

Concrete used in structures shall be Class D.

4.03.18 STEEL REINFORCEMENT FOR CONCRETE

Steel reinforcement shall be deformed bars or welded steel fabric.

4.03.19 MANHOLES

Manholes and reducing sections shall be precast concrete.

Manhole rings and covers shall have the following additional requirements:

- A. The twenty-four (24) inch manhole rings and covers shall be City of Evans, Colorado Standard pattern and constructed of cast iron or an approved composite material.
- B. The twenty-four (24) inch cast iron manhole cover shall weigh approximately 165 pounds. The twenty-four (24) inch cast iron ring shall weigh approximately 240 pounds.
- C. The twenty-four (24) inch recessed manhole covers for meter vaults shall be aluminum City of Evans Standard pattern with one or two recesses that are approximately seven (7) inches in diameter by three-quarter ($\frac{3}{4}$) inch deep with a two (2) inch hole for the mounting of an AMR device through the lid. The lid shall be cast with the words City of Evans Meter on the top.
- D. The twenty-four (24) inch by thirty-six (36) inch double ring and cover: The thirty-six (36) inch cover shall have an auxiliary twenty-four (24) inch opening and cover. The thirty-six (36) inch cover weighs approximately 250 pounds. The cast iron thirty-six (36) inch ring weighs approximately 280 pounds.
- E. Composite manhole covers for meter vaults shall be constructed of fiber reinforced polymer. They shall be furnished with a locking mechanism that prevents the lid from popping from its frame under traffic conditions. Composite covers shall retain traffic load rating and other performance characteristics between minus 60°F and 160°F. Composite manhole covers for meter vaults shall meet or exceed the requirements for cast iron manhole covers and shall fit equally well in cast iron or composite frames.

4.03.20 MANHOLE BASE SLABS AND BASE BEAMS

Manhole base beams shall be constructed of precast, reinforced concrete.

4.03.21 SUMP PITS FOR VAULTS AND MANHOLES

Sumps are required for vaults and manholes where there is seepage into existing vaults, in PRV installations, and as determined by City of Evans.

A gravity drain line or sump pump shall be used in conjunction with a sump where telemetry equipment is to be installed. A sump pump is not permitted in a meter vault.

Normal practice in constructing a sump is to excavate a thirty (30) inch diameter hole roughly three (3) feet deep. A six (6) inch concrete floor is placed and allowed to set. A twenty-four (24) inch section of cardboard tubing is then used for an inside form with concrete poured behind it to approximately three (3) inches of thickness cast-in place floor shall incorporate a monolithic sump pit.

4.03.22 VENT PIPES

Vent pipes are used in vaults and pits to provide proper ventilation. Installations that contain electrical equipment shall have a locally controlled, power-operated blower attached to the vent system. Electric powered blowers are not permitted in meter vaults. Vent pipes shall be field located at the nearest intersection of the street property line and the side lot line.

The above ground vent pipe shall be six (6) inch nominal diameter black steel pipe in accordance with ASTM A 53. The vent screen shall be a three-quarter ($\frac{3}{4}$) inch No. 9-F11 flattened, expanded galvanized metal screen. The below ground vent pipe shall be six (6) inch, Schedule 40 PVC with glued joints. A PVC glued joint by standard pipe thread female adapter shall be used to connect the steel pipe to the PVC pipe at ground level. This adapter is not needed where the residential vent pipe assembly is used.

PVC pipe is not allowed for eight (8) foot above-ground risers.

4.03.23 FIRE LINE CONNECTION TO MAINS

Fire lines that supply sprinklers shall be sized by the Evans Fire Rescue District and the persons responsible for the structure. City of Evans will not size fire lines.

4.03.24 SERVICE LINES

Service lines shall be sized to supply the requirements of the property being served. The minimum size line shall be three-quarter ($\frac{3}{4}$) inch. The only acceptable material is seamless Type K soft copper pipe for three-quarter ($\frac{3}{4}$) to two (2) inch service lines. Ductile iron pipe is required for three (3) inch and larger service lines. Service lines shall be the same type of material from beginning to end, unless an appropriate insulator is installed at the junctions of the dissimilar metals. Unless otherwise approved by the Director of Public Works or designee, there shall not be bends or changes in the size of the service line between the tap and a point five (5) feet past the outside wall of the meter pit or vault for outdoor meter settings or between the tap and a point five (5) feet past the curb valve for indoor meter settings.

All copper joints installed underground shall be made with compression fittings.

4.03.25 CORPORATION STOPS

Corporation stops provide the connection for the service line to the main; they shall use compression fittings. By utilizing a corporation stop, a service can be connected to the main without taking the main out of service. Corporation stops are also used in air valve assemblies, vacuum valve, and large butterfly valve installations as shown on the Standard Drawings. Corporation stops are made in three-quarter ($\frac{3}{4}$), one (1), one and one-half ($1\frac{1}{2}$), and two (2) inch sizes.

4.03.26 CURB STOP SERVICE BOXES

Curb stop service boxes, or stop boxes, shall be cast iron, Mueller type. The bottom part, shaped like an inverted U, shall straddle the service line and have a flanged bottom to support itself.

4.03.27 CORROSION PROTECTION SYSTEMS

Cast iron and ductile iron pipes and fittings shall be protected against corrosion.

A. Polyethylene Encasement Material

Polyethylene wrap shall be used on metallic pipe, fittings, rods, and appurtenances in conformance with AWWA C105.

B. Insulators

Insulators shall be installed at the outlet end of the corporation stop.

C. Pipe Joint Bonding

In areas where the soil resistivity is 1,000-Ω-cm or less and metallic pipe must be used, joints shall be bonded with No. 4 solid copper wire. Cadwelds shall be covered by an NEC-approved method.

D. Wax Tape

Wax tape ductile iron pipe and fittings that shall be subject to submersion in manholes and vaults not equipped with sump pumps.

4.03.28 KICKBLOCKS (THRUSTBLOCKS)

Concrete kickblocks shall be sized for working pressure plus water hammer surge pressures and soil bearing capacity. Standard shapes and sizes of kickblocks are shown on Standard Detail WA-14.

Kickblocks shall be constructed of Class B concrete or of a premeasured, sacked industrial mix such as Sakrete. Ready-mixed concrete mixes shall be approved by City of Evans.

4.03.29 BORINGS

A. CASING PIPES

Installation of mains through City of Evans ROW, or the ROW or easements of others, such as highways, railroads, etc., may require casing pipes to facilitate the installation of the main. The casing pipe may be required by the permitting agency or by City of Evans. The type of casing material and its properties shall be specified by the agency granting permission to cross. In the absence of a casing specification, City of Evans will specify the casing material. Such crossing will be subject to City of Evans approval to avoid conflicts in requirements or standards between City of Evans and the persons or agency granting permission to cross. Final approval of the boring and casing methods and materials shall be obtained from City of Evans prior to construction. When a bore is not required to cross interference, City of Evans may require the installation of the main under the interference.

B. CARRIER PIPE

Carrier pipe placed inside a casing pipe shall be fusible HDPE or CertainTeed Certa-Lok PVC pipe.

C. SPACERS

Carrier pipe shall be centered in casing pipe with appropriate skids/spacers. Skids/spacers to be manufactured by Calpico, Power Seal, or approved equal.

D. END SEALS

Carrier pipes at casing ends shall be sealed with wraparound end seals clamped to both casing and carrier to prevent soil or water entering into casing annulus. End seals to be manufactured by Calpico, Power Seal, or approved equal.

4.03.30 MISCELLANEOUS METALWORK AND PIPING

Fabrication shall be equal to the best practice in modern fabricating shops. Welding shall be performed by certified welders and exposed welds shall be ground smooth. Weld spatter shall be properly removed to City of Evans satisfaction.

Exposed hardware such as nuts, washers, bolts, and anchor bolts shall be galvanized. Exposed metal that is to be buried shall be given two coats of CA-1200 mastic cold coating as manufactured by the Protecto Wrap Company

of Denver, Colorado, except for metal with shop-applied coating approved by City of Evans.

Metal exposed to the weather shall be painted with one coat of rust inhibiting priming paint and two coats of aluminum paint unless otherwise directed by City of Evans. Surfaces that are to be painted shall be cleaned of oil, grease, weld spatter, burrs, grit, dust, or other objectionable surface irregularities. The cleaning solvent used shall be mineral spirits. Copper, aluminum, or galvanized pipe does not need to be painted unless directed by City of Evans.

Miscellaneous piping shall be installed in the best workmanlike manner. Threads on steel pipes shall be cut with sharp dies to standard depth and left clean cut and tapered. Threaded pipe joints shall be properly sealed with an approved joint compound applied on the male threads only. Concealed joints for copper water tubing within buildings shall be soldered or brazed in accordance with the appropriate building code. The joint of the copper pipe shall be properly cleaned, flux applied, and soldered with 95-5 tin-antimony solder that is applied in accordance with the best plumbing practice. Copper piping shall be protected with a copper saddle soldered to the underside of the pipe where in direct contact with pipe hangers or other metal supports.

Saddles may be made of split copper pipe.

4.03.31 AIR AND VACUUM VALVES

Combination air release and vacuum valves shall be installed in vaults such that they fully release air from the top of pipe. They may be installed directly above the pipe or with offset piping. Offset piping shall be the same size as the air-vac valve. Air-vac valves shall be installed with an isolation ball valve. Air-vac valves shall be as manufactured by APCO, Valmatic, or approved equal.

4.03.32 TRACER WIRE

Tracer wire shall be installed with all water mains in accordance with Standard Details (WA-5, WA-6, and WA-19). Tracer wire to be AWG 12 solid copper wire with 0.03-inch APWA-approved color (blue) PE insulation fastened to the pipe with two (2) inch PVC tape at least once per stick of pipe installed.

4.03.33 UNDERGROUND MARKING TAPE

Detectable marking tape shall be installed one (1) foot above the crown of pipe with a non-ferrous backing. Tape shall be minimum three (3) inches wide with 0.03-inch APWA-approved color (blue) PE insulation and black lettering indicating "Caution: Buried Water Line Below."

SECTION 4 PIPE INSTALLATION**4.04.01 HANDLING OF MATERIALS**

Pipe and fittings shall be loaded and unloaded by lifting to avoid shock or damage to materials. Materials shall not be dropped under any circumstances. If any part of the coating or lining of pipe is damaged, the replacement or repair of the damaged pipe shall be done to the satisfaction of City of Evans. Any pipe or fittings not acceptable to City of Evans shall be removed immediately from the jobsite. Pipe handling equipment and pipe handling methods shall be approved by City of Evans.

A. Pipe Storage

Support stockpiled pipe on wooden chocks or sandbags placed under the pipe. Provide sandbags of sufficient size to prevent pipe from contacting the ground or any obstruction and allow for the proper use of slings. Securely cover pipe ends with polyethylene material or other suitable bulkhead to prevent the entry of animals, water, dirt, mud, or undesirable substances and prevent the drying out of the interior of the pipe.

4.04.02 PREPARATION AND INSPECTION OF PIPE AND FITTINGS FOR INSTALLATION

Before placing pipe in the trench, each pipe or fitting shall be thoroughly cleaned of foreign material, kept clean thereafter, and carefully examined for cracks and other defects before installation. Bell ends and spigot ends are to be examined with particular care.

4.04.03 PIPE JOINT LUBRICANT

Joint lubricant shall be supplied by the pipe manufacturer/supplier and approved by City of Evans. Joint lubricant shall be non-toxic, water soluble, and certified to meet NSF/ANSI Standard 61.

4.04.04 CUTTING AND FITTING OF PIPE

Pipe shall be cut whenever necessary to be in accordance with the location of fittings, line, or grade. Cuts shall be straight and true in a manner so that a smooth end is attained without damage to the pipe. Burrs shall be removed from the ends of cut pipe and the ends of the pipe lightly rasped or filed. Tools used for pipe cutting shall be approved by City of Evans.

4.04.05 PIPE ALIGNMENT AND GRADE

The horizontal and vertical tolerance for laying pipe shall be plus or minus one (1) inch. Fittings, valves, and hydrants shall be installed at specified locations and elevations.

When pipe is laid on curves, the intent is to lay to the alignment. Pipe shall be kept in alignment by placing joints or bends on the curve. Bends shall be used whenever individual deflections exceed 0.8 times the maximum specified by the manufacturer. Minimum lay lengths shall be full sticks of pipe. The cutting of pipe to increase the numbers of joints to achieve bends or curves is not allowed.

The depth of cover over pipe, measured from ground line to top of pipe, shall be a minimum of four and one-half (4½) feet; it shall be known as the cover over pipe. If difficulties arise when crossing an interference, deviations from four and one-half (4½) feet of cover may be permitted where specifically approved in writing by City of Evans, and where appropriate, frost protection shall be used. In unusual circumstances, cover over the pipe may be reduced to a minimum of three (3) feet and increased to a maximum of ten (10) feet if approved by City of Evans.

Any changes in alignment and grade shall be authorized by City of Evans and accomplished by the installation of additional fittings.

Pipe shall be laid with the bell ends facing the direction of the pipe being laid unless otherwise directed by City of Evans.

4.04.06 DEVIATION OCCASIONED BY OTHER STRUCTURES

Whenever obstructions not shown on plans interfere to such an extent that an alteration in plans is required, City of Evans will have the authority to determine the best method of correction. City of Evans Inspector may change the plans and order a deviation from line and grade or arrangements may be made with the owners of the structure for its removal, relocation, or reconstruction. The developer and/or applicant shall pay the costs for changes.

4.04.07 EXCAVATION

All excavations shall be made to the lines and grades as established by the approved drawings. Pipe trenches shall be excavated to a minimum depth of six (6) inches below the bottom of the pipe. All areas shall be excavated in such a manner as will afford adequate drainage. Where material encountered within the limits of the work is considered unsuitable for a foundation by the Inspector, such material shall be excavated below the grade shown on the drawings to a depth necessary to ensure a stable, firm foundation and refilled with one and one-half (1½) inch rock uniformly graded to provide a firm foundation, unless otherwise specified by the Public Works Director or his designee.

All excavated materials which are considered unsuitable for backfill and any surplus of excavated material shall be disposed of by the contractor.

All existing asphalt or concrete surfacing shall be cut vertically in a straight line and removed from the job site prior to starting the trench excavation. This material shall not be used in any fill or backfill.

The trench shall be excavated so that a minimum clearance of six (6) inches is maintained on each side of the pipe for proper placement and compaction of the bedding or backfill material. The maximum trench width measured at the top of the pipe shall be the outside diameter of pipe plus twenty-four (24) inches.

If the trench width exceeds the maximum trench width, a stronger class pipe will be specified.

The trench shall be adequately supported, and the safety of workers provided for as required by the most recent standards adopted by the Occupational Safety and Health Act. The City reserves the right to inspect construction sites for compliance to OSHA regulations. The City is not responsible for the safety of any party or parties constructing the utility project.

Excavation for structures shall be of such dimensions as to allow for proper installation and to permit the construction of the necessary pipe connections.

Blasting shall not be allowed.

See Standard Details (WA-17).

4.04.08 TEMPORARY BULKHEADS AND PNEUMATIC PLUGS

During construction projects, sections of water mains are installed and at times left unattended leaving pipes vulnerable to human tampering and/or environmental contamination (e.g., ground water, muddy water, sanitary or storm water, animals, and insects). Whenever installed pipe is left unattended, temporary plugs (bulkheads or pneumatic) or approved end covers shall be installed at openings. Temporary plugs shall be watertight, installed

properly, and designed in a way that prevents human tampering and environmental contamination. Temporary plugs shall be approved in writing by the City of Evans.

The contractor shall install approved bulkheads or pneumatic plugs on pipe openings before storm events and before leaving the work site unattended and report any reported human tampering or contamination events to City of Evans immediately.

Bulkheads and/or pneumatic plugs shall be thoroughly cleaned and disinfected with 100 mg/l calcium hypochlorite or sodium hypochlorite (chlorine) using a swab or spray application method before installation. Plugs shall be kept free from contamination during storage and shall not be used in non-potable applications (e.g., sanitary sewer, storm water systems, and recycled water).

4.04.09 FROST

Pipe or appurtenant structures shall not be installed upon a foundation into which frost has penetrated or at any time when City of Evans deems there is a danger of ice formation or frost penetration at the bottom of the excavation. Installation shall not occur unless backfilling can be completed before the formation of frost and ice.

4.04.10 DUCTILE IRON PIPE

A. Push-on Joint

Immediately before joining two lengths of ductile iron pipe, the inside of the bell, the outside of the spigot end, and the rubber gasket shall be thoroughly cleaned to remove oil, grit, excess coating, and other foreign matter. The rubber gasket shall be flexed inward and inserted into the gasket recess of the bell socket. Caution shall be exercised to ensure the correct type of gasket is used.

A thin film of joint lubricant shall be applied to the inside face of the gasket, the spigot end of the pipe, or both.

The spigot end of the pipe shall be placed with care into the bell end to prevent the joint from contacting the ground. The joint shall be completed with a slow, steady pressure without jerky or jolting movements. Pipe furnished without a depth mark shall be marked before assembly to ensure insertion is to the full depth of the joint. The spigot end of field cut pipe shall be filed or ground to resemble the spigot end of manufactured pipe.

B. Mechanical Joint

Before joining mechanical joint ductile iron fittings to ductile iron pipe, the outside of the spigot, the inside of the bell, and the rubber gasket shall be thoroughly cleaned to remove oil, grit, excess coating, and other foreign matter.

Normal practice is to lubricate the joint with a soap solution; however, in cold weather the joint may be dry assembled if approved in writing by City of Evans. Extreme care shall be exercised in making dry joints.

The gland shall be slipped on the spigot end of the pipe with the lip extension of the gland toward the socket or bell end. The rubber gasket shall be placed on the spigot end with the thick edge toward the gland.

Pipe shall be pushed in until the spigot end fully penetrates the bell. The gasket shall then be pressed into place evenly within the bell around the entire joint. The ductile iron gland shall be moved along the pipe into position for bolting. Bolts shall be inserted, and nuts shall first be screwed finger tight with the final tightening to be done to the manufacturer's specifications with a torque-limiting wrench.

Nuts spaced 180-degrees apart shall be tightened alternately to produce equal pressure on the gland. Mechanical joint fittings shall be wrapped with polyethylene encasement material.

C. Bolted Sleeve-Type Couplings

When installing bolted sleeve-type couplings, care shall be taken to ensure the connecting pipe ends, couplings, and gaskets are clean and free of dirt and foreign matter with special attention given to the contact surfaces of the pipe, gaskets, and couplings. These couplings shall be assembled and installed in accordance with the recommendations and instructions of the coupling manufacturer.

Bolted sleeve-type couplings shall be wrapped with polyethylene encasement material.

Wrenches used to bolt couplings shall be of the type and size recommended by the coupling manufacturer. Coupling bolts shall be tightened to secure a uniform annular space between the end rings. The body of the pipe and bolts shall be tightened approximately the same amount. Diametrically opposite nuts shall be tightened progressively and evenly. Final tightening shall be done to the coupling manufacturer's specifications with a torque-limiting wrench.

4.04.11 POLYVINYL CHLORIDE PRESSURE PIPE

A. Elastomeric Gasket Joint

Immediately before joining two lengths of PVC pipe, the inside of the bell or coupling, the outside of the spigot, and the elastomeric gasket shall be thoroughly cleaned to remove foreign material.

Lubrication of the joint and rubber gasket shall be done in accordance with the pipe manufacturer's specifications.

Care shall be taken to ensure that only the correct elastomeric gasket, compatible with the annular groove of the bell, is used. Insertion of the elastomeric gasket into the annular groove of the bell or coupling shall be in accordance with the manufacturer's recommendations. Pipe that is not furnished with a depth mark shall be marked prior to assembly to ensure the spigot end is inserted to the full depth of the joint.

The spigot and bell or coupling shall be aligned and pushed until the reference line on the spigot is flush with the end of the bell or coupling. Pushing shall be done in a smooth, steady motion.

B. Pipe Storage

Pipe stored outside and exposed to sunlight for more than thirty (30) days shall be covered with an opaque material such as canvas. Clear plastic sheets shall not be used to cover pipe. Air circulation shall be provided under the covering. Pipe with chalking or evidence of damage due to UV exposure shall not be accepted.

C. Handling of Pipe in Cold Weather

PVC pipe has reduced flexibility and impact resistance as temperatures approach and drop below freezing. Extra care should be used in handling PVC pipe during cold weather.

D. Tracer Wire and Warning Tape Installation

Tracer wire and warning tape meeting these Specifications shall be used for all pipe installation.

4.04.12 INSTALLATION OF VALVES

Valves shall be handled in a manner that prevents injury or damage. Valves shall be set and joined to the pipe in the manner previously specified for cleaning, laying, and joining mechanical and push-on joints. Valves shall be set with the valve stems plumb. Valves shall be wrapped with polyethylene encasement material.

Valves shall be located at the point on the main that would be intersected by the street property line if extended. Any deviations shall be at City of Evans discretion.

Valves shall be exercised upon installation to ensure they are in good and operable condition.

4.04.13 INSTALLATION OF VALVE BOXES

A valve box shall be provided for every valve. The valve box shall not transmit shock or stress to the valve; it shall be centered and plumb over the nut of the valve with the box cover set to the elevation stated on the construction drawings or as approved by the City of Evans. See Standard Details (WA-19). The City shall not install nor maintain concrete collars for valve boxes outside of public rights-of-way.

4.04.14 INSTALLATION OF FITTINGS

Where PVC pipe is inserted into cast iron or ductile iron fittings, beveled portions of the spigots shall be removed to accommodate the expansion characteristics of the plastic to the lesser depth of the bell.

Repair fittings and stainless-steel repair clamps shall be wrapped with polyethylene encasement material when installed during a main repair.

4.04.15 INSTALLATION OF TAPPING SADDLES

A tapping saddle is used to make a wet connection to an existing main without taking the main out of service. A tapping saddle and tapping valve are not a substitute for a property line valve. A valve box shall be installed with the tapping valve.

Tapping saddles may be installed side-by-side when specifically approved in writing by City of Evans. A twelve (12) inch space shall be provided between adjacent saddle plates. In an intersection, two (2) tapping saddles may be used to run lines out of both sides of the pipe if the alignment of the pipe is kept straight in its run out of the saddles. Tapping saddles used for domestic services and fire lines shall be spaced to provide adequate clearance between the completed service lines and meter pits/vaults, fire hydrants, and similar underground structures. The use of two (2) tapping saddles, side-by-side or back-to-back, as a substitute for a cross is prohibited. A six (6) inch tap on a six (6) inch main and an eight (8) inch tap on an eight (8) inch main are allowed whereas a twelve (12) inch tap on a twelve (12) inch main is not allowed.

4.04.16 FIRE HYDRANTS

A. Installation

Hydrants shall be field staked for location and grade. The final location shall be in accordance with plans. Fire hydrants shall be set so that the elevation of the center of the traffic flange is three (3) inches above the ground line or top of the curb.

Each hydrant shall be connected to the street main by a six (6) inch branch line. The branch line shall be ductile iron pipe only. An independent six (6) inch gate valve shall be installed on each fire hydrant branch. The valve shall be firmly anchored to a mechanical joint tee with a six (6) inch anchor coupling (also called a swivel adapter or a locked hydrant adapter) or to a mechanical joint anchor tee (also called a swivel tee or a locked hydrant tee).

The fire hydrant branch shall be fully anchored to the valve by restrained mechanical joints.

Exception: When making a wet tap for a fire hydrant, a tapping valve and saddle shall be used in place of the mechanical joint tee, swivel adaptor, and valve.

B. Hydrant Drainage

Drainage shall be provided at the base of the hydrant by placing rock from the bottom of the trench to at least twelve (12) inches above the barrel flange of the hydrant and to a distance of twelve (12) inches around the elbow. The minimum distance from the bottom of the trench to the bottom of the hydrant elbow shall be six (6) inches. The minimum amount of rock placed shall be one-third (1/3) cubic yard. The rock shall be a gravel, cobble, or crushed rock one and one-half (1½) inch maximum diameter.

C. Hydrant Protection from Corrosion

The ductile iron branch line and fittings from the hydrant base up to and including the tee shall be encased in polyethylene wrap.

4.04.17 FIRE LINE CONNECTIONS

Fireline connections shall be restrained ductile iron pipe. The fire line connection shall have a valve two (2) to five (5) feet from the property line that is on the street side of the property line. The fire line connection shall be protected from corrosion. Requests for residential fire line connections shall be submitted with the plans to City of Evans for approval by the Evans Fire Protection District.

4.04.18 KICKBLOCKS (THRUSTBLOCKS)

The following standard shall apply to kickblocks:

A. Installation

Kickblocks shall be constructed at bends and fittings that require support due to unbalanced line thrust. Care shall be taken to ensure that outlets, cover bolts, nuts, clamps, and other fittings are accessible. A bond breaker shall be placed between the pipe and the kickblock to aid in future removal. If a large kickblock is to be placed, it shall be separated into sections by a suitable material. Bearing surface areas are minimum areas to bear against the undisturbed trench wall. If the soil bearing capacity is insufficient to provide adequate support based on minimum bearing areas shown on the Standard Details (WA-14A to WA-14C), then the minimum bearing area shall be increased to a size that shall ensure support restraint. In every instance, the kickblock shall bear against undisturbed earth.

Before placing concrete, equipment used in the mixing and transport shall be cleaned. Debris, water, or ice shall be removed from the area to be occupied by concrete. Concrete shall not be placed on frozen subgrade. Concrete shall be placed only in the presence of the City of Evans Inspector unless inspection is waived prior to the placement.

B. Formwork for Kickblocks

Forming for concrete kickblocks and anchors shall be done by bulkheading around the shape of the kickblock or anchor with wood, burlap sacks, or reinforced paper sacks that are filled with sand or earth. Sacks shall be constructed of a size easily handled when full and left in place in the trench. Wood forms shall be removed before backfilling.

Horizontal struts or braces required for trench shoring shall not remain in concrete kickblocks. Prior to

placing concrete, the forms and ditch bank will be inspected and approved by City of Evans.

When concrete is deposited against the ground without the use of forms, the ground shall be thoroughly moistened, or other provisions made to prevent the ground from wicking water from the concrete.

C. Kickblock Curing Time

Newly placed concrete shall be allowed to set undisturbed for a minimum of twenty-four (24) hours.

D. Compaction of Fill Over Kickblocks

Placing, tamping, or compacting shall not be allowed above the kickblock for a minimum of twenty-four (24) hours after placement, or until the concrete has set sufficiently and is able to support the weight of the backfill, whichever is greater.

4.04.19 CONCRETE STRUCTURES

A. Formwork

Forms shall produce shapes, lines, and dimensions of the concrete structures as shown on plans. The formwork shall be designed according to the loads and allowable stresses set forth in ACI 347.

Forms may be made of wood, metal, or other acceptable materials approved by City of Evans. Wooden forms shall be thoroughly wetted except in freezing weather or a form release agent applied. Forms shall produce a smooth concrete finish to the tolerances described in ACI 301.

Form material with raised grain, torn surfaces, worn edges, patches, dents, or other defects that impair the texture of the concrete surface shall not be used.

Forms shall be mortar tight and braced or tied to maintain proper position and shape during and after concrete placement. Embedded metal ties with snap-off ends shall be used for internal form ties. Use of ordinary wire ties is not permitted. The withdrawal of form ties through the walls is also not permitted.

Exposed edges shall be chamfered with a three-quarter ($\frac{3}{4}$) inch, forty-five (45) degree bevel.

Surfaces of forms and embedded items shall be cleaned of foreign material before concrete is placed. The recommendations of ACI 347 for form removal times under normal conditions shall be followed. City of Evans will determine if additional time is required before form removal.

Forms shall be removed in a manner that ensures the integrity of the structure and its surfaces.

B. Mixing and Placing

Ready-mixed concrete shall be mixed and delivered in accordance with ASTM C 94. Water may be added to the mix one time, i.e., immediately upon arrival at the job site to bring the slump within required limits.

The concrete shall be conveyed from the mixer to the place of final deposit by methods that prevent separation. Equipment for chuting, pumping, and conveying concrete shall be of such size and design as to ensure a continuous flow of concrete at the discharge end without the separation of materials. Concrete shall not free fall a vertical distance greater than five (5) feet during its discharge into the forms.

Concrete shall be deposited as near as possible to its final position to avoid segregation due to handling

or flowing. Concrete shall be placed at a rate that is, at all times, plastic and flows readily between reinforcing steel.

Concrete that has partially hardened or been contaminated by foreign materials is not allowed.

Concrete shall be deposited in continuous layers of such thickness that no concrete shall be deposited on or against concrete that has hardened to form seams or planes of weakness within the area or section. Concrete shall not be placed in lifts exceeding eighteen (18) inches in thickness.

The accumulation of water on the surface of the concrete due to water gain, segregation, or other causes during placement and consolidation shall be prevented by making adjustments in the mix design.

When placing concrete during cold weather as defined in ACI 306, the temperature of the concrete mix during placing shall not be lower than fifty-five degrees Fahrenheit (55°F) and concrete work shall follow the recommended practices of ACI 306. When placing concrete during hot weather as defined in ACI 305, the temperature of the concrete mix during placing shall not be higher than eighty-five degrees Fahrenheit (85°F) and concrete work shall follow the recommended practices of ACI 305. The cooling or warming of plastic concrete mixtures shall not be undertaken without City of Evans approval.

C. Consolidation

Concrete shall be thoroughly consolidated with internal vibrators as recommended in ACI 309. City of Evans will approve the size, type, and number of vibrators used for each concrete placement. The concrete shall be thoroughly worked around the reinforcing steel, around embedded items, and into the corners of the forms. Vibrators shall be supplemented by spading, rodding, or forking to eliminate honeycombing at the form face and voids around embedded items.

D. Finishing

When concrete surface finishes are not shown on plans, unformed flat surfaces shall be screeded and wood float finished. Interior floor surfaces shall be steel troweled with light broom finished to Class D tolerance in accordance with ACI 301.

The wetting of concrete surfaces during slab finishing operations is not permitted. Concrete finishing operations shall not be performed while there is water on the surface.

E. Construction and Contraction Control Joints

Construction joints not indicated on plans must be approved by City of Evans. Concrete surfaces where joints are made shall be thoroughly cleaned and laitance removed prior to placing adjoining concrete. Contraction control joints shall be cut one-quarter ($\frac{1}{4}$) of the depth of the slab. When power saw cutting methods are used, joints shall be cut as soon as the concrete surface is firm enough not to be torn or damaged by the saw blade. Water employed in the cutting, washing, and rinsing of concrete contraction control joints shall not stain, discolor, or affect exposed surfaces of the structures or damage the environment of the project or adjacent areas. Methods of wastewater disposal shall be subject to City of Evans approval.

F. Curing and Protection

Concrete shall be cured by a method recommended by ACI 308. When the daily mean ambient temperature is above forty degrees Fahrenheit (40°F), the finished concrete shall be cured continuously for a minimum of seven (7) days or for the time necessary to attain seventy (70) percent of the specified compressive strength, whichever period is less. When the mean daily ambient temperature is forty

degrees Fahrenheit (40°F) or lower, the finished concrete shall be continually cured at a minimum temperature of fifty-five degrees Fahrenheit (55°F) for the period recommended by ACI 306 to prevent damage from early-age freezing and provide the service category strengths required for each placement.

Concrete curing on formed surfaces shall be initiated immediately after the removal of forms or as directed by City of Evans.

Concrete curing on slabs shall be initiated immediately after the water on the surface of the slab has evaporated or as directed by City of Evans.

G. Surface Repair

Surface defects, including fins, tie holes, and honeycombed areas, shall be repaired down to solid concrete in accordance with ACI 301.

4.04.20 REINFORCING STEEL FOR CONCRETE STRUCTURES

A. Installation

Reinforcing steel shall be accurately formed to the dimensions indicated on plans. Bends in bars shall be made cold. Bars with kinks or bends not shown on plans shall not be used.

Splices shall be located where shown on plans. Splices at other locations must be approved in writing by City of Evans. Welded wire mesh shall be lapped one space and securely wired together.

Before reinforcement is embedded in concrete, the surfaces of the bars and the bar supports shall be cleaned of flaky rust, loose mill scale, dirt, grease, or other foreign substances that are objectionable. Reinforcement will be inspected for compliance with requirements as to size, shape, length, splicing position, and amount after it is placed.

B. The Placing and Reinforcing Steel

Steel reinforcing bars and welded wire fabric shall be placed accurately within forms and secured with annealed wire before concrete is placed. Steel reinforcing bars in walls shall be tied at a minimum of every other intersection or as directed by the City of Evans. Steel reinforcing bars in slabs shall be tied at every intersection. Steel reinforcement in slabs shall be supported on chairs of metal, plastic, or concrete in a manner to prevent steel reinforcement dislocation during slab construction.

Splices other than those shown on plans shall not be constructed without City of Evans approval.

Reinforcing steel shall be protected by the thickness of concrete indicated on plans. Where not otherwise shown, the thickness of concrete over the reinforcement shall be as follows:

1. Where concrete is deposited against the ground without the use of forms, it shall not be less than three (3) inches.
2. Where concrete is exposed to weather or exposed to the ground but placed in forms, it shall not be less than two (2) inches for bars more than five-eighths (5/8) inch in diameter and one and one-half (1½) inches for bars five-eighths (5/8) inch diameter or less.
3. In formed surfaces not in contact with the ground or exposed to weather, it shall not be less than three-quarter (¾) inch.

4.04.21 JOINT RESTRAINT DEVICES

Joint restraint devices may be used in lieu of kickblocks. Where joint restraints are used, the adjoining piping shall also be restrained for minimum lengths along the main(s) as dictated by soil, trench, and cover conditions. Joint restraint shall be required for the minimum of the following installations:

- A. Fire hydrants (mechanical joint restraints or full pipe restraint required from main to hydrant)
- B. Fire line connections
- C. Domestic line connection three (3) inches and larger
- D. Vertical bend
- E. Reducers
- F. Vertical and horizontal offsets
- G. Horizontal bends, line valves, and fittings
- H. Bulkheads and plugs
- I. Bored casings
- J. When the bearing capacity of the soil is not sufficient to provide adequate restraint in the opinion of the City
- K. When the City identifies potential future development that may utilize or connect to the water main to be installed requiring exposure for tapping or extension of live main(s).

4.04.22 CONNECTIONS TO CITY OF EVANS SYSTEM

A. Connections

Connections to City of Evans system shall be in a neat and workmanlike manner. City of Evans will be present during the construction of connections. Connections are subject to City of Evans approval.

City of Evans does not guarantee the water tightness of its valves on existing facilities. If existing valves leak, City of Evans will assist in reducing the leakage; however, the contractor shall use appropriate methods to work with the resulting leakage.

Connections will not be installed or allowed by City of Evans unless the water supply is protected as required against actual or potential cross-connections. Water service to premises will be discontinued by City of Evans if a required BFPA is not installed, tested annually, and maintained, if it has been removed or bypassed, or if an unprotected cross-connection exists.

Water service will not be restored until such conditions or defects are corrected.

An approved BFPA shall be installed on each service line within a developer and/or applicant's water system five (5) feet downstream from the meter or where the service line enters the building and before the first branch line leading off the service line wherever the following conditions exist:

- 1. In the case of premises having an auxiliary water supply that may not be of safe bacteriological or chemical quality and that is not acceptable as an additional source by City of Evans, City of

Evans system shall be protected against backflow from the premises by the installation of an approved RP BFPA in the service line and a fireline appropriate to the degree of hazard.

2. In the case of premises on which industrial fluids or any other objectionable substance is handled in such a fashion as to create an actual or potential hazard to City of Evans system, City of Evans system shall be protected against backflow from the premises by the installation of an approved RP BFPA in the service line appropriate to the degree of hazard. This shall include the handling of process waters originating from City of Evans system that have been subject to deterioration inequality.
3. In the case of premises having internal cross-connections that cannot be permanently corrected and controlled, having intricate plumbing and piping arrangements, or where entry to portions of the premises is not readily accessible for inspection purposes thereby making it impractical or impossible to ascertain whether or not dangerous cross-connections exist, City of Evans system shall be protected against backflow from the premises by the installation of a RP BFPA in the service line.

B. Operation of Valves

When connecting to City of Evans system, it may be necessary to operate existing City of Evans valves. Valves on City of Evans system that must be operated to make a connection will be operated only by appropriate City of Evans personnel. The contractor shall give City of Evans forty-eight (48) hours notice to arrange for the operation of valves. Both the contractor and City of Evans will be present when valves are operated.

C. Interruption of Service

The installation of a connection that requires the closing of existing valves may cause an outage of water to existing City of Evans customers. Affected customers shall be notified by the contractor in writing forty-eight (48) hours in advance of service interruptions. The notices shall be delivered by hand to each resident. If an occupant cannot be contacted, the written notice shall be left at the door.

The Evans Fire Rescue District shall be notified forty-eight (48) hours in advance of service interruptions. The contractor shall provide a description of the boundaries of the affected area and the location of fire hydrants in that area to the Evans Fire Rescue District.

A normal outage shall be a maximum of four (4) hours. If an outage is to be greater than four (4) hours, the work shall be done in a manner that minimizes the inconvenience to customers, such as working at night in a continuous operation until service is restored. A connection that requires an outage longer than four (4) hours will be subject to review by City of Evans to determine the appropriate timing of the connection.

If there is an industry or building in the area that cannot be out of water during the process of the installation, such as a hospital, appropriate means shall be taken to provide and convey water. The water and the means of its conveyance shall be approved in writing by City of Evans.

4.04.23 CORROSION PROTECTION SYSTEMS

A. Dissimilar Materials

Cathodic protection and insulation shall be installed as required by City of Evans. Particular care shall be taken to insulate between dissimilar materials.

B. Insulating Joints

Wherever it is necessary to join pipe of dissimilar metals, a method of insulating against the passage of electrical current, approved by City of Evans shall be provided. Special care shall be exercised during installation to prevent electrical conductivity across joints. After the insulating joint installation is complete, City of Evans will test the joint. If the insulated joint fails the test, it shall be removed, inspected, and repairs made. The joint shall then be reinstalled and tested. This process shall continue until the joint passes the test.

C. Polyethylene Encasement Material

Metallic pipe, joint restraint, fittings, tie rods, and appurtenances shall be polyethylene encased regardless of soil resistivity. The polyethylene encasement shall prevent contact between the pipe and the bedding material; it is not intended to be a completely airtight and watertight enclosure.

A two- (2) inch-wide, 10-mil thickness polyethylene pressure-sensitive tape shall be used to close seams or hold overlaps. Prolonged exposure to sunlight eventually deteriorates polyethylene film. Keep exposure to sunlight to a minimum.

Before City of Evans will tap a water main, the trench, pipe, and polyethylene wrapping shall be in a state of readiness. Damage to polyethylene pipe wrap in the trench prior to and during the backfill process shall be repaired to the satisfaction of City of Evans. Damage to the pipe wrap caused by tapping the main will be repaired by City of Evans.

4.04.24 CHLORINATION

Main extensions and private pipe extensions shall be chlorinated in accordance with AWWA C651 and the requirements of the local health authority having jurisdiction prior to acceptance by City of Evans. The chlorinating agent and the method of application shall be approved by City of Evans.

The chlorination of the finished pipeline shall be done prior to hydrostatic testing. Before filling the pipe with water, the pipe shall be cleaned and free of debris to the satisfaction of City of Evans. City of Evans will not provide labor or material for disinfection to approved applicants for the installation of mains under private contract.

Chlorine tablets may be used for disinfection in twelve (12) inch and smaller pipes. Chlorine tablets shall be attached to the inside top of the pipe with an approved adhesive and certified to NSF/ANSI Standard 61 prior to pipe installation in the trench. An approved adhesive is Dow Corning 748 Multipurpose Sealant. For sixteen (16) inch and larger pipes, chlorine slurry is required to be fed into the water used to fill the pipe.

Table 4.04-5
Required Hypochlorite Tablets

Number of hypochlorite tablets of 5-gram strength required for a dose of 50milligrams/liter*			
Pipe Length (Feet)	Pipe Diameter (Inches)		
	6	8	12
13 or less	2	2	5
18	2	3	6
20	2	3	7

*Based on 3¾ grams of available chlorine per tablet

After the pipe is filled with water and chlorine, the chlorinated water shall be held in contact with the pipe for twenty-four (24) hours. At the end of the twenty-four (24) hour period, the water in the pipeline shall be tested

by the local health authority having jurisdiction, or their designated representative, to ensure a residual chlorine content of no less than twenty-five (25) milligrams per liter. The pipeline shall then be thoroughly flushed to remove the heavily chlorinated water.

Samples of water shall be collected for bacteriological examination and residual chlorine content testing before the pipe is put into service. Testing of residual chlorine and sampling shall be done by the local health authority having jurisdiction or their designated representative.

4.04.25 HYDROSTATIC TESTING

Newly installed water mains and fire lines shall be hydrostatically tested. Hydrostatic tests shall not be made on any portion of the pipeline until field placed concrete has had adequate curing time as defined for kickblocks.

City of Evans shall be notified twenty-four (24) hours in advance of testing. Testing shall be made in the presence of City of Evans.

Only the following methods are acceptable for supplying potable water for hydrostatic testing:

- A. Water may be taken from a nearby pressurized water source that was previously chlorinated, tested, and accepted, such as a fire hydrant. No cross-connection shall be made to the City water system for testing purposes.
- B. Water may be delivered to the site in a state licensed chlorinated water truck having a minimum capacity of 300 gallons. The water truck shall be used exclusively for the transportation of potable water.
- C. Any previously tested, chlorinated, and accepted water main that is pressurized and is to serve the new main extension may be tapped on the pressurized side of the closed valve.

The method of supplying water and the source of water for hydrostatic testing must be certified and approved by City of Evans. The use of barrels, sanitary or otherwise, to supply water for hydrostatic testing is prohibited.

City of Evans will furnish the calibrated meter for testing but will not supply the pump. The pipeline shall be properly backfilled and in a state of readiness for testing. Bulkheads, pumps, taps, and appurtenances necessary to fill the pipeline and maintain the required pressure shall be in place and the pipeline filled with water. The test pressure of 150 psi shall then be applied to the pipeline by means of a continuously operating pump that is equipped with a bypass valve for pressure regulation. The pipeline shall be filled at a rate that does not cause surges and does not exceed the rate at which air can be released. Air in the line shall be properly purged. Where blow offs or hydrants are not available or are not effective in purging air from the line, City of Evans will require a tap to purge the line. The location and the size of the tap to be used is at City of Evans discretion.

While the test pressure is maintained, an examination shall be made of the pipeline and any leaks located and repaired. Pipe or fittings found to be faulty shall be removed and replaced. Leakage is not allowed through the bonnet of the line valve. A valve leaking through the bonnet may be repaired in place or removed and replaced. Cutting and replacement of pavement as well as excavation and backfilling may be necessary when locating and repairing leaks discovered during pressure testing.

After visible leaks are stopped, the full test pressure shall be maintained for one (1) continuous hour. Allowable leakage for each section between line valves shall not exceed the following leakage rates for four (4) through twenty (20) inch distribution and transmission mains:

Table 4.04-6
Hydrostatic Testing Allowable Leakage Per Hour

Pipe Size (Inches)	Gallons Per 1,000 Feet of Pipe
4	0.33
6	0.50
8	0.66
12	0.99
16	1.32
20	1.66

Should testing reveal a leakage rate in excess of the above rates, the pipeline will not be accepted. The pipeline shall be repaired, re-chlorinated, and retested until it meets test requirements.

4.04.26 ACCEPTANCE AND RELEASE FOR TAPS

A main will be accepted by City of Evans and released for taps when the following conditions are met:

- A. Installation: The main and appurtenances are installed to the satisfaction of City of Evans and pertinent notes and measurements made.
- B. Tests: The following tests are passed and the test outcomes provided to City of Evans:
 1. A chlorination test and any other tests required by the local health authority having jurisdiction.
 2. A compaction test indicating the trench backfill meets City of Evans requirements performed under the direction of a Professional Engineer licensed in Colorado.
 3. Compaction tests shall be performed by a qualified tester under the direction of a Professional Engineer licensed in Colorado, every lift (maximum lift depth = twelve (12) inches) every 200 feet along the trench or at the discretion of the Director of Public Works or designee while construction is proceeding.
 4. Two (2) compaction tests shall be performed on every lift (maximum lift depth = twelve (12) inches) in the vicinity of all valves.
 5. A hydrostatic test.
 6. A valve and valve box inspection.

4.04.27 BLOW-OFF ASSEMBLY

Blow-off assemblies shall be installed in accordance with Standard Details WA-2.

The standard required blow-off assembly for twelve (12) inch and smaller mains shall be two (2) inches. Under special conditions, such as a long run with only a few taps, a non-standard blow-off larger than two (2) inches may be required.

The standard required blow-off for sixteen (16) inch and larger diameter pipe shall be a six (6) inches.

4.04.28 SEWER CROSSINGS

When water mains or associated piping cross over or under a sanitary or storm sewer constructed of vitrified clay or concrete pipe, the sewer shall be replaced or protected as shown on plans during the course of installation, as described below, shown on Standard Details (WA-3 and WA-4), or as otherwise directed by the City of Evans.

When the sewer is fifteen (15) inches or less in diameter and crosses over the water mains or associated piping and protection is not otherwise shown on plans, where applicable, the sewer shall have no join within ten (10) feet of the main. Reconnections to the existing sewer pipe shall be made with watertight, flexible couplings approved by City of Evans and the authority having jurisdiction over the sewer being replaced. Drains that exist under the sewer shall be restored in a manner that prevents any flow from entering the trench.

When the sewer is greater than fifteen (15) inches in diameter, necessary precautions shall be taken to protect the sewer during the installation of water mains or associated piping. Drains that exist under the sewer shall be restored in a manner that prevents any flow from entering the trench.

When water mains or associated piping cross over the sewer with less than two (2) feet of clearance between the pipes, the sewer shall be encased. The encasement shall extend along the centerline of the sewer for a minimum of ten (10) feet beyond the OD of the water main or associated piping at each end of the encasement.

In addition, when water mains or associated piping cross under a sewer, the bedding material shall be replaced around the sewer to a point at least one (1) foot above the top of the sewer pipe for sewers fifteen (15) inches in diameter and smaller, and to at least spring line for sewers larger than fifteen (15) inches in diameter. Bedding material shall be thoroughly compacted and consolidated to support the sewer.

Water mains shall not be placed closer than eighteen (18) inches, as measured from the outside bottom of the sewer pipe to the top of the water pipe.

A sewer may not be cut without the express consent of the authority having jurisdiction over the sewer.



NON-POTABLE WATER SPECIFICATIONS

CITY OF EVANS
PUBLIC WORKS DEPARTMENT
AUGUST 2019

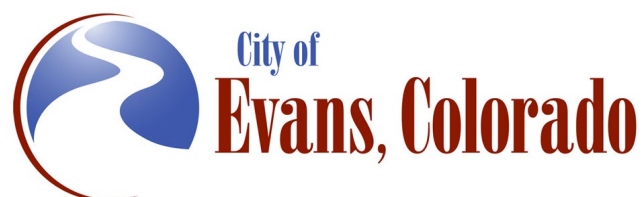


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SECTION 1 DESIGN CRITERIA**5.01.01 SCOPE**

The purpose of this section is to set forth the general criteria to be used in the design of non-potable irrigation mains and appurtenances within the City of Evans service area. Any deviation from these Standards must be supported in writing and approved by the Public Works Director or designee.

5.01.02 GENERAL

The developer shall provide a complete system design of mains, laterals, proposed water usage demand, from source (well, ditch, or point of connection) to emitters, for service connections as prepared by a design professional, for acceptance and approval by the City.

5.01.03 QUALITY OF THE DISTRIBUTION SYSTEM

The purpose of these standards is to ensure that only proven high-quality materials are professionally installed with first-class workmanship. Determination of the best materials and construction methods are based upon lowest life cycle costs, not necessarily upon lowest initial costs. The sizing and layout of the system are part of the total consideration of design, operation, and maintenance of a non-potable irrigation supply system that yields optimum quality service at the lowest total cost to the consumer.

5.01.04 SIZING OF DISTRIBUTION MAINS

The minimum diameter for non-potable irrigation mains in residential areas, including cul-de-sacs, shall be four (4) inches. All schools, shopping centers, business parks, industrial parks, and high-density residential areas shall be looped with mains at least four (4) inches in diameter. Sizing of all mains shall be accomplished by utilizing a flow network model incorporating any one of the several acceptable flow network analysis methods. A Utility Report shall be submitted to and approved by the Public Works Department along with system drawings. All non-potable irrigation lines shall be looped. No dead-end lines will be permitted unless otherwise stated by the Public Works Director or authorized designee.

The maximum acceptable head loss shall be two (2) feet per 1,000 feet of main. The Public Works Department reserves the right to oversize mains to provide service for future needs.

Piping shall be sized and configured such that all areas within the system have a maximum difference in pressure of fifteen (15) psi (two (2) inch minimum). Pressure regulation/flow control fittings may be necessary to achieve such results.

Output results of modeling used for system sizing shall be delivered to the City with plan application, for review and approval prior to installation.

5.01.05 MATERIALS

Non-potable irrigation mains shall be constructed with purple polyvinyl chloride (PVC) pipe. Pipe sizes four (4) through twelve (12) inch shall be C900 DR-18, and sizes greater than twelve (12) inch shall be C905 DR-18.

All materials must conform to the material requirements as set forth in Section 4.02.09 of these specifications.

Non-potable irrigation piping shall include tracer wire and marking tape.

5.01.06 PIPE DEFLECTION

- A. Pipe deflection shall be defined as the axial deflection, either horizontal or vertical, at the joints of the pipe.
- B. The pipe deflection for polyvinyl chloride pipe shall be no greater than 3° unless approved by the City. For design proposes, pipe deflection should be limited to 80% of this value.

5.01.07 GROUND COVER

All mains shall be designed so that a minimum of five and one-half (5½) feet of cover exists over the top of the pipe after final grade has been established. No main shall have more than six and one-half (6½) feet of cover unless specifically approved by the Public Works Director.

When a non-potable irrigation main crosses underneath a stream, irrigation ditch, storm drainage ditch, or other area which has surface flow for a significant period of the year, there shall be a minimum of four and one-half (4½) feet of cover over the pipe and the pipe shall be encased in concrete. Refer to the Stream and Drainageway Crossing Detail (No. NP-14), and the Concrete Encasement Detail (No. NP-3) for complete specifications. Valves shall be located such that the non-potable irrigation main at such crossings can be isolated with enough room to allow for maintenance. The type of material and class of pipe to be utilized will be specified by the Public Works Director or designee.

5.01.08 LOCATION

All mains shall be installed in dedicated streets. Typical location for non-potable irrigation mains is five (5) feet plus the radius of the sanitary sewer line from the centerline on the south or west side of the street. Non-potable irrigation mains to be installed in exclusive easements and rights-of-way may be approved when, as determined by the Public Works Director, it is not practical to make such an installation in the dedicated street.

The request must be submitted in writing to the Public Works Director. When such exceptions are made, the minimum width requirements for easements and rights-of-way are in Table 5.01-1. All non-potable irrigation mains shall be located in an easement at least two times the depth to the invert in width unless otherwise specified by the Public Works Director. The minimum width of easement shall be twenty (20) feet.

Table 5.01-1

Easements and Rights-of-Way Minimum Width Requirements	
One utility line	Total width of 20 feet; 15 feet on one side of the property line
Two utility lines (Non-potable irrigation and sewer)	Total width of 30 feet; 10 feet on either side, and 10 feet Between Lines

Non-potable irrigation lines shall not be installed beneath any concrete, such as sidewalks, curb and gutter, and cross pans, except when the non-potable irrigation lines are crossing the concrete installation.

Drains shall be installed at low point of system for draining following irrigation season where freezing may occur. Minimize drains by installing piping to drain to common points.

The following paragraphs apply to utility line crossings:

- A. Vertical Separation

Under no circumstances shall the vertical clearance between any lines involving a non-potable

irrigation or sanitary sewer line be less than 12 inches without written approval from the Public Works Director. Refer to Conduit or Storm Sewer Crossing Detail, (No. NP-4) and Utility Crossing Detail, (No. NP-17) located in Appendix A, for placement information. In all cases, the crossing pipes shall be centered over each other so that the joints are at a maximum distance from the crossing.

B. Non-potable Irrigation Line Crossing Over a Sanitary/Storm Sewer Line

If there is less than eighteen (18) inches vertical clearance, encase the sewer line ten (10) feet each side of the crossing. Encasement of joints only shall be required on sewer lines fifteen (15) inches and larger in diameter. Polyvinyl chloride pressure pipe may be used in lieu of an encasement if the sewer line is AWWA C900 or C905.

C. Sanitary/Storm Sewer Line Cross Over a Non-potable Irrigation Line

Encase the sewer line no matter what the vertical clearance is ten (10) feet each side of the crossing. Encasement of joints only shall be required on sewer lines fifteen (15) inches and larger in diameter. Polyvinyl chloride pipe may be used in lieu of an encasement if the sewer line is AWWA C900 or C905 pipe.

5.01.09 VALVES

Valves shall not be located in concrete areas, such as sidewalks, cross pans, aprons, or curb and gutters. All valves shall have a concrete collar around the valve box as shown in the Non-Potable Irrigation Valve Box Detail (No. NP-12).

Residential distribution systems shall have valves be placed in such a manner to ensure that no more than 600 feet of main or one residential block may be out of service for any one single break. Valve placement shall be such that there are two (2) valves at every tee and three (3) valves at every cross. Valves shall be placed at the first property line that intersects the main line. When non-potable irrigation mains are designed in such a way that a dead-end exists at the edge of a subdivision or at the boundary of a filing/phase within a subdivision, the main shall be terminated with an isolation valve, two (2) full lengths of pipe and a temporary blowoff valve. Refer to Pipe Intersections & Dead Ends Detail (No. NP-13), and Blowoff Assembly Installation Detail (No. NP-2), located in Appendix A for additional specifications. When a new extension shall connect to an existing main not terminated with a valve, the new main must have valves at the connection in order that the entire, newly constructed system may be pressure tested.

5.01.10 BLOW-OFF ASSEMBLIES

Blow-off assemblies are required at the end of non-potable irrigation mains which terminate at the subdivision boundary in streets that will be extended at a future date as per Pipe Intersection & Dead Ends Standard Details (NP- 13).

Blow-off assemblies shall consist of valves, pipe and material necessary to install the blow-off valve complete in place. Blow-off assemblies will be required at the end of mains extended into cul-de-sacs. Refer to the Blow-off Assembly Installation Standard Details (NP-2).

5.01.11 KICKBLOCKS (THRUSTBLOCKS)

All bends, tees, plugs, dead-ends, wet taps, and blow-off assemblies shall be designed and constructed with kickblocks as set forth in Standard Details (NP-15). Mechanical joint restraints may be used in lieu of kickblocks.

5.01.12 OPERATING PRESSURES

Pressures within the distribution system will be a minimum of sixty (60) psi during the maximum hour demand and a maximum of one hundred (100) psi during low peak demand.

5.01.13 CANALS

New or modified canals are required to be lined with concrete prior City acceptance. Canals may require re-sizing due to the change in friction factor for the new material. Side slopes may be flattened out as appropriate. Existing canal structures shall be incorporated into the lining or modified as required to fit new design.

Where practical, pipe shall be installed to replace open canal or lateral. Sizing shall not “check-up” flow. Appropriate inlet/outlet transitions shall be installed, and a trash rack must be provided at both ends of the pipe. Existing canal structures shall be considered and appropriate accommodations shall be designed and approved by the Public Works Director or designee.

Box culverts may be designed for extended crossings. Inlet and outlet transitions shall be designed for either type of culvert, and design flow shall be 120% of maximum canal capacity. Culverts shall have free air along the entire length and not be “inverted siphons.”

5.01.14 PONDS

Ponds shall be provided on all new distribution systems. Pond storage shall be designed to accommodate four (4) days of supply at full build out and during peak irrigation periods. All ponds shall be lined with PVC, HDPE, or bentonite.

The PVC liner shall a minimum thickness of twenty (20) mil. An eight (8) oz. geotextile liner must be installed on all slopes of 3:1 or more. Geotextile rolls shall be overlapped a minimum of twelve (12) inches. The sub-base should be a minimum of six (6) inches of soil and contain no rock or materials of jagged edges larger than one (1) inch. After the PVC liner is placed, a twelve (12) to eighteen (18) inch soil cover, free of any type of debris, shall be placed over the liner.

The bentonite liner material shall be high swelling sodium montmorillonite clay. The bentonite application rates shall be determined by the manufacture in conjunction with the on-site soil test and by the Design Engineer.

Ponds will not be accepted by the City without PVC or a bentonite liner. Testing for water tightness shall be completed with a permeability test and reported to the City prior to initial acceptance by the City.

Supply piping shall be completed from the point of delivery to the pond with no ability to back-flood. The supply line shall have a forebay designed to dissipate silt out of the supply water prior to discharge into the pond. Velocity into the pond shall be three (3) fps or lower. Six (6) inch minus riprap shall be placed at outlet of piping for energy dissipation. Where excessive velocities are experienced at the inlet to the pond, a perforated manhole shall act as a baffle.

An overflow shall be designed into the pond such that if the pond reached capacity, property shall not be damaged.

Pond banks shall be designed to resist force applied from vehicle weight as well as impounded water.

A vertical measuring gauge shall be installed in all ponds to show relative depth of water. The gauge may be part of the overflow. Marks and numbers shall be easily legible from the pump station (and delivery point if located nearby). The zero should begin at the top of rock on the bottom of the pond.

5.01.15 AERATION SYSTEM

All ponds shall have aeration system. All components of the aeration system shall include compressors, ozone generators, electrical controls, valves, prefabricated pipe manifolds, flow meters, gauges, lake aeration tubing, and all other items necessary for the proper assembly and operation of the system.

5.01.16 CROSS-CONNECTIONS

Cross-connections are required on all non-potable irrigation systems. The cross-connection is to be between the non-potable and potable main lines as per Cross-Connection Standard Details (NP-6). The location of the cross-connections must be pre-approved by the Public Works Director.

Houses within a subdivision with non-potable irrigation shall be connected to the non-potable service line. No individual cross-connections will be allowed in these subdivisions.

5.01.17 WELLS

The use of a well for non-potable irrigation shall be approved by the Public Works Director. The City will not accept non-potable irrigation wells that require augmentation. All non-potable irrigation wells shall be adjudicated for the property the well is to irrigate. The developer/owner shall furnish the following documentation about the well: the legal description, the depth and diameter, the test results from a water well pump test, a copy of the well permit, and a copy of the Colorado Water Rights decree.

All wells shall conform to the State of Colorado Rules and Regulations for Water Well Construction, Pump Installation, and Monitoring and Observation Hole/Well Construction, also known as the Water Well Construction Rules with the following additional requirements and/or exceptions.

In addition to the well testing requirements made by the Water Well Construction Rules, Rule 12, the developer/owner shall hire a well testing firm to perform a three (3) hour pump test at a rate equal to 150% of the design flow. These test results shall be forwarded to the City's Public Works Department within ten (10) days of testing and prior to initial acceptance by the City.

Boreholes shall be constructed in a manner to provide a minimum of three-quarter ($\frac{3}{4}$) inch between the casing and the bore hole. The space between the bore hole and the casing shall be filled with an approved cement grout, see Water Well Construction Rules Table 3 - Grouts, for approved grout types and application rates. After placement of grout, construction on the well shall resume a minimum of twenty-four (24) hours after placement of the grout, if accelerators are not used and a minimum of six (6) hours, if accelerators are used.

Well casings can be constructed using steel, PVC, or precast concrete rings. Steel well casing shall conform to ASTM specifications A53 for a Grade B welded seamless pipe with a minimum thickness of 0.188 inches. PVC casings shall be Schedule 40 with a minimum thickness of 0.2 inches. Precast concrete rings shall be a minimum of three (3) inches. Thickness of well casings shall be adequate to prevent collapse due to hydrostatic pressures.

Wells shall be disinfected immediately following any type of work that is done to the well. Disinfecting the well shall be completed in accordance to Rule 15 of the Water Well Construction Rules.

Pumping systems that produce pressures greater than seventy-five (75) psi shall be equipped with a pressure relief valve. All pump installations shall be equipped with a check valve or a backflow prevention device to prevent damage to the pump and to prevent contamination of the aquifer. Check valves and backflow prevention devices shall also include a downstream isolation valve for removal from service without system depressurization or backflow.

SECTION 2 CONSTRUCTION CRITERIA FOR NON-POTABLE IRRIGATION SYSTEM**5.02.01 SCOPE**

The purpose of this section is to set forth the general criteria to be used in the construction of non-potable irrigation mains and appurtenances in the City of Evans service area. Any deviation from these standards must be approved by the Public Works Director.

5.02.02 MATERIALS

All materials furnished shall be new and undamaged. Everything necessary to complete all installations shall be furnished and installed, whether shown on approved drawings or not, and when complete, all installations shall be fully operational.

Acceptance of materials or the waiving of inspection thereof shall in no way relieve the developer of the responsibility for furnishing materials meeting the requirements of the specifications.

The City of Evans Public Works Department reserves the right to direct or deny use of certain types of materials in specific circumstances. All materials delivered to the job site shall be adequately housed and protected to ensure the preservation of their quality and fitness for the work.

A. Polyvinyl Chloride Pressure Pipe

All polyvinyl pressure pipes shall be manufactured in accordance with either AWWA C900 or C905, with the following additional requirements and/or exceptions.

All AWWA Class 150 pipe shall meet the requirement of AWWA DR-18 and AWWA Class 200 shall meet the requirements of AWWA DR-14.

All non-potable irrigation lines shall be purple in color. Solvent cement joints are strictly prohibited.

Each length of pipe will be a standard laying length of eighteen (18) or twenty (20) feet. Random lengths shall not be acceptable unless specifically approved by the Public Works Director. Under no circumstances shall the random length be less than ten (10) feet long.

PVC must conform to the cast-iron outside diameters. Pipe that will be stored outside and exposed to sunlight for more than thirty (30) days shall be covered with an opaque material such as canvas. Clear plastic sheets shall not be used to cover the pipe. Air circulation shall be provided under the covering. Any sunburned pipe will not be permitted for installation and shall be removed from the job site immediately. All pipes must be Underwriters' Laboratory-approved.

B. Fittings

All ductile iron fittings shall be manufactured in accordance to AWWA C104, C110, C111, C116 and C153, latest revisions, with the following additional requirements and/or exceptions:

All fittings shall be furnished with a cement mortar lining or epoxy coating of standard thickness as defined in referenced specifications and given a seal coat of bituminous material, if cement mortar lining is applied.

All fittings shall be furnished with mechanical joint or ring-tite ends conforming to referenced specifications. In addition, the tee-head MJ bolts and hexagon nuts shall be fabricated from a high-strength, low alloy steel known in the industry as “Cor-Ten” or an approved equal. Swivel fittings as approved by the Public Works Director may also be utilized.

All fittings shall have a pressure rating of 250 psi. All fittings shall be made from gray iron or ductile iron.

Corrosion protection shall be as specified in Section 4.03.27 of these specifications.

C. Gate Valves

All valves shall be manufactured and tested in accordance with AWWA C500, C509, & C515, latest revisions, with the following additional requirements and/or exceptions.

Valves meeting AWWA C500 shall be of a modified wedge disc construction, coated both inside and out with a tough durable epoxy to prevent corrosion, cast-iron body, fully bronze mounted with non-rising stems and resilient seats.

All valves shall be suitable for frequent operation and/or long periods of inactivity. Operating pressure for all valves six (6) through twelve (12) inches shall be 200 psi.

Valve stems shall be made of bronze and threaded so that valves shall open by turning to the left (counterclockwise).

Each valve shall be furnished with a two (2) inch square operating nut. The operating nut shall have an arrow showing the direction of opening and the word “OPEN” cast on the nut. The stem seal shall consist of two O-rings, one or both positioned above the thrust collar with the valve under pressure in the full open position.

All components of the mechanical joint shall conform to AWWA C111. The tee-head bolts and hexagon nuts shall be fabricated from a high-strength, low alloy steel known in the industry as “Cor-Ten” or an approved equal.

After approved factory assembly, each valve shall be given the operation and hydrostatic tests.

Wedge disc valves shall only be from a manufacturer pre-approved by the Public Works Department (Waterous Series-500, Mueller - A-2370I).

Resilient-sealed gate valves shall only be from a manufacturer pre-approved by the Public Works Department (American-80 “CRS” Gate Valve).

D. Valve Boxes

Valve box parts shall only be from a manufacturer pre-approved by the Public Works Department and made of gray cast iron. Five and one-quarter (5¼) inch screw-type shaft shall be adjustable from forty-five (45) to sixty-six (66) inches. Valve box lids shall be marked with the word "IRRIGATION" and shall have a lip or flange extending into the valve box shaft. No slip-type boxes will be allowed. The valve box shall be of a design which will not transmit shock or stress to the valve and shall be centered and plumb over the operating nut of the valve with the box cover one-quarter (¼) to three-eighths (3/8) of an inch below the surface of the pavement. See Non-potable Irrigation Valve Box Detail (NP-12) for additional specifications.

Corrosion protection shall be as specified in Section 5.02.04 of these Specifications.

E. Air and Vacuum Valves

Air valves shall be one of the two types:

1. An Air Valve called for on the plans shall mean an Air and Vacuum Valve of the ball-type designed to permit the escape of air from a pipeline when the line is being filled and to permit air to enter the pipeline when the line is being emptied.
2. A Combination Air Valve called for on the plans shall mean a combination Air and Vacuum and Air Release Valve designed to fulfill the functions of an Air and Vacuum valve and also designed to permit the escape of air accumulated in the line at the high point when the line is under pressure while in operation. The valve shall be self-contained in one unit, not a combination of two valves. This type would normally only be used in large transmission mains with few connections.

Air valves shall be installed at each highpoint in all non-potable irrigation mains of twelve (12) inches in diameter and larger. Installation shall include one (1) inch or two (2) inch gate valves between saddle and air valve for maintenance purposes. They shall be installed in vaults as specified in Section 4.03.32 and fitted with air vents of adequate cross section open to the atmosphere. A minimum of one (1) foot of one and one-half (1½) inch rock shall be placed under the pipe in air valve manholes. When air valves are required, specifications shall be submitted to the Public Works Director for review and approval. These specifications shall include the size, type, and all calculations required. Refer to Air and Vacuum Relief Valve Detail (No. NP-1), located in Appendix A, for additional specifications

F. Blowoff Assemblies

Blowoff assemblies or drain valves shall be installed at each low point in all non-potable irrigation mains of twelve (12) inches in diameter and larger. All non-potable irrigation mains installed having dead ends, where stagnant water may collect, shall be provided with blowoff devices which will allow flushing of the main without interruption of non-potable irrigation service. Refer to Blowoff Assembly Installation Detail (No. NP-2), located in Appendix A of these specifications for non-potable irrigation mains less than twelve (12) inches in diameter. Design for installations of six (6) inches and larger shall be approved by the Public Works Director.

G. Vaults

All vaults shall be designed to adequately house the valves and fittings therein contained, as well as to withstand all external loadings imposed by earth, thrust, and AASHTO H-20 highway live loading. Vaults located in areas other than those that will involve vehicular traffic may be designed for a loading other than AASHTO H-20 by a Registered Professional Engineer of the State of Colorado. Vaults shall be, furnished with removable roof slabs to allow removal of all valves and fittings. They shall also be sized to allow sufficient room for valve maintenance and minor repair and shall be furnished with manhole rings for easy access. They shall be constructed in such a manner as to allow operation of all valves from above ground and shall be fitted with air vents open to the atmosphere. Vaults shall be constructed so that the vault opening opens directly over the meter. Vaults shall be made waterproof after construction by use of sealants, epoxies, or other approved methods. All vaults shall be designed with wall sleeves and approved seal at pipe penetrations and be capable of handling thrusts caused by removing valves. If the vault is not to be in a street, the roof shall be designed to support the overhead earth fill and any other reasonable loading that may occur.

Steps for vaults, which must be secured in concrete, may be Grade 60, three-eighths (3/8) inch diameter deformed reinforcing rod and conform to ASTM A-1011 coated with a co-polymer polypropylene. These steps, which may be cast into the vault at time of forming or field installed, must conform to ASTM D-4101.

Concrete floors shall have twelve (12) inch diameter by eighteen (18) inch deep sump holes in the corner but not open to the outside of the vault. The designing engineer shall submit shop drawings along with design calculations including the electric layout to the Public Works Director for approval.

H. Kickblocks (Thrustblocks)

Kickblocks shall be constructed at all bends and fittings which result in unbalanced line thrust. Care shall be taken not to block outlets or to cover bolts, nuts, clamps or other fittings or to make them inaccessible. A bond breaker shall be placed between the fitting and the kickblock to aid in ease of future removal. The vertical sides of the concrete thrust blocks shall be formed to allow for symmetrical thrust.

All concrete kickblocks shall be designed for shape and size as required by type of soil and shall in every instance bear against undisturbed earth. If soil bearing strength is unknown, soil bearing capacities used in design must be approved by the Public Works Director. When it is impossible through over excavation or other causes to pour a kickblock against undisturbed earth, deformed reinforced rods shall be required to anchor the fittings to the main upon approval of the Public Works Director. Backfill may be placed over the thrust block once the surface has set sufficiently to resist the weight of the backfill. However, no tamping or compacting shall be allowed above the kickblock for a minimum of 24 hours after placement. Concrete must set a minimum of 48 hours prior to the performance of a hydrostatic test. See Standard Details (NP-15).

I. Concrete

All cement used shall be Portland Type II cement acceptable under ASTM C-150. All concrete shall have a minimum twenty-eight (28) day compressive strength of 3,000 psi. The concrete design mix of Portland cement, fine aggregate, coarse aggregate, water, and admixtures shall be submitted along with test results of the design mix to the Public Works Director for approval upon request.

Concrete shall not be placed on frozen subgrade. Concrete shall be placed only in the presence of the Inspector unless inspection has been waived prior to the placement. When concrete is deposited against ground without the use of forms, the ground shall be thoroughly moistened, or other provisions made to prevent the ground from drawing water from the concrete. Newly placed concrete shall be allowed to set undisturbed for a minimum curing time of twenty-four (24) hours. When concrete is placed at temperatures below forty degrees Fahrenheit (40°F), the developer/contractor shall provide satisfactory methods and means to protect the mix from injury by freezing and comply with all American Concrete Institute (ACI) standards or latest revisions.

No trucks shall be permitted to place concrete if placement does not begin prior to ninety (90) minutes from when the truck left the plant. Allowable slump shall be three (3) inches \pm one (1) inch.

Hand-mixed concrete will not be permitted.

J. Concrete Reinforcement

All deformed reinforcing bars shall conform to ASTM A-615, Grade 40 or 60; or ASTM A-996, Grade 40 or 60. All welded steel wire fabric shall conform to ASTM A-185.

K. Galvanized Material

Under no circumstances shall any galvanized fittings or material be used.

L. Mechanical Joint Restraint

All mechanical joint restraints shall be incorporated in the design of a mechanical joint gland. The gland shall be manufactured of ductile iron conforming to ASTM A-536. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-head bolts conforming to AWWA C111, C153, and C605, latest revision.

The restraint mechanism shall consist of numerous individually activated gripping surfaces to maximize restraint capability. The gripping surfaces shall be wedges designed to spread the bearing surfaces on the pipe. Twist-off nuts sized same as tee-head bolts and shall be used to ensure proper actuate of restraining devices. When the nut is sheared off, a standard hex nut shall remain.

The mechanical joint restraint device for ductile iron pipe shall have a working pressure of at least 250 psi with minimum safety factor of 2:1.

The mechanical joint restraint device for PVC shall have a working pressure of at least 150 psi with a minimum safety factor of 2:1.

The mechanical joint restraint devices shall be of the type listed below or equal, approved by the Public Works Department prior to construction:

For Ductile Iron Pipe: EBAA Iron, Inc., Mega lug 1100 series (4"-12")
Uni – Flange UFR-1400-D

For PVC Pipe: EBAA Iron, Inc., Mega lug 2000 PV series
(4"-12") Uni-Flange UFR – 1500 – C

M. Pressure Reducing Valves

PRVs shall have a working pressure of 150 psi or greater. They shall be located at points, which will keep excessive pressures from building up downstream

N. Pressure Gauge

Liquid filled pressure gauges shall be installed upstream and downstream of all pressure regulating valves, flow control valves, and pumps. All shall have petcock valve for removal or replacement. All shall be plainly visible from a standing position. Any pressure gauge, which may encounter a vacuum, shall be a pressure/vacuum gauge.

O. Shotcrete

Shotcrete shall be fiber-reinforced, using one and one-half (1½) pounds per cubic yard polypropylene fibers, one (1) inch fiber length, or equivalent. Unless otherwise stated, shotcrete shall be a minimum of two (2) inches thick in all designated application areas but may taper off from there. Shotcrete shall be applied to surfaces that are of compacted rock. Finish shall be troweled for a semi-smooth surface.

P. PVC Liner

The thickness of the PVC liner shall be a minimum of twenty (20) mil. PVC liner shall be bedded with ten (10) inches above and six (6) inches below of sand or silt or native material if accepted by Public Works Director. The edges of liner shall be keyed into banks. The leading and trailing ends for canals shall also be keyed in. If installed in a canal, the prism may need to

be reshaped to accommodate new friction factor and side slope requirements.

Q. Tracer Wire

Tracer wire shall be installed with all mains in accordance with Standard Details (NP-12). Tracer wire to be AWG 12 solid copper wire with 0.03-inch APWA-approved color (purple) PE insulation fastened to the pipe with two (2) inch PVC tape at least once per stick of pipe installed. Tracer wire shall daylight as shown on Standard Details (NP-12).

R. Underground Marking Tape

Detectable marking tape shall be installed one (1) foot above the crown of pipe with a non-ferrous backing. Tape shall be minimum three (3) inches wide with 0.03-inch APWA-approved color (purple) PE insulation and black lettering indicating “Caution: Buried Irrigation Line Below.”

5.02.03 PUMPING SYSTEMS

A. General:

Where pumping stations/pumps are installed for systems that will be delivered to the City for Operations and Maintenance, the Developer/Purchaser shall provide a minimum of the following:

1. Prior to Approval by the City:
 - System Demand Curve
 - Pump Curve(s)
 - Pumping Station Design Drawings
 - Manufacturer’s Submittal Package
2. Prior to Acceptance by the City:
 - Manufacturer’s Warranty
 - Pump Station Operations and Maintenance Manual
3. Provision:
 - The purchaser shall be responsible for providing all material, equipment, and labor necessary to install all items associated with a fully functional pumping system.
4. Manufacturer’s Responsibilities:
 - The manufacturer will assist with the installation by providing supervision of installation, start up, training, and technical support. The purchaser must obtain from the manufacturer an Installation, Start-up and Training Commencement Certificate to validate the warranty. The manufacturer will provide Installation, Operation, and Maintenance Manuals.

B. Installation

Offloading is the responsibility of the purchaser. Supervision of installation will be provided by the manufacturer of the pumping system. Installation shall be done after the wet well is completed, and the level floor of the pump house has been poured, and properly cured. The pumping system will be installed over the wet well, and leveled as necessary, as per the Site Preparation Drawing. The pumps will be installed and connected to the piping of the pumping system, and the packaged pumping system will be complete, and ready for the electrical hookup, and connecting all piping. The pumping system will be anchored to the floor of the pump house. The purchaser shall notify the manufacturer of the pumping system two (2) weeks prior to the scheduled installation date so that installation can be coordinated. Supervision of installation will be limited to one (1) eight (8) hour day, unless otherwise specified.

C. Start Up

When electrical inspection of the purchaser’s service entrance equipment has been completed,

and approved, the pumping system manufacturer shall be contacted for start-up by the purchaser. Truck access shall be provided to the site of the pumping system by the purchaser. A minimum two (2) week notice shall be given to manufacturer prior to the scheduled start-up date. During start up, the pumping system shall be given a running test of normal start, and stop, and full demand. During this test, each pump shall demonstrate its ability to operate without undue vibration, or overheating, and shall demonstrate its general fitness for service. Any defects shall be corrected, and adjustments made at the expense of the pumping system manufacturer. Test shall be repeated until satisfactory results are obtained. Start up assistance will be provided but will be limited to one (1) eight (8) hour day, unless otherwise specified.

After the startup has been complete, but before leaving the job site, a training session will be given. The training session will be given to the owner, or the owner's representative to familiarize them with the pumping system operation, maintenance and adjustments. This training session will be limited to three (3) separate eight (8) hour days to be scheduled at the City of Evans discretion.

D. Extended Warranty and Maintenance Contract

The developer/contractor shall ensure that materials supplied are covered under warranty for five (5) years from date of authorized start up but not later than five and one-half (5½) years from date of manufacturer's invoice.

The City reserves the right to require that a workmanship/maintenance warranty extends past the City's typical two (2) year warranty period for public improvements to cover the entirety of the manufacturer's materials warranty period. If the City exercises this right, it will be specified in the Development Agreement.

A maintenance contract shall be included for the life of the extended warranty and will include manufacturer's services for spring start up, winterization and one (1) scheduled four-hour (4) maintenance visit during the first irrigation season following installation.

5.02.04 CORROSION PROTECTION

All ductile iron pipe, fittings, valves, and valve boxes shall be protected as specified in this section.

All ductile iron pipe, fittings, valves, and valve boxes shall be hand-wrapped using polyethylene with a minimum wall thickness of eight (8) mils and a two- (2) inch-wide, ten- (10) mil-thick, polyethylene pressure sensitive tape to close seams or hold overlaps.

All polyethylene encasement material shall be installed in accordance with AWWA C105, latest revision. In all cases the polyethylene shall be so applied as to prevent the contact of backfill material with the fitting. Other means of corrosion protection must be specifically pre-approved by the Public Works Director or designee.

5.02.05 EXCAVATION

All excavations shall be made to the lines and grades as established by the approved drawings. Pipe trenches shall be excavated to a minimum depth of six (6) inches below the bottom of the pipe. All areas shall be excavated in such a manner as will afford adequate drainage. Where material encountered within the limits of the work is considered unsuitable for a foundation by the Inspector, such material shall be excavated below the grade shown on the drawings to a depth necessary to ensure a stable, firm foundation and refilled with one and one-half (1½) inch rock uniformly graded to provide a firm foundation, unless otherwise specified by the Public Works Director or designee.

All excavated materials which are considered unsuitable for backfill and any surplus of excavated material shall be disposed of by the developer/contractor.

See Standard Details (NP-16) for additional specifications on trench excavations.

All existing asphalt or concrete surfacing shall be cut vertically in a straight line and removed from the job site prior to starting the trench excavation. This material shall not be used in any fill or backfill.

The trench shall be excavated so that a minimum clearance of six (6) inches is maintained on each side of the pipe for proper placement and compaction of the bedding or backfill material. The maximum trench width measured at the top of the pipe shall be the outside diameter of pipe plus twenty-four (24) inches.

If the trench width exceeds the maximum trench width, a stronger class pipe will be specified.

The trench shall be adequately supported, and the safety of workers provided for as required by the most recent standards adopted by the Occupational Safety and Health Act. The City reserves the right to inspect construction sites for compliance to OSHA regulations. The City is not responsible for the safety of any party or parties constructing the utility project.

Excavation for structures shall be of such dimensions as to allow for proper installation and to permit the construction of the necessary pipe connections.

Blasting shall not be allowed.

5.02.06 DEWATERING

All pipe trench excavations shall be kept free from all water during pipe laying and other related work. All pipes shall be plugged with a temporary water-tight plug at the end of the day. The method of dewatering shall remove all free-standing water at the final lines and grades of the excavation. All water shall be disposed of in a suitable manner without creating a menace to public health or causing a public inconvenience. The dewatering operation shall continue until such time as it is safe to allow the water table to rise in the excavations. Pipe trenches shall contain enough backfill to prevent pipe flotation.

5.02.07 PIPE BEDDING

After completion of the trench excavation and proper preparation of the trench foundation, a minimum of six (6) inches and a maximum of twelve (12) inches of bedding material shall be placed on the trench bottom for support under the pipe. Bell holes shall be dug deep enough to provide a minimum of two (2) inches of clearance between the bell and the bedding material. All pipe shall be installed in such a manner as to ensure full support of the pipe barrel over its entire length.

After the pipe is adjusted for line and grade and the joint is made, the bedding material shall be carefully placed and tamped under the haunches of the pipe, up to spring line in lifts not to exceeding eight (8) inches (loose thickness), and in the previously dug bell holes. The bedding shall then be installed to a minimum of six (6) inches and a maximum of twelve (12) inches above the top of the pipe, regardless of the type of pipe.

The bedding material shall be squeegee sand or in-situ material, if approved by the Public Works Director, and shall conform to Table 5.02-3 limits when tested by means of laboratory sieves.

Table 5.02-3
Bedding Material Gradations

Sieve Size	Total Percent Passing by Weight
3/8"	100
No. 200	0-5

If in-situ material is used for bedding, all material greater than three (3) inches in diameter shall be removed. Subgrade stabilization materials, if required, shall consist of one and one-half (1½) inch angular crushed rock. See Standard Details (NP-10).

5.02.08 INSTALLATION OF PIPE

All pipes shall be installed in accordance with AWWA C600 or C605, latest revisions, along with the following provisions:

Pipe and fittings shall be loaded and unloaded by lifting to avoid shock or damage. Under no circumstances shall such material be dropped. Before the placing of pipe in the trench, each pipe or fitting shall be thoroughly cleaned of all foreign material, kept clean at all times, and examined for cracks or defects prior to installation.

Joint lubricant shall be as provided by the pipe manufacturer/supplier.

When laying pipe on curves, the pipe shall be kept in alignment by deflection joints or using short lengths of pipe. Minimum pipe length shall be ten (10) feet. If the joints are being deflected, they shall not exceed 0.8 times the manufacturer's recommended maximum. Pipe shall be laid with the bell ends facing in the direction of lying unless directed otherwise by the Inspector.

No pipe or appurtenant structure shall be installed upon a foundation into which frost has penetrated or at any time when the Inspector deems there is a danger of ice formation or frost penetration at the bottom of the excavation. No pipe or related structure shall be installed unless backfilling can be completed before the formation of ice and frost.

Immediately before joining two (2) lengths of pipe, the inside of the bell and the outside of the spigot end and the gasket shall be thoroughly cleaned. Caution shall be exercised to ensure that the correct type of gasket is used. A thin film of gasket lubricant shall be applied to either the inside face of the gasket or the spigot end of the pipe or both. The spigot end of the pipe shall be placed in the socket with care to prevent the joint from contacting the ground. The joint shall be completed by pushing the pipe home with slow steady pressure, without jerky or jolting movements. Stabbing shall not be permitted. Pipe furnished without a depth mark shall be marked before assembly to ensure insertion to the full depth of the joint.

Extra care should be used in handling PVC pipe during cold weather due to the reduced flexibility and impact resistance as temperatures approach and drop below freezing.

Harnessing of joints may be accomplished by use of mechanical joint restraint systems, or by use of one of the several proprietary joint restraint systems supplied by pipe manufacturers. The proprietary systems will require approval of the Public Works Department prior to use. Regardless of the system used, restrained lengths of pipe for various fittings, where harnessing is utilized or required, shall be at least equal to the lengths shown on the construction drawings or as directed by the Public Works Director.

Where joint restraint is required on PVC pipe, the designer shall use a mechanical joint restraint system or one of the approved proprietary systems. Rods and clamps shall not be used on PVC pipe.

See Standard Details (NP-16).

5.02.09 TEMPORARY BULKHEADS AND PNEUMATIC PLUGS

During construction projects, sections of pipe are installed and, at times, left unattended leaving them vulnerable to human tampering and/or environmental contamination (e.g., ground water, muddy water, sanitary or storm water, animals, and insects). Whenever installed pipe is left unattended, temporary plugs (bulkheads or pneumatic) or approved end covers shall be installed at openings. Temporary plugs shall be

watertight, installed properly, and designed in a way that prevents human tampering and environmental contamination. Temporary plugs shall be approved in writing by the City of Evans.

The contractor shall install approved bulkheads or pneumatic plugs on pipe openings before storm events and before leaving the work site unattended and report any reported human tampering or contamination events to City of Evans immediately.

Bulkheads and/or pneumatic plugs shall be thoroughly cleaned and disinfected with 100 mg/l calcium hypochlorite or sodium hypochlorite (chlorine) using a swab or spray application method before installation. Plugs shall be kept free from contamination during storage and shall not be used in non-potable applications (e.g., sanitary sewer, storm water systems, and recycled water).

5.02.10 INSTALLATION OF VALVES AND VALVE BOXES

All valves shall be thoroughly cleaned and fully functional at time of installation. Valves shall be set in such a manner that the valve stems are plumb. Valves shall be located at points in same manner as specified in Section 4.01.08. Any deviation from this shall be at the discretion of the Public Works Director or designee.

Valve boxes shall be installed plumb and centered over valve operating nut. Valve boxes which have shifted during backfill operations or are no longer plumb shall be realigned to the satisfaction of the Public Works Director or designee.

Final elevation of valve boxes shall be left one-quarter ($\frac{1}{4}$) to one-half ($\frac{1}{2}$) inch below pavement surface. See Standard Details (NP-12). The City shall not install nor maintain concrete collars for valve boxes outside of public rights-of-way.

5.02.11 BACKFILL

It is expected that the trench excavation will provide suitable backfill material. Wet, soft, or frozen material, pieces of asphalt or concrete, or other undesirable substances shall not be used for backfilling. The backfill material shall be free from rubbish, stones larger than five (5) inches in diameter, and clods and frozen lumps of soil. If the excavated material is not suitable for backfill as determined by the Public Works Director, suitable material shall be hauled in and utilized, and the rejected material hauled away and disposed of. All snow shall be removed from the trench prior to proceeding with backfill operations.

Backfilling shall be conducted at all times in a manner to prevent damage to the pipe or its coating and shall be kept as close to the pipe laying operation as possible to minimize the amount of open trench.

All backfill around structures shall be consolidated by mechanical tamping. Backfill shall be placed in lift thicknesses capable of being compacted to densities specified in Table 5.02-3, but in no case no more than twelve (12) inches.

In areas where existing pavement is to be cut and replaced, existing material excavated shall be removed from the site and the trench backfilled with select material up to six (6) inches below the pavement as specified in Chapter 3, Section 4. Excess material shall be removed prior to surfacing. Squeegee sand shall not be considered backfill material and shall not extend more than twelve (12) inches above the top of the pipe.

Soil resistivity tests and/or any other soil tests may be required at the sole discretion of the Public Works Director. The developer/Developer/contractor shall incur the costs of all soil testing, as required.

construction from the non-potable irrigation main to the meter pit or vault. Any deviations from these standards must be approved in writing by the Public Works Director.

B. MATERIALS

Service lines shall not be constructed with galvanized pipe. The minimum size allowable for a service line shall be one (1) inch diameter.

- Copper Service Pipe—Type K Only

Type K copper shall be used for service lines one (1) inch through three (3) inch diameter. Three (3) inch ductile iron pipe may be used upon approval by the Public Works Director or designee.

- Service Connection

Non-potable irrigation service saddles shall be cast bronze with double bronze straps and shall be pre-approved by the Public Works Department. See Standard Details (NP-11).

Corporation stops shall be AWWA taper thread to copper compression fittings. Taps shall be inspected by Public Works Department prior to backfill.

- Curb Stops

A curb stop or valve of the same size as the service pipe and conforming to the following standards shall be installed on every service line between the non-potable irrigation main and the meter, at a point at or near the property line.

Curb stops shall use compression fittings. Flared end fittings are not allowed.

Curb stop service boxes shall be a combination lid and pentagon plug, cast iron box, extension- type and marked “IRRIGATION.” The curb stop box shall be installed exactly center over the curb stop valve and in a vertical position. The top lid of the curb stop box shall be installed a maximum of one (1) inch above the final grade.

C. PIPE BEDDING

All specifications are applicable except that K copper service lines require a minimum bedding depth of six (6) inches of squeegee for up to a three (3) inch service line. Any service line larger than three (3) inches shall have typical non-potable irrigation main bedding.

D. LOCATION

That portion of the service pipe between the main and the curb stop and/or meter when installed must be in a continuous straight line, with no joints and perpendicular, if possible, to the main line. Service lines stubbed into the property line shall be of sufficient length to allow direct connection to the shut-off valve. The main to be tapped must extend along the entire length of the front lot line of the property to be served.

If service is requested for a lot at the end of a cul-de-sac street, the main to be tapped shall be a maximum of twenty-five (25) feet from the curb line or the proposed curb line at the end of the cul-de-sac. The service pipe between the main and the property line in cul-de-sacs shall be in a continuous straight line. No service line may be constructed through or in front of any adjoining property. The service line shall be located five (5) feet from the property line on the high side of the lot. Non-potable irrigation service lines must be a minimum of five (5) feet

apart horizontally, or concrete encasement or special protection of the sewer line will be required. Service locations will also be marked with a “NP” on the face of the curb during the placement of concrete.

E. DEPTH

All service pipe shall be provided with at least four and one-half (4½) feet of cover below the established grade of the street in which they shall be laid, and all other places at least four and one-half (4½) feet below the surface of the ground, unless otherwise approved by the Public Works Director.

F. SEPARATE TRENCHES

Except as hereinafter provided, no service pipe may be installed in a trench containing other conduits which convey any substance other than non-potable irrigation. The trench containing the service pipe shall be separated laterally from trenches containing other conduits by at least five (5) feet of undisturbed compacted earth.

G. CONNECTIONS

Service pipes of two (2) inches or less in diameter shall be connected to the main by means of a brass corporation cock of the same diameter as the service pipe.

No underground joints are allowed in the copper service pipe less than two (2) inches in diameter between the corporation cock and the curb stop and/or meter. The use of underground joints may be allowed only on the repair of existing service lines with specific approval from the Public Works Director or designee.

Non-potable irrigation taps shall be made by the developer/contractor utilizing material as specified in Section 5.02.02. No taps will be made until the service line, and copper setter (on residential), and curb stop (on commercials) have been installed.

Care shall be taken to properly install non-potable irrigation service lines so that enough slack is in the service lines to protect against pullout problems.

Non-potable irrigation mains will be tapped at a forty-five (45) degree angle up from the horizontal centerline of the non-potable irrigation main on the same side of the pipe as the non-potable irrigation meter. When tapping into non-potable irrigation mains, an approved tapping tool shall be required.

Tapping mains may require digging out bedding material and cutting or removing part of the corrosion protective wrapping. After the taps are made, the wrap shall be repaired or replaced by the installing contractor in such a manner as to protect both the service pipe and the main.

Service taps shall have a minimum separation of twenty-four (24) inches and be no closer than twenty-four (24) inches to a coupling or joint. No more than four (4) service taps shall be permitted on any one (1) joint of pipe.

H. PUMP

The installation of pumps on service pipes is prohibited, except when specifically authorized by the Public Works Director or designee.

I. LAWN SPRINKLERS

Lawn sprinkler systems must be tapped on the outlet side of the meter pit in a separate pit. Non-potable connections shall be in accordance with Standard Details (NP-7). A non-potable irrigation meter shall be a one (1) inch meter, and shall be installed by the City Public Works Department.

J. VIOLATIONS

If it is necessary to abandon an existing non-potable irrigation tap, it shall be turned off and disconnected at the main. A charge will be assessed for all labor and materials necessary to perform this work.

Service lines that have been installed in improper locations, shall be moved to the location noted in these specifications, if such action does not require the cutting and patching of asphaltic concrete surfacing.

SECTION 3 NON-POTABLE IRRIGATION MAIN RELEASE PROCEDURE**5.03.01 SCOPE**

The release procedure covers pressure testing and reporting of results. This procedure is to be followed when: 1) releasing a newly installed non-potable irrigation main, or 2) releasing a repaired pre-existing non-potable irrigation main.

All non-potable irrigation lines and appurtenances shall be tested after backfilling operations have been completed and acceptable compaction test results have been submitted to the City. All test results shall be submitted to the City within ten (10) working days from the day of testing. There shall not be any pipe in place for more than ninety (90) calendar days prior to the completion of testing

5.03.02 NEW MAINS

Installation will be in accordance with established AWWA C600 or C605, latest revisions, with particular attention paid to the provision for cleanliness within the pipe itself.

5.03.03 REPAIRED MAINS

After a main has been repaired and flushed, personnel from the City of Evans shall inspect the non-potable irrigation for color and turbidity, prior to restoring the repaired main into service.

5.03.04 HYDROSTATIC TESTING

No hydrostatic tests shall be made on any portion of the pipeline until all field-placed concrete has had adequate curing time, minimum 5-days per AWWA, and all compaction test results have been submitted to and approved by the Public Works Director or designee.

The pipeline shall be tested in accordance with AWWA C600 or C605, latest revision, except as follows:

The pipeline shall be tested with non-potable irrigation at a pressure of 150 psi or 150% of the working pressure, whichever is greater. The Public Works Director shall be notified twenty-four (24) hours in advance of testing. All acceptance testing shall be only after the pipeline is in a state of readiness for testing.

All air in the line shall be properly purged. Where blow-off assemblies are not available or effective in purging air from the line, the developer/contractor shall install a tap to purge the line. The location and size of the tap shall be at the discretion of the Public Works Director or designee. The cost for such a tap will be the responsibility of the developer/contractor.

No leakage is allowed through the bonnet of the line valve. Any valve leaking through the bonnet shall be removed and replaced.

The pressure test shall be a two (2) hour test taken at the high point in the line. Every time the non-potable irrigation line pressure drops five (5) psi, the pump will be started to bring the line pressure back to the initial pressure. At the discretion of the Public Works Director or designee, a minimum one (1) hour pressure test may be conducted in lieu of a two (2) hour test.

The Public Works Director or designee shall direct the developer/contractor to repair specific leaks regardless of test results if in his opinion; they are serious enough to endanger the future service of the pipeline. Pipelines shall be tested in sections as rapidly as such section may be isolated. Should any leakage of the pipeline become apparent during the two-year warranty period, the City of Evans Public Works Department personnel or their authorized designees may perform or may direct

developer/contractor to perform the necessary repairs. The developer/contractor shall be invoiced for all work performed during the two-year warranty period. Blow-off assemblies, pressurizing pump, corporation stops and non-potable irrigation measuring apparatus shall be provided by the developer/contractor, at his expense. At the inspector's discretion, measuring apparatus may be required to be calibrated by City of Evans personnel at the developer/contractor's expense.

The City of Evans Public Works Department shall not be held responsible for non-potable irrigation tightness of its valves on existing facilities. If existing valves leak, the City will assist in reducing the influx of non-potable irrigation, but the developer/contractor must use methods at his own disposal to work with the resulting leakage.

SECTION 4 NON-POTABLE IRRIGATION METER INSTALLATION CRITERIA

5.04.01 GENERAL INFORMATION

A. Warranty

A two-year warranty as to materials and workmanship will be in effect upon final acceptance of the meter pit or vault.

B. Non-potable Irrigation Meters

All non-potable irrigation meters, regardless of size, connected to the City of Evans’ utility system, shall be purchased from and remain the property of the City of Evans. Under no circumstances shall anyone other than City of Evans Public Works Department personnel remove a non-potable irrigation meter once the pit or vault has been inspected and approved, unless otherwise specified by the Public Works Director.

C. Special Meter Installation

For any installation where special or unusual conditions might exist, detailed drawings, accompanied by a letter of explanation, shall be submitted to the City of Evans Public Works Department.

D. Non-potable irrigation Meters Over Four (4) inches in Size

For any non-potable irrigation meter installation over four (4) inches in size, detailed drawings of the proposed installation shall be submitted to the Public Works Director for approval prior to any construction.

E. Easements

The City of Evans Public Works Department shall be provided easements for non-potable irrigation meter installations, if required.

F. Electrical Wiring

There shall be no electrical wiring allowed in any non-potable irrigation meter pit or vault except for radio wiring, unless otherwise authorized by the Public Works Director.

G. Inspection of Residential Pits and Commercial Vaults

Inspections of all residential pits and commercial pits or vaults shall be conducted by personnel from the City of Evans Public Works Department. Locations for commercial pits or vaults shall be determined by personnel from the City of Evans Public Works Department.

H. Re-inspection Fees

A re-inspection fee (as adopted by the City Council by Resolution) shall be assessed for every inspection after the initial installation inspection.

I. Variance from Standard Specifications

A variance may be applied for when certain conditions exist that may cause a necessary deviation from these standard specifications. This variance shall be applied for in writing, accompanied by drawings and engineering calculations, and submitted to the City for approval.

5.04.02 INSTALLATION OF 24-INCH PITS

A. Extension

All extensions shall be approved by the City.

B. Copper Setters

Copper setters of the proper laying length to accommodate the non-potable irrigation meter are required on all installations of non-potable irrigation meters.

Cutting of the copper setter for purposes of increasing or decreasing the span across the copper setter is specifically prohibited.

5.04.03 INSTALLATION OF 1-INCH METERS

A. Meter Pits

Meter pits shall be constructed according to Meter Setting Detail for Non-potable Irrigation Line (No. NP-7) located in Appendix A of these Standards. The trench floor under the pit shall be compacted earth. The pit shall not bear on the service pipe. Meter Pits shall be located in a greenbelt and not in concrete or in asphalt pavement. Refer to the Meter Setting Detail for Non-potable Irrigation Line (No. NP-7) for more information.

B. Copper Setter Installation

The copper setter shall be of an all copper and brass construction and shall have a positive one-quarter ($\frac{1}{4}$) turn locking shut-off valve on the inlet side of the copper setter. The copper setter, when installed, shall be eight (8) to ten (10) inches from the frost lid, see Meter Setting Detail for Non-potable Irrigation Line (No. NP-7).

C. Non-potable Irrigation Meter Pit Covers

The dome and frost lid (inner lid) shall be cast iron construction as approved by the Public Works Director or designee. The dome shall have the word "Irrigation" on it. Frost lids (inner lids) of either rubber or neoprene construction are specifically prohibited. When installed, the dome shall be level and two (2) inches above the final grade (curb and gutter, sidewalk, etc.). The center of the dome's top lid, when installed, shall be a maximum of two (2) feet behind the public right-of-way line. Meter pits shall be located a maximum of six (6) feet behind back edge of curb when no sidewalk exists, as long as pit remains in the right-of-way. There shall be a one and seven-eighths ($1\frac{7}{8}$) inch holes in the non-potable irrigation meter pit lids for AMR antenna.

D. Installation

The non-potable irrigation meter shall be installed by Public Works Department personnel. The developer/contractor(s) responsible for the installation of the meter pits covered in this section are specifically prohibited from installing these pits in any type of vehicular or pedestrian traffic zone.

E. Plastic Pipe

Plastic pipe and fittings are specifically prohibited

F. Galvanized Pipe

Galvanized pipe and fittings are specifically prohibited.

G. Pit Inspection and Acceptance

Non-potable irrigation meter pit installations shall not be given final inspection until final grading around the structure has been completed. Necessary grade adjustments to the pit after the City of Evans Public Works Department personnel have given final inspection shall be the responsibility of the owner. Any service line material changes must occur outside the meter pit on the outlet side.

5.04.04 INSTALLATION OF 1½ AND 2-INCH METERS

A. Non-potable Irrigation Meter Vaults

Non-potable irrigation meter vaults for one and one-half (1½) inch and two (2) inch non-potable irrigation meter installations shall be rectangular and constructed of reinforced concrete. The entry hole through the top (or roof) of the vault shall be located so that the center of the opening is over the non-potable irrigation meter. All vaults shall be sealed at all major joints and be made as non-potable irrigation tight as possible. The design of this vault must be submitted by a registered Professional Engineer to the Public Works Director upon request. See Meter Setting Detail For 1½” and 2” Meter (No. NP-8), located in Appendix A for more information.

B. Meter Vault Lids and Covers

Meter vault lids shall be aluminum and have a one and seven-eighths (1-7/8) inch hole for AMR antenna.

C. One and One-half (1½) and Two (2) inch Meter Setters

All one and one-half (1½) inch and two (2) inch meters will be set in factory-made setter with a bypass. No built-on-site setters will be allowed. The developer/contractor shall purchase the meter from the City of Evans.

D. Valves

Valves shall be AWWA C500, C509, and C515, latest revision approved valves of all brass construction. The valve stems shall be of non-rising design. Valves shall be installed both upstream and downstream of the non-potable irrigation meter within the vault. The valves shall open counterclockwise. All valves located in vaults shall have hand wheels in lieu of two (2) inch square operating nut.

E. Unions

Unions will not be allowed. Only flange-type fittings are allowed for setting of meters.

F. Check Valves on Bypasses for Backflow Prevention

Approved backflow prevention devices shall be installed on bypass service lines where the service line being bypassed has a backflow prevention device. The device shall be AWWA (C510, latest revision) approved and be of all brass construction. It shall be installed downstream of the bypass valve and approved by the Public Works Director.

G. Installation

Meter vault lids and covers shall be installed a maximum of two (2) inches above the final grade level of the adjacent property. Easy accessibility must be maintained at all times. Meter vaults shall be installed in greenbelt areas only. Once installed, meter vault lids and covers shall be maintained level with the adjacent grade by the property owner. A two-year warranty as to materials and workmanship is required from the Developer/contractor.

5.04.05 INSTALLATION OF 3-INCH AND LARGER METERS

A. Non-potable irrigation Meter Vaults

Non-potable irrigation meter vaults for three (3) inches and larger non-potable irrigation meter installations shall be rectangular design and constructed of reinforced concrete. The entry hole through the top (or roof) of the vault shall be located as so that the center of the opening is over the non-potable irrigation meter. All vaults shall be sealed at all major joints and be made as non-potable irrigation tight as possible. The design of this vault must be submitted by a registered professional engineer to the Public Works Director upon request. See Meter Setting Detail for 3" and Larger, Detail (No. NP-9) located in Appendix A for more information.

B. Meter Vault Lids and Covers

Meter vault lids and covers shall be per approved by the Public Works Department.

C. Piping Installation

Piping inside the vault for three (3) inches and larger meter services shall be of ductile iron, flange joint design only. Insulation shall be provided between connections of dissimilar metals. The meter vault piping shall be of the same size as the non-potable irrigation meter orifice, both entering and leaving the vault. Any service line material changes must occur outside the meter vault on the outlet side.

D. Valves

Gate valves installed shall meet all AWWA C500, C509, and C515, and be capable of withstanding 200 psi working pressure. The valves shall open counterclockwise and have non-rising stem-type construction with hand wheels in lieu of square operating nuts. Valves shall be installed both upstream and downstream of the non-potable irrigation meter, within the vault. Gate valves larger than three (3) inches in size shall be resilient wedge disc-type.

E. Bypass Piping

Bypass piping shall be installed on these services to facilitate removal of the non-potable irrigation meter without disconnection of service. A gate valve conforming to the same specifications as outlined in Section 5.02.02 shall be installed in the bypass line. Connection to the meter service may be made by means of a wye connection outside the vault.

F. Check Valve on Bypass for Backflow Prevention

Approved backflow prevention devices shall be installed on bypass lines where the service line being bypassed has a backflow prevention device. The device shall be AWWA C510, latest revision, installed downstream of the bypass valve, and must be approved by the Public Works Director.

5.04.06 RADIO READING SYSTEM

All non-potable irrigation meters installed and made a part of the City of Evans utility system shall be equipped with a self-generating radio reading system as required by Public Works Director. The City of Evans shall install the self-contained generator, wire, and the register.

The location of the radio transmitter will be in the meter pit.

The ownership of the wire, meter, conduit, and radio transponder will belong to the City. Any damage to the readout system that is due to negligence or vandalism will be the responsibility of the property owner of record. All repairs to the remote readout system will be performed by City of Evans Public Works Department personnel. Routine maintenance of the radio readout system will be the City's responsibility.

5.04.07 COMMERCIAL METER SETTING PROCEDURE

The following procedure shall be adhered to for the installation of commercial meters:

- A. City of Evans personnel will install all meters up to and including two (2) inches in size.
- B. City personnel will conduct a general inspection prior to the issuance of the engineering release to assure that all facilities conform to their specifications.
- C. If the meter pit or vault passes an inspection performed by City personnel, the meter will be set and the necessary paperwork forwarded to the Finance Department. This inspection will not be made until requested through the Finance Department by the developer/contractor. If the meter pit or vault fails the inspection performed by Public Works personnel, the Public Works Inspector will leave a list of failure items and the Finance Department phone number for re-inspection. The non-potable irrigation meter shall be installed after the meter pit or vault passes inspection.
- D. If there is a jumper in the vault, this jumper will be allowed to stay in place for one (1) week after the pit or vault failed inspection. If all discrepancies have not been resolved in this one (1) week time frame, personnel from the Public Works Department shall then pull the jumper and lock the service. This time frame and consequences for failure to bring the pit or vault up to specifications will also be indicated on the inspection list. Once all discrepancies have been resolved, a re-inspection should be scheduled through the Finance Department.

Meters larger than two (2) inches in size will be installed by the developer/contractor. All meter setters will be purchased from the City of Evans.



SANITARY SEWER SPECIFICATIONS

**CITY OF EVANS
PUBLIC WORKS DEPARTMENT
AUGUST 2019**

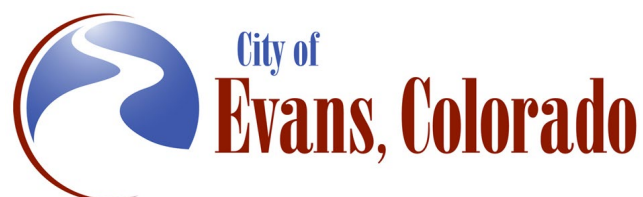


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SECTION 1 DESIGN CRITERIA – SANITARY SEWERS

6.01.01 SCOPE

The purpose of this section is to set forth the general criteria to be used in the design of sanitary sewers and appurtenances in the City of Evans service area. Any deviation from these standards must be authorized in writing by the Public Works Director or designee.

6.01.02 GENERAL

All sanitary sewer mains and appurtenances shall be in conformance with these specifications and shall be designed by or under the direct supervision of a Registered Professional Engineer licensed to practice in the State of Colorado.

6.01.03 DESIGN FLOW

Sanitary sewers must be designed to carry the peak discharge with the pipe being no more than sixty (60) percent full and be able to transport suspended material such that deposits in the sewer are precluded. It is essential that the sewer have capacity for peak hourly sewage flow and adequate velocity at minimum sewage flow.

All sewers shall be designed and constructed to give velocities, when flowing eighty (80) percent of flow depth, of not less than two (2) feet per second nor more than ten (10) feet per second based on the Manning approximation of the Kutter Formula. Higher velocities may be acceptable if the pipe materials are specifically designed to prevent erosion or other negative effects.

$$V = \frac{1.486}{n} * R^{\frac{2}{3}} * S^{\frac{1}{2}}$$

where V = Mean Velocity (ft/sec)
 R = Hydraulic Radius (ft)
 S = Slope of Energy Grade Line (ft/Ft)
 n = 0.013

Use of other practical Manning’s n values may be permitted, if justified, on the basis of research and field data and approved by the Public Works Director or designee. Table 6.01-1 shows the minimum allowable slopes for sanitary sewer lines.

Table 6.01-1
 Min. Allowable Slopes

Sewer Size (Inches)	Minimum Slope
4	2.08%
6	1.04%
8	0.40%
10	0.28%
12	0.22%
15	0.15%
18	0.12%
21	0.10%
24	0.08%

Flow calculations shall be submitted by a Colorado Registered Professional Engineer and shall include the following.

The quantity of sewage flow expected to be generated by the project using the criteria set forth in this section; the nature of any wastes that are not ordinary domestic sewage; and the quantity and type of discharge of an unusual nature such as swimming pool drainage, cooling water, commercial boundaries, floor drains from auto repair garages, steam cleaning, chemical dairy, food processing or service, car washes, metal treating or plating operations, or other similar cases.

In addition to the quantity of flow generated within a project, the impact of the expected peak flow in the sewer system downstream should be investigated to ensure that adequate capacity is available, not only for the proposed project, but for all present users of the existing public sanitary sewer system at a minimum.

Table 6.01-2 shows the design sewage flow.* These flows shall be used as guidelines to determine estimated flows generated from the various types of land use for undeveloped parcels.

Table 6.01-2
Design Sewage Flow

Residential Areas**	
Laterals	400 Gallons/Day/Capita
Main, Trunk, and Outfall Sewers	250 Gallons/Day/Capita
Industrial Areas	1250 Gallons/Day/Acre
Commercial Areas	1000 Gallons/Day/Acre

*For pipes flowing at sixty (60) percent of flow depth.

**For residential areas, the calculation shall be based upon 3.5 persons per single family unit, 2.2 persons per multi-family unit, and 2.6 persons per manufactured home.

Table 6.01.3
Wastewater Quantity Guidelines

Type of Establishment	Gallons Per Person Per Day *
Airports (Per Passenger)	5
Bathhouses & Swimming Pools	10
Camps	
Campground w/Central Comfort Stations	35
With Flush Toilets, No Showers	25
Construction Camps {Semi-Permanent}	50
Day Camps (No Meals Served)	15
Resort Camps (Night & Day) w/Limited Plumbing	50
Luxury Camps	100
Cottages & Small Dwellings w/Seasonal Occupancy	50
Country Clubs (Per Resident Member Present)	100
Country Clubs (Per Non-Resident Member Present)	25
Dwellings	
Boarding Houses	50
Additional for Non-- Resident Boarders	10
Luxury Residences and Estates	150
Apartment/Multiple Family Dwelling (Per Resident)	75
Rooming Houses	40
Single Family Dwellings	100
Factories (Gallons Per Person, Per Shift, Exclusive of Industrial Wastes)	35
Hospitals (Per Bed Space)	250+
Hotels w/ Private Baths (Two Persons Per Room)	60
Hotels w /Private Baths	50
Institutions Other Than Hospitals (Per Bed Space)	125
Laundries, Self-Service (Gallons Per Wash; i.e., Per Customer)	50
Mobile Home Parks (Per Space)	250
Motels w/Bath, Toilet, & Kitchen Wastes (Per Bed Space)	50
Motels (Per Bed Space)	40
Picnic Parks (Toilet Wastes Only) (Per Picnicker)	5
Picnic Parks w/Bathhouses, Showers, and Flush Toilets	10
Restaurants (Toilet & Kitchen Wastes Per Patron)	10
Restaurants (Kitchen Wastes Per Meal Served)	3
Restaurants Additional for Bars & Cocktail Lounges	2
Schools	
Boarding	100
Day, w/o Gyms, Cafeterias, or Showers	15
Day, w/Gyms, Cafeterias, & Showers	25
Day, w/Cafeteria, w/o Gym or Showers	20
Service Stations (Per Vehicle Served)	10
Swimming Pools & Bathhouses	10
Theatres	
Movie (Per Auditorium Seat)	5
Drive-In (Per Car Space)	5
Travel Trailer Parks	
w/o Individual Water & Sewer Hookups (Per Space)	50
w/ Individual Water & Sewer Hookups (Per Space)	100
Workers	
Construction (at Semi-Permanent Camps)	50
Day, at Schools & Offices (Per Shift)	15

*Unless otherwise noted

A peaking factor of four (4) shall be used when determining the peak flow rate.

If design flows other than those given in Table 6.01-2 and 6.01-3 are used, the consulting engineer must submit data supporting their design flows.

All calculations of flows to be generated by the proposed project are to be submitted to the City of Evans Public Works Department for review along with the engineering drawings.

6.01.04 SIZING OF MAINS

No sanitary sewer mains shall be less than 8 inches in diameter. Sanitary sewer mains (8 -12 inches) shall be designed to carry peak flows at sixty (60) percent depth ($d/D = 0.60$). Sanitary sewer mains larger than 12-inches shall be designed to carry peak flows at seventy-five (75) percent depth ($d/D = 0.75$).

The Public Works Department reserves the right to require oversized mains to provide service for future needs. Reimbursement agreements may be entered into so that the developer can recover costs from other properties that would contribute flows to the oversized main.

Sanitary sewer mains constructed of the following materials will be allowed:

- A. Polyvinyl Chloride Pipe
- B. Polyvinyl Chloride Pressure Pipe

All materials must conform to the material requirements as set forth in Section 6.02.03 of these Specifications. Other pipe material may be allowed on a case by case basis with specific written permission from the City.

6.01.05 GROUND COVER

All sewer mains within the public right-of-way shall be designed so that a minimum of four and one-half ($4\frac{1}{2}$) feet of cover exists over the pipe after final grade has been established unless specifically approved by the Public Works Director or designee.

No main or service line shall have more than twenty (20) feet of cover unless specifically approved by the Public Works Director or designee.

Sewer lines which must cross under irrigation ditches or through bogs or swamps where the soil is unstable and water infiltration may be high must be specially designed for such conditions by the Consulting Engineer and approved by the Public Works Director or designee.

6.01.06 LOCATION

All mains to be dedicated to the City of Evans shall be installed in dedicated streets. Typical location for these sewer mains is the centerline of the street as determined by the Public Works Director or designee. See Standard Details (S-35) for approximate location of all wet utilities in the right-of-way. Sewer mains may be installed in exclusive easements and rights-of-way when, as determined by the Public Works Director or designee, it is not practical to make such installation in the dedicated street. When such exceptions are made, the minimum width requirements for easements and rights-of-way are in Table 6.01-4.

Table 6.01-4
Minimum Easement of Right-of-Way

Number of Utilities	Easement Width
One Utility Line	- Total Width of 20 feet - 15 feet on One Side of the Property Line
Two Utility Lines (Water & Sewer)	- Total Width of 30 feet - 10 feet on Either Side - 10 feet Between Lines

All sewer mains shall be in an easement at least twice the depth to the invert in width unless otherwise specified by the Public Works Director. The minimum width of easement shall be twenty (20) feet. All sanitary sewer lines and manholes shall be located so that they are accessible to City of Evans maintenance crews at all times.

No curvilinear sewers shall be permitted.

Sanitary sewers shall not be installed in drainage ditches.

Sanitary sewer installations shall conform to all specifications as described in Design Criteria Considered in the Review of Wastewater Treatment Facilities, as published by the Colorado Department of Public Health and Environment, except that all distances shall be measured outside edge to outside edge.

A. Vertical Separation

Under no circumstances shall the vertical clearance between any lines involving a water or sanitary sewer line be less than twelve (12) inches without written approval from the Public Works Director or designee. The corrosion protection must adhere to Section 4.03.27. When ductile iron pipe is utilized, see Standard Details (WA-4 and WA-15) for placement information.

B. Water Line Crossing Over a Sanitary Sewer Line

If there is less than eighteen (18) inches vertical clearance, encase the sewer line ten (10) feet each side of the crossing and the water line must be a full twenty (20) foot section of ductile iron pipe centered over the crossing. The proper corrosion protection must be adhered to whenever ductile iron pipe is utilized. Encasement of joints only shall be required on sewer lines fifteen (15) inches and larger in diameter. Polyvinyl chloride pressure pipe may be used in lieu of an encasement if the sewer line is AWWA C900 or C905.

C. Sanitary Sewer Line Crossing Over a Water Line

Encase the sanitary sewer line, no matter what the vertical clearance is, ten (10) feet each side of the crossing. If the vertical clearance is less than eighteen (18) inches, the water line must also be ductile iron pipe. The proper corrosion protection must be adhered to whenever ductile iron pipe is utilized. Encasement of joints only shall be required on sewer lines fifteen (15) inches and larger in diameter. Polyvinyl chloride pressure pipe may be used in lieu of an encasement if the sanitary sewer line is AWWA C900 and C905, latest revision.

D. Sanitary/Storm Sewer Line Crossing Over a Sanitary/Storm Sewer Line

If the vertical clearance is less than eighteen (18) inches, encase the sewer line ten (10) feet each side of the crossing. Encasement of joints only shall be required on sewer lines fifteen (15) inches and larger in diameter. Polyvinyl chloride pressure pipe may be used in lieu of an encasement if the sewer line is

AWWA C900 and C905, latest revision.

E. Landscape Separation

Landscape and utility plans shall be coordinated. The following list sets forth minimum dimension requirements for the most common tree/utility separations. Tree/utility separations shall not be used as a means of avoiding the planting of required street trees.

1. Forty (40) feet between street trees and streetlights. Fifteen (15) feet between ornamental trees and streetlights.
2. Ten (10) feet between trees and water or sewer lines unless a wider separation is required by the City in consideration of unusually deep utility installations.
3. Four (4) feet between trees and gas, telephone, electric and other underground utilities.
4. Ten (10) feet from a driveway.
5. A minimum clearance of three (3) feet on each side of a fire hose connection must be maintained. No vegetation other than turf or low-growing ground covers may be planted between the fire hose connection and the sidewalk or street.

All concrete encasements shall be per Standard Details (WA-3).

Additional support may be required by the Public Works Director or designee where large diameter lines cross over utility mains.

6.01.07 MANHOLES

Manholes should be installed at the upper end of each line, at changes in grade, size, or alignment, at pipeline intersections, and at distances not greater than 400 feet for all sewers. Manhole locations will not be located in the normal wheel track of public streets. See Standard Details (WW-5). The City shall neither install nor maintain concrete collars around manhole covers outside of public rights-of-way.

A drop manhole shall be provided for a sewer entering a manhole at an invert elevation of twenty-four (24) inches or more above the manhole invert. Where the difference in elevation between the incoming sewer invert and the manhole invert is less than twenty-four (24) inches, the invert shall be shaped or filleted to prevent solids deposition.

The minimum internal diameter of the manhole barrel shall be forty-eight (48) inches for sanitary sewers of twelve (12) inches or less, sixty (60) inches for sewers of fifteen (15) to twenty-seven (27) inches diameter, and seventy-two (72) inches for sewers thirty (30) inches and larger. When an inside drop manhole is utilized the minimum manhole barrel size shall be increased by twelve (12) inches.

The flow channel through the manhole shall be made to conform to the shape and slope of the sewers.

Sewers shall be located as per Section 6.01.06. Under no circumstances shall a manhole be located in concrete areas, such as sidewalks, cross pans, aprons, or curb and gutters.

Manholes shall be constructed as indicated in Standard Details (WW-5). All manholes under construction shall be sealed tightly to prevent storm or other non-sewage flows from entering the sanitary sewer system. All dead-end manholes shall have line laid through the manhole and plugged with an approved plug provided by the pipe manufacturer.

Sewer pipe connections to existing manholes where there is no existing pipe stubbed out shall be made in such a manner that the finished work will conform as nearly as practical to the essential requirements specified for new manholes. The developer/contractor shall break out as small an opening in the existing manhole as necessary to insert the new sewer pipe. The existing concrete foundation bench shall be chipped to the cross-section of the new pipe in order to form a smooth, continuous invert similar to what would be formed in a new concrete base.

Non-shrink Portland cement grout shall be used as necessary to smoothly finish the new invert and to seal the new lines, so the junction is watertight.

Precast manholes using rubber gaskets to smoothly finish the new invert and to seal the manhole shall be accepted.

Top elevation of the manhole shall be adjusted to exactly match final street grade prior to the initiation of the two (2) year warranty period. If manholes are in open fields, they should be left eighteen (18) inches above grade where practical. A locking ring and cover should be installed. In cultivated areas, manholes shall be properly protected, and marked. Final elevation of all manholes is to be at the discretion of the City.

6.01.08 CLEANOUTS

Cleanouts shall not be permitted in city streets unless specifically approved by the Public Works Director or designee.

6.01.09 UNDERDRAINS

Underdrains on sanitary sewer service lines shall be installed per Standard Details (WW-8 and WW-11). Such drains shall not discharge into sanitary sewers, on the surface, or to any other location not approved by the Department of Public Works.

6.01.10 GREASE TRAPS/SAND AND OIL INTERCEPTORS

Grease traps/sand and oil interceptors shall be installed in accordance with the City's Industrial Pretreatment and Fats, Oils, and Grease (FOG) policies.

SECTION 2 CONSTRUCTION CRITERIA – SANITARY SEWERS

6.02.01 SCOPE

The purpose of this section is to set forth the general criteria to be used in the construction of sanitary sewer mains and appurtenances in the City of Evans service area. Any deviation from these standards must be approved by the Public Works Director or designee.

6.02.02 SUBMITTALS

All submittals shall include the type of pipe material that will be used, the pipe manufacture specifications, the pipe manufacture’s recommended installation technique, and bedding material specifications.

6.02.03 MATERIALS

All materials furnished shall be new and undamaged. Everything necessary to complete the installation shall be furnished and installed whether shown on approved drawings or not, and all installations shall be fully operational when complete.

Acceptance of materials or the waiving of inspection thereof shall in no way relieve the developer/contractor of the responsibility for furnishing materials meeting the requirements of the specifications.

The City of Evans Public Works Department reserves the right to direct or deny use of certain types of materials in specific circumstances.

All materials delivered to the job site shall be adequately housed and protected to ensure the preservation of their quality and fitness for the work.

A. Polyvinyl Chloride Pipe

All pipe materials and fittings shall meet 4” through 15”, ASTM D3034; 18” through 27”, ASTM F-679; Type PSM, SDR 35, or latest revision thereof.

All fittings and accessories shall be as manufactured and furnished by the pipe supplier or approved equal and have bell and/or spigot configurations compatible with the pipe.

B. Alternative Pipe

Before the installation of any alternative pipe, the developer/contractor shall acquire the approval from the Public Works Director or designee, based on the recommendation of the design engineer.

All pipe materials and fittings shall meet the extra-strength minimum requirements of ASTM D-3034, SDR-35, or latest revision thereof.

All fittings and accessories shall be as manufactured and furnished by the pipe supplier or approved equal and have bell and/or spigot configurations compatible with the pipe.

Prior to installation of alternative pipe type, the manufacture installation guidelines shall be provided to the City and available on site.

C. Manholes

Manholes barrels shall be constructed of pre-cast concrete. Concrete bases may be poured in place or pre-cast concrete, with a minimum thickness of eight (8) inches. Manhole inverts shall be formed as indicated in the Sanitary Sewer Flow Line Channel Detail (No. WW-9), located in Appendix A of these specifications, to ensure smooth flow through the manhole.

Manhole steps shall be aluminum, or plastic-coated steel, and shall be spaced sixteen (16) inches on center, aligned away from the invert. The first step shall be a maximum distance of twenty-four (24) inches from the final grade.

All cones shall be eccentric. Pre-cast manhole risers and cones shall be manufactured in accordance with ASTM Designation C-478. The cone section shall not extend closer than twelve (12) inches to the top of the manhole cover. Pre-cast concrete, HDPE, or cast-in-place adjustment rings shall be used on top of the cone to support and adjust the manhole frame to the required final grade. Flat top sections may be used on shallow lines where cone sections are impractical to use as specified by the Public Works Director or designee. The developer/contractor shall minimize the amount of adjustment rings. The maximum adjustment with the use of adjustment rings is twelve (12) inches.

The manhole barrels shall be watertight at all joints and riser sections. The performing flexible plastic joint sealing compound shall be “RAMNEK” or approved equal. The application of the priming compound and the sealing compound shall be accomplished in strict conformance with the manufacturer's instructions as to the quantity of material, the grade of the materials, and the application temperatures. This plastic joint compound shall be applied to all manhole joints.

Ring and cover shall be cast iron, twenty-four (24) inches in diameter for forty-eight (48) inch in diameter manhole barrels, with a combined weight of not less than 338 pounds. Manhole rings and covers shall be thirty (30) inches in diameter for sixty (60) inch and seventy-two (72) inch diameter manhole barrels, unless otherwise specified by the Public Works Director or designee. See Standard Details (WW-4).

For additional specifications on manhole construction, see Standard Details (WW-5).

D. Drop Manholes

A drop manhole shall be constructed at all manholes where the incoming pipe invert is more than two (2) feet above the manhole invert.

See Standard Details (WW-1 and WW-2) for drop manhole specifications.

When the inside drop manhole is utilized, the diameter of the manhole sections shall be increased twelve (12) inches from the typical manhole size, with a minimum diameter of sixty (60) inches.

E. Concrete

All cast in place concrete shall be minimum 4,500 psi at twenty-eight (28) days.

6.02.04 EXCAVATION

All excavations shall be made to the lines and grades as established by the approved drawings. Pipe trenches shall be excavated to a minimum depth of six (6) inches below the bottom of the pipe. All areas shall be excavated in such a manner as will afford adequate drainage. When unstable material is encountered within the limits of the work, such material shall be excavated below the grade shown on the drawings to a depth necessary to ensure a stable, firm foundation and refilled with a one and one-half (1½) inch stabilization rock uniformly graded to provide a firm, stabilized foundation. All excavated materials which are considered unsuitable for back

fill and any surplus of excavated material shall be disposed of by the developer/contractor in an approved area.

All existing asphalt or concrete surfacing shall be cut vertically in a straight line as specified in Chapter 3, Section 9, and removed from the job site prior to starting the trench excavation. This material shall not be used in any fill or backfill.

The trench shall be excavated so that a minimum clearance of six (6) inches is maintained on each side of the pipe for proper placement and densification of the bedding or backfill material. The maximum trench width, measured at the top of the pipe, shall be the outside diameter of pipe plus twenty-four (24) inches, or be less than the outside diameter of the pipe barrel plus twelve (12) inches when measured at any point below the top of the pipe bell, flange or collar. See Standard Details (WW-8).

Where the width of the lower portion of the trench exceeds the maximum width herein stated, the developer/contractor, at his expense, shall furnish and install special pipe embedment or concrete encasement to protect the pipe from the additional loading. The type and quantities of special pipe embedment shall be determined by the pipe supplier, using trench loading criteria based upon saturated backfill weighing 120 pounds per cubic foot and allowing for truck and other superimposed live loads.

Excavation in paved streets shall be confined to a minimum practical width. The pavement will be saw cut as specified in Chapter 3, or in a manner approved by the Public Works Director or designee.

Any pavement that is damaged by the developer/contractor outside the above-stated limits shall be replaced at the developer/contractor's expense.

The trench shall be adequately supported and the safety of workers provided for as required by the most recent standards adopted by the Occupational Safety and Health Act (OSHA). The City reserves the right to inspect construction sites for compliance to OSHA regulations. The City is not responsible for the safety of any party or parties constructing the utility project.

Excavation for structures shall be of such dimensions as to allow for proper installation and to permit the construction of the necessary pipe connections.

Blasting shall not be allowed.

6.02.05 DEWATERING

All pipe trenches or structure excavations shall be kept free of standing water during pipe laying and other related work. The method of dewatering shall remove all free-standing water at the final lines and grades of the excavation. All water shall be disposed of in a suitable manner without creating a menace to public health or causing a public inconvenience. Ground water shall not be allowed to enter the pipe during installation. The dewatering operation shall continue until such time as it is safe to allow the water table to rise in the excavations. Pipe trenches shall contain enough backfill to prevent pipe flotation.

6.02.06 PIPE BEDDING

After completion of the trench excavation and proper preparation of the trench foundation, a minimum of six (6) inches and a maximum of twelve (12) inches of bedding material shall be placed on the trench bottom for support under the pipe. Bell holes shall be dug deep enough to provide a minimum of two (2) inches of clearance between the bell and the bedding material. All pipe shall be installed in such a manner as to ensure full support of the pipe barrel over its entire length. After the pipe is adjusted for line and grade and the joint is made, the bedding material shall be carefully placed and tamped under the haunches of the pipe up to spring line and in the previously dug bell holes. The bedding shall then be installed to a minimum of six (6) inches and a maximum of twelve (12) inches above the top of the pipe (Standard Details WW-6) regardless of the type of pipe is being installed. The bedding material shall be as per pipe manufacturer's specifications and shall be reviewed by the City Public Works Department.

6.02.07 INSTALLATION OF PIPE

Pipe and fittings shall be loaded and unloaded by lifting so as to avoid shock or damage. Under no circumstances shall such material be dropped. Before the placing of pipe in the trench, each pipe or fitting shall be thoroughly cleaned of all foreign material, kept clean at all times, and examined for cracks or defects before installation.

Joint lubricant shall be used as supplied/recommended by the pipe manufacturer/supplier.

Pipe shall be laid upstream with spigot ends pointing downstream. All pipe is to be placed true to line and grade with ends abutting, carefully centered and with a smooth invert at the joint. The joint shall be made in a workmanlike manner so as to be watertight. New installations shall be complete and flushed prior to connecting to existing lines.

No pipe or appurtenant structure shall be installed upon a foundation into which frost has penetrated or at any time when the City deems there is a danger of ice formation or frost penetration at the bottom of the excavation. No pipe or appurtenant structure shall be installed unless backfilling can be completed before the formation of ice and frost.

Immediately before joining two (2) lengths of pipe, the inside of the bell, the outside of the spigot end, and the gasket shall be thoroughly cleaned.

A thin film of gasket lubricant shall be applied to both the inside face of the gasket and the spigot end of the pipe.

The spigot end of the pipe shall be placed in the socket with care to prevent the joint from contacting the ground. The joint shall be completed by pushing the pipe home with a slow, steady pressure. Stabbing shall not be permitted.

Install minimum AWG 12 solid copper wire with 0.03 inch of PE insulation fastened to the pipe with two (2) inch wide PVC tape. The splicing of tracer wire shall be in accordance with the manufacturer's recommendation. Developer/contractor shall test tracer wire before construction acceptance is issued while City utility inspector is present. A three (3) inch wide, detachable warning tape shall be installed above all pipe, for the purpose of warning of location of buried pipeline. Color of tracer wire and warning tape shall be green, conforming to APWA Standards.

6.02.08 TEMPORARY BULKHEADS AND PNEUMATIC PLUGS

During construction projects, sections of water mains are installed and at times left unattended leaving pipes vulnerable to human tampering and/or environmental contamination (e.g., ground water, muddy water, sanitary or storm water, animals, and insects). Whenever installed pipe is left unattended, temporary plugs (bulkheads or pneumatic) or approved end covers shall be installed at openings. Temporary plugs shall be watertight, installed properly, and designed in a way that prevents human tampering and environmental contamination. Temporary plugs shall be approved in writing by the City of Evans.

The developer/contractor shall install approved bulkheads or pneumatic plugs on pipe openings before storm events and before leaving the work site unattended and report any reported human tampering or contamination events to City of Evans immediately.

Bulkheads and/or pneumatic plugs shall be thoroughly cleaned and disinfected with 100 mg/l calcium hypochlorite or sodium hypochlorite (chlorine) using a swab or spray application method before installation. Plugs shall be kept free from contamination during storage and shall not be used in non-potable applications (e.g., sanitary sewer, storm water systems, and recycled water).

6.02.09 BACKFILL

See General conditions.

6.02.10 COMPACTION

Refer to Chapter 3, Section 9, Standard Details (S-32), of these specifications.

6.02.11 TRENCH MAINTENANCE

Refer to Chapter 3, Section 9, Standard Details (S-32), of these specifications.

6.02.12 TESTING

All sanitary sewer pipe and appurtenances shall be cleaned and tested after back-fill operations have been completed and acceptable compaction test results have been submitted to the City. All test results shall be submitted to the City in writing within ten (10) working days from the day of testing. There shall not be any pipe in place for more than ninety (90) calendar days prior to the completion of testing.

Should the City find that the completed line or any portion thereof fails on any of the specified tests; the City may halt construction of any new sewer line until such time as the previously placed sewer line meets the specifications. If the sewer line is completed, the City may require that the developer/contractor repair the line until it meets specifications before the line is released by the Public Works Director or designee.

The low-pressure air test along with the TV inspection shall be required on the entire length of all pipeline installations. All sewer lines must be cleaned, tested, and approved by the City. All work necessary to receive approval for cleaning and testing shall be completed within fifteen (15) days of backfilling.

The developer/contractor shall furnish all labor, materials, tools, and equipment necessary to clean the pipe and appurtenances, conduct the tests, and perform all work incidental thereto. Any damages to the pipeline caused by cleaning or testing operations shall be repaired or replaced by the developer/contractor at his own expense. Should the pipeline fail to meet these requirements, the developer/contractor shall determine the source or sources of the leakage and shall replace all defective materials or workmanship, all at his own expense. Pipelines which fail to meet these requirements shall be repaired or replaced and retested in accordance with these requirements. The City or its designee reserves the right to be present during all sanitary sewer testing. The developer/contractor must notify the City forty-eight (48) hours prior to any testing. At the City's discretion the developer/contractor may be responsible for any cost that the City may incur due to sanitary sewer testing inspection.

A. Low Pressure Air Test

All pipe outlets shall be plugged with suitable test plugs. Pipe may be tested without pre-wetting if the pipeline to be tested is submerged in groundwater. The developer/contractor shall determine the groundwater elevation at the test location and provide it to the City. The backpressure on the pipe due to groundwater shall be determined and the internal pipeline test pressure shall be established at 4.0 psig in excess thereof. Air shall be slowly added to the portion of the pipe being tested. After the pipeline has been filled to the required pressure, at least two (2) minutes shall be allowed for the air temperature to stabilize, while adding only the amount of air necessary to maintain the test pressure. After the two (2) minute period, the air supply should be disconnected and allow the initial pressure allowed to drop to 3.5 psig in excess of the groundwater backpressure. The time interval required for the pipeline internal pressure to drop from 3.5 psig to 2.5 psig above the excess of groundwater backpressure shall be measured and recorded.

The basis for acceptance of the air test shall be the minimum time required for the internal pressure to drop 1 psig. The pressure must remain within the allowable limits for the time (min:sec) indicated on

the following table:

Table 6.02-4
Allowable Pressure Drop Times

Pipe Diameter (Inches)	Length of Pipe Being Tested (Feet)						
	0-150	200	250	300	350	400	500
8	7:34	7:34	7:34	7:36	8:52	10:08	12:38
10	9:26	9:26	9:53	11:52	13:51	15:49	19:45
12	11:20	11:24	14:15	17:05	19:56	22:47	28:26
15	14:10	17:48	22:15	26:42	31:09	35:36	44:26

Table 6.02-4 is based on the formula $T = 0.0237 (L) (D^2)$, where:

- T = time of test (sec)
- L = length of pipe being tested (ft)
- D = diameter of pipe (in)

The minimum allowable pressure drop times for pipe eighteen (18) inches in diameter and larger (in seconds) shall be calculated using the above formula.

Section of pipe which fails the air test shall have the defects repaired and the test shall be repeated. Repair and repeat testing shall be continued until the testing requirements are met.

If it appears that excessive infiltration is present after the air tests have been completed, the Public Works Director or designee may require an infiltration test prior to final acceptance. Excessive infiltration may be the cause for rejection.

The developer/contractor shall follow all precautions necessary to perform a safe and successful test. Plugs used to isolate the line for the air test must be securely braced to avoid the unintentional release of the plug. Gauges, air piping manifolds, and control valves shall be located above ground. No one shall be permitted to enter a manhole when a plugged pipe is under pressure. Air testing apparatus shall be equipped with a pressure relief device designed to relieve the pressure when in excess of 6 psig.

B. Television Inspection

The TV inspection tape shall show the entire inside periphery of the pipe. The developer/contractor shall furnish a recording of the inspection to the City’s preferred digital media format. The footage shall include a voice narrative of the inspection. The television inspection shall be performed on one manhole section at a time. Unsatisfactory inspection results may be cause for rejection. The developer/contractor shall be responsible for any repairs or replacement of any portions of the pipeline which are determined defective as a result of the television inspections.

C. Vacuum Manhole Test

Manholes shall be tested before the ring and cover and grade adjustment rings have been installed. All pipes entering the manhole shall be plugged and braced and a vacuum of ten (10) inches of mercury shall be drawn. The vacuum pump shall be turned off and the time monitored as the vacuum drops one (1) inch. The vacuum must not drop more than one (1) inch for the duration of the time indicated in Table 6.02-5.

Manholes which fail the vacuum test shall have the defects located and repaired, and the test shall be repeated. Repair and repeat testing shall be continued until the testing requirements are met.

Table 6.02-5
 Specified Test Duration for Diameter of Manhole

Manhole Diameter (inches)	Time (seconds)
48	60
60	75
72	90

6.02.13 SEWER SERVICE LINES

A. General

All sanitary sewer service lines connecting to the City of Evans sanitary sewer system shall be established in accordance with these specifications. The specifications shall cover all new sanitary sewer service line construction and repairs to existing lines; from the sewer main to the building plumbing. Any deviation from these standards must be approved in writing by the Public Works Director or designee. No sanitary sewer service lines shall be less than four (4) inches in diameter.

B. Pipe Bedding

All specifications are applicable except that four (4) inch and six (6) inch service lines require a minimum bedding depth of six (6) inches as shown on Standard Details (WW-6).

C. Location and Alignment

Only one tap is allocated per unit. Sanitary sewer service lines shall be constructed on the shortest and straightest route possible. At no time shall the service line be closer than five (5) feet to the side property line, and no service line may be constructed through or in front of any adjoining property. When possible, the service line shall be located five (5) feet toward the low side of the lot from the centerline of the lot. Sewer and water service lines must be a minimum of ten (10) feet apart horizontally. Refer to Section 04.02.02 for additional information.

D. Stub-Ins to Property Line

Service stub-ins shall extend to the property line at a minimum. Stub-ins shall be plugged with a watertight compression stop, a Schedule 40 Glue Cap, or an approved equal. Adjacent to the end of the service stub-in, four by four (4x4) inch wood shall be placed in a vertical position prior to backfilling. This four by four (4x4) wood shall remain in place until service locations are stamped into the fresh concrete on the face of curb with an "S". If the four by four (4x4) is not present at time of stamping, the developer shall bear the expense of reaffirming the location of the service stub out by re-excavation. The developer/contractor shall take measurements of distances from manholes to service taps and give this information to the City.

No more than two (2) forty-five-degree (45°) bends shall be permitted in any sanitary sewer service line. No forty-five-degree (45°) bends are allowed within the public ROW. A cleanout will be required, for each 100 feet of service line or fraction thereof. Where underdrain is present, a four (4) inch underdrain service shall be placed under the sanitary sewer service and stub into property.

E. Connections

Where wye's have not or could not have been installed in the main sewer, the developer/contractor shall excavate around the main and prepare the main for tapping. Public Works Department personnel must inspect existing conditions prior to commencement of new tap work. The main shall then be tapped by the developer/contractor or a duly authorized designee at the expense of the developer/contractor. The connection shall be watertight and at a forty-five degree (45°) angle above the pipe horizontal centerline. No projection of the sewer service pipe inside the sewer main that is being tapped shall be permitted. After Public Works Department personnel have inspected the sewer tap, pipe laying and all other work may be completed.

Only City-approved saddles and tees shall be permitted. The City shall inspect the main and saddle at every tap prior to backfilling. In the event the tap is covered before it is inspected, it shall be dug out by the developer/contractor and all dirt around the fitting shall be removed to allow visual inspection of the tap and the main. If the main sewer line is cracked or broken during the process of locating and tapping, it shall be repaired immediately by replacing the broken section. All taps shall be a minimum of five (5) feet apart and shall not be within two (2) feet of the bell. Service taps shall not oppose each other.

A manhole shall be installed instead of a service tap when a six (6) inch connection is to be made on an existing eight (8) or ten (10) inch line. Six (6) inch connections may be made without a manhole on new line installations with the use of a wye. Service taps to existing manholes shall not be permitted without the written approval of the Public Works Director or designee. See Standard Details (WW-7 and WW-10).

At no time shall a sewer service be allowed without an upstream manhole.

F. Commercial and/or Industrial Manholes

A manhole may be required, where specified by the Public Works Director or designee, in order to have samples taken if industrial waste is suspected. Such a manhole would be located on the commercial service line, so samples could be taken before such fluids reach the sanitary sewer main line.

G. Grease and/or Sand Traps

Grease traps/sand and oil interceptors shall be constructed in accordance with the City's Industrial Pretreatment and Fats, Oils, and Grease (FOG) policies.

H. Infiltration

The joints shall be made in a workmanlike manner so as to ensure a maximum infiltration of not more than 0.032 gallon per inch of diameter per hour, per 100 feet of length.

Service lines to be abandoned shall be dug and plugged at the main with an approved watertight plug, unless otherwise specified. The plug shall not protrude into the main.



DRAINAGE SPECIFICATIONS

**CITY OF EVANS
PUBLIC WORKS DEPARTMENT
AUGUST 2019**

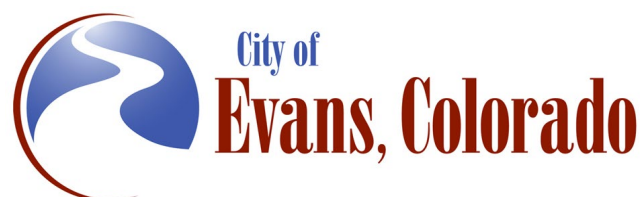


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SECTION 1 STORM DRAINAGE DESIGN AND TECHNICAL CRITERIA**7.01.01 SCOPE**

This chapter sets forth the design and technical criteria and specifications for the analysis and design of drainage systems. All subdivision plats, site improvement plans, planned building groups and other proposed construction submitted to the City for acceptance will be accompanied by a storm drainage analysis, unless waived by the Public Works Director or designee. Appropriate drainage system design must be submitted to and accepted by the Director for each phase of construction. Such analysis and design will conform to the criteria set forth herein. Acceptance of the analysis and design is subject to the following conditions:

- A. Construction of the system must commence within one (1) year of the date of acceptance.
- B. No construction has been completed on any adjacent property that may have affected the drainage pattern within the basin.
- C. If either condition fails, the Public Works Director or designee may require a new submittal.

A large portion of the criteria and design aids included in these Standards and Specifications originated from the Mile High Flood District (formerly UDFCD) Urban Storm Drainage Criteria Manual (USDCM), current volume and the City of Evans' Municipal Separate Storm Sewer System Phase 2 Permit (MS4 Permit). For any information not detailed in these specifications, refer to MHFD USDCM, MS4 Permit, or Evans Drainage Criteria Manual.

7.01.02 GENERAL PROVISIONS**A. General Design Criteria**

Except where specified here, the procedure, criteria, and standards set forth in the latest revision of the USDCM will be instituted for the analysis of any drainage system. Sound knowledge of current engineering practices and drainage methodology, as well as common sense, will be involved with the analysis of any drainage system.

All development must be in conformance with the current Master Drainage Plan. For areas not included in the Master Drainage Plan, onsite historic flood peaks shall be calculated using the present land use of the site. For offsite areas draining onto the site, flood peaks shall be calculated using fully developed land use determined using the land use plan or, if land use is not defined, using historic percent impervious and runoff coefficients.

Conveyance must be provided downstream of the site to the major drainage way with sufficient capacity to pass the 100-year event. Easements for these conveyance systems must be provided and shown on the drainage plan as well as conveyed to the city at time of platting.

All major storm floodplain boundaries will be shown on all preliminary and final drainage plans. All pond facilities will be of the detention type. The Public Works Director or designee will approve methods of detention. Retention facilities shall not be allowed. Infiltration basins that comply with State requirements will be reviewed and approved by the Public Works Director or designee.

Construction that will impair surface or subsurface drainage will not be accepted. The City reserves the right to Issue and enforce more stringent criteria should adverse conditions exist. Designs varying from the criteria will require written approval of the exemption by the Director prior to final acceptance of the plans.

B. Design Principals

Natural topographic features will be the basis of location for easements and future runoff calculations. In developed and undeveloped areas, average land slopes may be utilized in runoff computations. Wherever existing drainage patterns and slopes are defined, these will be used. The drainage facilities so designed must be able to handle the design flows with no erosion damage to the system. Streets will not be used as primary floodways for major storm runoff. The amount of runoff in the streets will not exceed the limits established in these Standards and Specifications.

Any alteration to natural drainage patterns will not be approved unless a thorough investigation and analysis shows no hazard or liability. The Public Works Director or designee will have final authority over any system design. The planning and design of the drainage system will not be such as to simply transfer the problem from one location to another or create a more hazardous condition downstream. Provisions will be made in every subdivision in the form of an easement or right-of-way for the 100-year storm to pass through that subdivision safely.

Enhancement of stormwater runoff quality is required for all developments within the City of Evans using structural or nonstructural Best Management Practices (BMPs). Refer to USDCM Volume 3 for guidance on selection, use and design of BMPs. All drainage improvements will be as natural in appearance as possible to be aesthetically pleasing. Maintenance access will be provided for all drainage and flood control facilities as well as inspection to provide proper function and maintenance. Irrigation ditches will not be used as the outfall of any drainage basin. Expressed written approval must be obtained from the managing organization for irrigation ditches being considered for crossing or easements.

7.01.03 DESIGN METHODS

A. Minor and Major Design Storms

Every urban area has two separate and distinct drainage systems whether or not they are planned for and designed. One is the minor system corresponding to the minor (or ordinary) storm recurring at regular intervals. The other is the major system corresponding to the major (or extraordinary) storm, which has a one (1) percent probability of occurring in any given year. Since the effects and routing of storm waters for the major storm may not be the same as for the minor storm, all storm drainage plans submitted for acceptance will detail two separate systems; one indicating the effects of the minor storm and the other showing the effects of the major storm.

1. *Minor storm provisions:* The objectives of such drainage system planning are to minimize inconvenience, to protect against recurring minor damage, to reduce rising maintenance costs, and to create an orderly drainage system. The minor storm drainage system may include such facilities as curb and gutter, storm sewer, swales, and other open drainage ways and detention facilities.
2. *Major storm provisions:* The major storm will be considered the 100-year storm. The objectives of the major storm planning are to eliminate substantial property damage or loss of life and will be as directed and accepted by the Public Works Director or designee. Major drainage systems may include storm sewers, open drainage ways and detention facilities. The correlation between the minor and major storm system will be analyzed to insure a well-coordinated drainage system.

B. Storm Return Periods

The minor and major storm design return periods are defined in table 7.01-1.

Table 7.01-1
Design Storm Frequencies

Land Use	Minor Storm (yr)	Major Storm (yr)
Residential	5	100
Open Space Parks	5	100
Commercial, Public Buildings, Business, Industrial	10	100
Natural Drainageway	25	100

C. Runoff Computations, Colorado Urban Hydrograph Procedure (CUHP)

The CUHP method is to be used on developments greater than ninety (90) acres. The procedures for the CUHP, as explained in the USDCM, shall be followed in the preparation of drainage reports and storm drainage facility designs in the City. The CUHP program requires the input of a design storm, either as a detailed hctograph or as a one (1) hour rainfall depth. The one (1) hour rainfall depths for the City of Evans are presented in Table 7.01-2.

Table 7.01-2
City of Evans One-Hour Rainfall Depth

Design Storm	Rainfall Depth (in.)
2-Year	1.04
5-Year	1.49
10-Year	1.76
50-Year	2.51
100-Year	2.78

The hydrograph from the CUHP program must be routed through any proposed conveyance facility using UDSWM or a similar method.

D. Runoff Computations, Rational Method

The Rational Method is to be used on developments less than ninety (90) acres. The procedures for the Rational Method, as explained in the USDCM, shall be followed in the preparation of drainage reports in the City.

E. Runoff Coefficients

Rational method runoff coefficients: The runoff coefficient (C) to be used in conjunction with the Rational Method will not be less than those listed in theUDFCD Manual.

F. Rainfall Intensities

The rainfall intensities to be used in the computation of runoff using the Rational Method shall be calculated using the equation RA-3 in the UDFCD Manual.

7.01.04 DETENTION

A. General

On-site detention is required for all new development, expansion, and redevelopment. The required minimum detention volume and maximum release rates at these volumes for the ten (10) year and 100-year storms shall be determined in accordance with the procedure and data set forth in these criteria. For lands where the City has adopted a Master Plan, detention facilities identified in the Master Plan shall be constructed. For lands where there is no Master Plan, on-site detention is required for all development as discussed in this section. For these lands, detention facilities should be designed using hydrograph and routing methods where possible.

In accordance with State of Colorado Water Law/Water Rights, all detention facilities other than micro-pools and/or approved wet-bottom ponds shall be designed to fully drain in no more than seventy-two (72) hours.

Off-site drainage shall be routed around the detention pond or the drainage area should be included in the pond volume and release rates.

More stringent detention volumes and release rates may be required by the Public Works Director or designee to avoid negatively impacting the downstream properties.

Water Quality as called out in the USDCM shall be provided for all new development, expansion, and redevelopment. The water quality capture volume shall be stored and released slowly over time. Water quality may be provided for in the same facility as flood control. When designing such a facility use the Excess Urban Runoff Volume (EURV) Extended Detention Basin method, refer to USDCM for further specifications.

Parking lots that serve as detention storage ponds shall not have a storage depth of more than one (1) foot. Parking lots that serve as detention storage ponds shall include notification signs that the area is a pond during a rainfall event. The signs shall be permanent and high quality, meeting the City's specifications for traffic signs. Approval from the Public Works Director or designee is required for all parking lot detention.

Underground detentions will only be used when no other method is practical. Approval from the Public Works Director or designee is required for underground detention.

B. Grading Requirements

Slopes shall not be steeper than four (horizontal) to one (vertical) (4:1). The geotechnical engineer for the project shall verify slope stability. All earthen slopes shall be covered with topsoil and re-vegetated. For irrigated grassed detention facilities, the minimum bottom slope shall be two (2) percent measured perpendicular to the trickle channel. Wet bottom detention facilities shall be reviewed on a case-by-case basis.

C. Freeboard Requirements

The minimum required freeboard for grassed and parking lot detention facilities is one (1) foot above the computed 100-year water surface.

D. Trickle Flow Control

All detention ponds shall include a trickle channel. Refer to the USDCM for trickle flow control.

E. Outlet Configuration

All detention ponds shall include a micropool, refer to the USDCM for outlet configuration.

F. Inlet Configuration

All detention facilities shall include a forebay, refer to USDCM for inlet configuration.

G. Embankment Protection

Whenever a detention pond uses an embankment to contain water, the embankment shall be protected from catastrophic failure due to overtopping. Overtopping can occur when the pond outlets become obstructed or when a larger than 100-year storm occurs. Failure protection for the embankment may be provided in the form of a buried heavy riprap layer (Type H) on the entire downstream face of the embankment or a separate emergency spillway having a minimum capacity of twice the maximum release rate for the 100-year storm. Structures shall not be permitted in the path of the emergency spillway or overflow. The invert of the emergency spillway shall be set equal to or above the 100-year water surface levels.

H. Release Rates

Refer to the USDCM Volumes 2 and 3 latest versions and UDFCD Technical Memorandum dated 11/26/2015 for water quantity and quality release rates.

I. Minimum Detention Volume

The minimum required detention volumes should be determined using the procedures outlined in USDCM Chapter 12, Volume 2, Section 4, for full Spectrum Detention.

J. Exemptions from On-Site Detention

If one or more of the circumstances as listed below are met, then the site may request an exemption in writing from on-site detention facility requirements from the Public Works Director or designee:

- The site drains to a regional detention and water quality facility that is publicly owned and maintained; or
- The parcel shares a common parcel boundary with a regional outfall channel and the ratio of drainage basin area to site area is 1000:1 or more.

K. Low Impact Development

All new development, redevelopment, or expansions shall incorporate low impact development techniques. All low impact development must be approved by the Public Works Director or designee. See the USDCM for specifications

7.01.05 INFILTRATION BASINS

Infiltration basins shall be reviewed and approved by the City Engineer on a case-by-case basis and must comply with C.R.S. §37-82-602 (8)(b)(I).

7.01.06 DESIGN STANDARDS

A. Open Channels

Except as modified herein, open channels, defined as either natural occurring or manmade, will be designed for the 100-year frequency storm for all tributary areas and will conform to the criteria set forth in the USDCM. However, the channel design will also be analyzed with respect to minor storm runoff and its effect made known. Whenever practical, the channel should have slow flow characteristics, be

wide and shallow, and be natural in its appearance and functioning.

Channels will be designed in such a manner that critical depth and super-critical flows are avoided. Capacities for small channels may be computed from Manning's Formula for uniform flow, except at crossings and transitions where backwater effects will need to be accounted for.

The channel cross section may be almost any type suitable to the location. However, the limitations for design for the major storm and minor storm design flows will include:

1. The channel shall have adequate capacity for the 100-year storm runoff.
2. Side slopes: Side slopes will be as flat as practical. Side slopes of four to one (4:1) will be considered a normal minimum. Under special conditions, slopes of three to one (3:1) may be utilized with written approval of the Public Works Director or designee. However, a slope of no steeper than four to one (4:1) is the practical limit for mowing equipment.
3. Depth: The maximum design depth of flow for the major storm shall be limited to five (5) feet, not including freeboard. Any design variation exceeding the maximum depth of flow must be submitted in writing for approval by the Public Works Director or designee. Critical depths and velocities will be investigated for both the major and minor storm runoffs and these values made available to the Public Works Director or designee.
4. Freeboard: Except where localized overflow in certain areas is desirable for additional ponding benefits or other reasons, the minimum allowable freeboard will be one (1) foot.
5. Bottom width: The bottom width should be designed to satisfy the hydraulic capacity of the cross-section recognizing the limitations on velocity, depth and Froude number.
6. Slope of channel: Grass lined channel slopes are dictated by velocity and Froude number requirements. Where natural topography creates erosive velocities a drop structure will be required.
7. Curvature: The centerline curvature will not have a radius less than twice the design flow top width, but not less than one hundred (100) feet.
8. Trickle channels: Trickle channels to carry low flows will be required for all new channels. The capacity of a trickle channel will be approximately two (2) percent of the major design flow. Where two (2) percent of the major design flow exceeds ninety (90) cfs, a low flow channel will be required. Low flow channels shall be in accordance with the USDCM.
9. Design velocity: The maximum velocity for the major storm design runoff will not exceed seven (7) feet per second for grass lined channels, except in sandy soil where the maximum velocity shall not exceed five (5) feet per second. The maximum Froude number shall not exceed 0.80 for grass lined channels. Reference Table 8-1 of Volume 1 of the USDCM.
10. Erosion: All channels will be designed with the proper and adequate erosion control features.
11. Grass lining: The grass lining for channels shall be in accordance with the USDCM.
12. Water surface profile: A water surface profile for the major storm runoff will be computed for all channels and clearly shown on the final drawings submitted for acceptance. Computations of the water surface profile will utilize standard backwater methods such as HEC-2 taking into consideration all losses due to velocity changes, drops, bridge and culvert openings, and other obstructions. A Drainage Report will be submitted along with the final design plan. The energy gradient line must be shown on the final drawings.

13. Roughness coefficient (n): The value of the roughness coefficient (n) to be used in Manning's Formula will not be less than those listed in Table 7.01-3:

Table 7.01-3
Minimum Values of Manning’s Roughness Coefficient (n)

Type of Channel and Description Closed		Minimum
Concrete Pipe:		
	Culverts with bends, connections & debris	0.013
	Storm sewer	0.013
	Subdrain with open joints	0.016
PVC Pipe		0.011
Concrete Surfaces (bottom & sides):		
	Smooth finish	0.015
	Unfinished	0.017
Concrete Bottom (with sides of):		
	Mortared stone	0.020
	Dry rubble or riprap	0.030
Gravel Bottom (with sides of):		
	Formed concrete	0.020
	Dry rubble or riprap	0.040
Excavated or Dredged Channels and Ditches:		
Earthen, Straight & Uniform, no brush or debris:		
	Grassed, less than 6" high with:	
	Depth of flow < 2.0 feet	0.035
	Depth of flow > 2.0 feet	0.030
	Grassed, approx. 12" high with:	
	Depth of flow < 2.0 feet	0.060
	Depth of flow > 2.0 feet	0.035
	Grassed, approx. 24" high with:	
	Depth of flow < 2.0 feet	0.070
	Depth of flow > 2.0 feet	0.035
	Earth bottom with riprap on sides	0.040
Rock or Shale Cuts:		
	Smooth and uniform	0.035
	Jagged and irregular	0.040
	Curb and Gutter (concrete)	0.016

B. Street Flow Capacities

Except as modified herein, the criteria set forth in the USDCM will be used in analyzing and approving the adequacy of streets as a function of the drainage system. The street classifications for Drainage Purposes are listed in Table 7.01-4.

Table 7.01-4
Street Classification for Drainage Purposes

Street Classification	Function	Speed/Number of Lanes	Intersection Signalization	Street Parking
Local	Provide access to residential and industrial	Low speed with two moving lanes	Stop signs	One or both sides of the street
Collector	Collect and convey traffic between local and arterial	Low to moderate speed with 2 or 4 moving lanes	Stop signs or traffic signals	One or both sides of the street
Arterial	Function as primary through traffic	Moderate to high speeds with 4 to 6 lanes	Traffic signals (controlled access)	Usually prohibited
Freeway	Provide rapid and efficient transport	High speed travel with 4 lanes or more	Cloverleaves, access ramps (limited access)	Always prohibited

Both the minor storm runoff and major storm runoff must be considered, and calculations showing such runoff at critical sections shall be submitted. The following criteria will apply in the determination of allowable street flow capacities:

1. Street, curb/gutter, walks, crosspans and curb cuts shall conform to all applicable Sections of these Standards and Specifications.
2. In relation to street capacity for minor storm, pavement encroachment for the minor design storm will not exceed the limitations set forth in Table 7.01-5.

Table 7.01-5
Allowable Pavement Encroachment and Depth or Flow for Minor Storm Runoff

Street Classification	Maximum Encroachment*
Local	No curb overtopping; flow may spread to crown of street
Collector	No curb overtopping; flow spread much leave the equivalent of one 10-foot driving lane clear of water.
Arterials	No curb overtopping; flow spread much leave the equivalent of two 10-foot driving lanes clear of water—one lane in each direction
Freeways	No encroachment is allowed on any traffic lane.

* Where no curbing exists, encroachment will not extend past property lines.

The storm sewer system will commence at the point where the maximum allowable encroachment occurs.

3. In relation to street capacity for major storm, the allowable depth of flow and inundated area for the major design storm will not exceed the limitations set forth in Table 7.01-6.

Table 7.01-6
Allowable Depth of Flow and Inundated Area for Major Storm Runoff

Street Classification	Minor Storm Flow
Local and Collector	Residential dwellings and public, commercial, and industrial buildings should be no less than 12 inches above the 100-year flood at the ground line or lowest water entry of the building. The depth of water of the gutter flowline will not exceed 18 inches and 12 inches for collector streets.
Arterial and Freeway	Residential dwellings and public, commercial, and industrial buildings should be no less than 12 inches above the 100-year flood at the ground line or lowest water entry of the building. The depth of water should not exceed the street crown to allow operation of emergency vehicles. The depth of water over the gutter flowline should not exceed 12 inches.

Cross street flow: Cross street flow will occur by one of the following methods. One method is runoff which has been flowing in a gutter and then flows across the street to the opposite gutter or inlet. The second case is flow from some external source, such as a drainage way or conduit, which will flow across the crown of the street when the conduit capacity is exceeded. Allowable Cross Street Flow is set forth in Table 7.01-7.

Table 7.01-7
Allowable Cross Street Flow

Street Classification	Minor Storm Flow	Major Storm Flow
Local	6 inches of depth in cross-pan	18 inches of depth above gutter flow line.
Collector	Where cross-pans allowed, depth of flow should not exceed 6 inches	12 inches of depth above gutter flow line.
Arterial/Freeway	None	No crossflow. Maximum depth at upstream gutter on road edge of 12 inches.

C. Storm Sewers and Storm Inlets

Except as subsequently modified, the design of storm sewers and inlets shall conform to the criteria set forth in the USDCM. Storm sewers and inlets will be of sufficient capacity to adequately carry the expected runoff from the minor design storm as listed in Table 7.01-1. The storm sewer system and subsequent storm inlets will commence at all locations where the allowable street capacity is exceeded or wherever ponding of water is likely to occur. Hydraulic analysis must be provided in the Drainage Report showing no significant surcharge condition exists at inlets or manholes. The minimum allowable pipe size to be used in storm sewers and laterals will be as listed in Table 7.01-8.

Table 7.01-8
Minimum Allowable Pipe Size

Type of Conduit	Minimum Inside Pipe Diameter
Main Trunk Sewer	18"
Short Laterals	15"

Arch pipes may be allowed where design conditions dictate, provided that the minimum cross-sectional areas will not be less than those specified above. All storm sewer conduits will be of sufficient structural strength to withstand an H-20 design load.

The maximum allowable distance between manholes or other suitable appurtenances for cleanouts will not exceed those listed in Table 7.01-9.

Table 7.01-9
Maximum Allowable Manhole Spacing

Inside Diameter of Sewer	Maximum Allowable Distance Between Manholes and Cleanouts (ft)
18" - 36"	400
42" - 60"	500
60" and larger	500

The capacities of conduits will be computed using the criteria set forth in the USDCM. Friction, lateral, bend, exit and entrance losses shall be included in the design. The storm sewer design shall include tailwater conditions. The value of the Manning’s roughness coefficient used shall not be less than those specified in Table 7.01-3 above. The average flow velocity for the minor storm conduits will not be less than two (2) feet per second.

Allowable storm inlets will be curb opening inlets, Type "R" or combination curb/grate inlets, Type "13", or as approved by the Public Works Director or designee. Inlets will be utilized at all points where ponding or sump conditions exist. See Standard Details.

The theoretical capacity and spacing of storm inlets will be analyzed using the criteria set forth in the USDCM.

The allowable inlet capacity will be determined using reduction factors. These reduction factors compensate for debris plugging, pavement overlaying, variations in design assumptions or other factors that decrease inlet capacities.

The size of outlet pipes from storm water inlets will be based on the theoretical capacity of the inlet for the major event.

Computations for storm sewer design and storm inlet designs shall be submitted on forms similar to those included in these specifications for acceptance. Adequate details of the proposed storm sewer system, including plan and profile, details of inlets, manholes and other appurtenances will be included in the overall drainage plan submitted for acceptance.

During construction, the storm sewer outlet shall be protected for the major storm. The protection shall be designed as called out in the USDCM.

D. Culverts

Culvert capacities shall be at least equal to the capacities of culverts designed in accordance with the procedures outlined in the USDCM. Culverts may be of any shape and construction required by existing topographic features, provided, however, the size, shape, location, and type of construction of culverts will be subject to acceptance by the Public Works Director or designee. Culverts installed under local and collector streets shall be designed to pass at least the ten (10) year storm. Culverts installed under arterials shall pass at least the 100-year storm.

Culverts under principal arterials shall have sufficient capacity to pass all the runoff from the major storm considering a minimum of twenty (20) percent of the inlet plugged. Higher percentages may be required based on site-specific considerations. In determining the amount of emergency overflow required, capacity credits may be utilized when approved by the Public Works Director or designee.

Culvert installations will be designed with an emergency overflow. An emergency overflow spillway that can pass the 100-year event at a depth less than one foot shall be provided.

The following design criteria will be utilized for all culvert design:

1. The culvert, including inlet and outlet structures, will properly take care of water, bed load and debris at all stages of flow.
2. Inlets: Culvert inlets will be designed to minimize entrance and friction losses. Inlets will be provided with either flared-end sections or head walls with wing walls. Projecting ends are not acceptable. For large structures, provisions will be made to resist possible structural failure due to hydrostatic uplift forces.
3. Outlets: Culvert outlets will be designed to avoid sedimentation, undermining of culvert, or erosion of downstream channels. Outlets will be provided with either flare-end sections or headwalls, with wingwalls and riprap. Projecting outlets will not be acceptable. Outlet protection shall be designed according to the USDCM.
4. Slopes: Culvert slopes will be such that neither silting nor excessive velocities nor scour occur. Generally, the minimum slope of culverts will be limited to one-half percent (0.5%).
5. Excessive ponding above culvert entrances will not be acceptable if such ponding appears likely to cause property or roadway damage, culvert clogging, saturation of fills, detrimental upstream deposits of debris, or inundate existing or future utilities and structures.
6. Tailwater: The height of tailwater at the outlet will be subject to acceptance by the Public Works Director or designee.
7. Hydraulic Design: Culverts will be analyzed to determine whether discharge is controlled by inlet or outlet conditions for both the minor storm discharge and the major storm discharge. The value of the Manning's roughness coefficient used will not be less than those specified in Table 7.01-3 above. Computations for selected culvert sizes will be submitted for approval on forms similar to those included in these specifications.
8. Minimum Allowable Size: The required size of the culvert will be based on adequate hydraulic design analysis. In no case will approval be made for round culverts with less than eighteen (18) inches inside.
9. Multiple Culvert Installations: Where physical conditions dictate, multiple culvert installations will be acceptable, subject to approval by the Public Works Director or designee. Headwalls shall be used with multiple culvert installations. The minimum size of any culvert will not be less than the requirements set forth in Table 7.01-8 above.
10. Structural Design: The structural design of culverts shall conform to those methods and criteria recommended by the manufacturer of a specific type of culvert for the specified embankment conditions.

E. Pet Waste Stations

In order to protect stormwater runoff quality, pet waste stations must be installed at all parks, trails, multi-family, and single family attached developments. The pet waste station must include approved signage, waste basket, and waste bags.

7.01.07 EROSION CONTROL

Erosion and sediment control measures shall be designed in conformance with CDPHE stormwater management plan preparation guidance and USDCM. All land-disturbing activities within the City of Evans shall be in compliance with applicable Colorado Discharge Permit System (CDPS) Storm Water , the City of Evans MS4 Program, and Colorado Air Quality Control Commission regulations.

7.01.08 EROSION AND SEDIMENT CONTROL PLAN

See Chapter 2 of these Standards and Specifications.

7.01.09 EROSION CONTROL STRUCTURES

When applicable, details of erosion control measures should be obtained from the USDCM.



recommendation. Contractor shall test tracer wire before construction acceptance is issued while City utility inspector is present.

Three (3) inch wide, detachable warning tape shall be installed above all pipe, for the purpose of warning of location of buried pipeline. Tape shall include black lettering indicating purpose of buried facility “Caution: Buried _____ Pipeline Buried Below.”

Color of tracer wire insulation and warning tape shall correspond to the type of utility it is warning of in conformance with APWA and Utility Notification Center of Colorado (UNCC) conventions.

Pipe class designation or gauge shall be as shown on the accepted plans or as designated by the Public Works Director or designee for each individual project. Pipe material shall be chosen based on strength and soil conditions.

All pipe shall be inspected by the Public Works Director or designee in order to allow for rejection of pipe that fails to conform to the requirements of these Standards and Specifications. Defects will be marked so as not to disfigure the rejected pipe. Rejected pipe will be removed from the job site within twenty-four (24) hours.

At all locations where corrugated metal pipe is to be installed, a corrosion resistance level test shall be performed and a test report submitted to the Public Works Director or designee for acceptance. The test will classify the soil and water to one of the CR levels shown in Table 7.02-10.

Table 7.02-10
Guidelines for Selection of Corrosion Resistance (CR) Levels

CR Level	Sulfate (SO4) % max.	Chloride (Cl) % max.	pH	Sulfate (SO4) ppm* max.	Chloride (Cl) ppm max.	pH
CR 0**	0.05	0.05	6.0 – 8.5	250	250	6.0 – 8.5
CR 1	0.15	0.15	6.0 – 8.5	250	250	6.0 – 8.5
CR 2	0.05	0.05	6.0 – 8.5	500	500	6.0 – 8.5
CR 3	0.15	0.15	6.0 – 8.5	500	500	6.0 – 8.5
CR 4	0.50	1.00	5.0 – 9.0	1,000	1,000	5.0 – 9.0
CR 5	1.00	1.50	5.0 – 9.0	2,000	2,000	5.0 – 9.0
CR 6	1.00	1.50	5.0 or 9.0	2,000	2,000	5.0 or 9.0
* ppm = parts per million						
**No special corrosion protection recommended when values are within these limits.						

7.02.04 PIPE JOINTS

Pipe joints shall be constructed as designated on the accepted construction plans or as otherwise accepted by the Public Works Director or designee. Rubber gasket joints for concrete pipe will conform to ASTM C-443. Corrugated metal pipe joints will be installed according to pipe manufacturer's recommendations. Cement mortar joints will be constructed with mortar mixture composed of one (1) part Portland cement to three (3) parts sand and sufficient water to produce a workable mix. Mortar that has started to set will be discarded and a new batch prepared.

7.02.05 MANHOLES, INLETS, AND SIDEWALK CHASES

Manholes and inlets may be constructed of cast-in-place or precast concrete. Precast concrete shall comply with ASTM C478 and be constructed using Type II cement. Compressive Strength shall be 4,500 psi at twenty-eight (28) days.

Inlets shall conform to the Standard Details and to applicable Colorado Department of Highways "M" Standards. All lids for inlets shall have the words “No Dumping – Drains to River,” “Storm Sewer,” and an imprinted fish

emblem.

Sidewalk chases may be approved on a case-by-case basis by the Public Works Director or designee. At a minimum, they shall have non-skid surfacing (diamond plate or approved equal), and bolt-down covers for pedestrian safety.

7.02.06 MANHOLE BASE SLABS & BASE BEAMS

Manhole base slabs and base beams may be constructed of cast-in-place or precast concrete. Precast concrete shall comply with ASTM C478 and be constructed using Type II cement. Compressive Strength shall be 4,500 psi at twenty-eight (28) days.

7.02.07 CONCRETE

Concrete shall have compressive strength of 4,500 psi at twenty-eight (28) days for Portland cement concrete work. Type II cement will be used. Concrete encasement of pipe will conform to the details shown on the accepted plans.

7.02.08 RIPRAP AND FILTER CLOTH

Riprap and filter cloth shall be installed at those locations noted on the accepted plans, or in locations designated by the Public Works Director or designee. Riprap and bedding shall meet the standards set forth in the USDCM.

7.02.09 RIPRAP

Rock used for riprap shall be hard, durable, angular in shape, and be free from cracks, overburden, shale and organic matter. Neither breadth nor thickness of single stone shall be less than one-third (1/3) its length and rounded stone will not be accepted. The rock shall sustain abrasion test (Los Angeles machine - ASTM C0535-69) and shall sustain a loss of not more than ten (10) percent after twelve (12) cycles of freezing and thawing (AASHTO test 103 for ledge rock procedure A). The rock shall have a minimum specific gravity of 2.50. Classification and gradation for riprap are shown in Table 7.02-11.

The riprap designation and total thickness of riprap shall be as shown on the accepted plans. The maximum stone size shall not be larger than the thickness of the riprap.

Table 7.02-11
Classification and Gradation of Riprap

Riprap Designation	% Smaller than Given Size by Weight	Intermediate Rock Dimension (Inches)	D (50) * (Inches)
Type VL	70-100	12	
	50-70	9	
	35-50	6	6**
	2-10	2	
Type L	70-100	15	
	50-70	12	
	35-50	9	9**
	2-10	3	
Type M	70-100	21	
	50-70	18	
	35-50	12	12
	2-10	4	
Type H	70-100	30	
	50-70	24	
	35-50	18	18
	2-10	6	
Type VH	70-100	42	
	50-70	33	
	35-50	24	24
	2-10	9	

*d (50) = Mean particle size

** Bury Types VL and L with native topsoil and re-vegetate to protect from vandalism

7.02.10 FILTER CLOTH

Filter cloth shall be manufactured especially for the stability of erosion control construction and made from polyethylene, polypropylene or polyester yarns in accordance with the following:

Table 7.02-12
Filter Cloth Requirements

Property	Minimum Value	Designation
Weight	3.9 oz/yd	ASTM D1910
Thickness	15 mils	ASTM D1777
Grab Strength	130 lbs.	ASTM D1682
Elongation Break	60%	ASTM D1682
Mullen Burst Strength	140 psi	ASTM D3786
Puncture Strength	40 lb.	ASTM D751
Trapezoid Tear Strength	60 lb.	ASTM D751
Equivalent Opening Size	70-100 U.S. Sieve	CW 02215

The filter material that shall be placed on top of the filter cloth (at specified thickness) prior to placement of the riprap shall meet the requirements of “Stabilization Material,” which is crusher run rock conforming to ASTM D448 size #357.

Table 7.02-13
Filter Cloth Bedding Material Gradation

Sieve Size	Percent Passing
2½"	100
2"	95-100
1"	35-70
½"	10-30
#4	0-5

When requested by the Public Works Director or designee, the contractor shall furnish copies of tests from a certified and acceptable testing laboratory for the following:

- Gradation and soundness of riprap
- Gradation of filter material
- Strength and characteristic tests for filter cloth

7.02.11 CONSTRUCTION OF MANHOLES, INLETS AND SIDEWALK CHASES

Manholes and inlets shall be constructed in accordance with these Standards and Specifications. See Standard Details for manhole details, inlet details, and for sidewalk chase details. Inlets shall be per CDOT Construction Details or accepted by the City of Evans.

The City shall neither install nor maintain concrete collars around manhole covers outside of public rights-of-way.

7.02.12 CONSTRUCTION OF OPEN CHANNELS AND SPECIAL STRUCTURES

All work will conform to details shown on the accepted plans and whatever additional specifications are required. Construction will be accurately done to line and grade according to construction stakes. When required, sidewalk chases will be constructed as detailed on the Standard Details.

7.02.13 RIPRAP AND FILTER CLOTH

The developer/contractor shall complete the excavation in accordance with the accepted plans or as directed by the Director, then he shall place the filter cloth over the graded areas loosely enough so that any protrusions from underneath or applied bands to the cloth will not cause stretching of the cloth beyond elastic limits.

The outer edge of the filter cloth shall be folded vertically upward at the trench. All overlapping joints shall be a minimum of two (2) feet wide, with the upstream section overlapping the downstream portion. The overlapping joints shall be secured with staples at each edge of the adjoining sections of cloth and spaced at two (2) foot intervals. The contractor, at his expense, in accordance with the manufacturer’s recommendations, shall repair any holes, rips or other damage to the filter cloth.

Stabilization material shall be placed on top of the filter cloth (where filter cloth is used) to a thickness of six (6) inches. The material shall be placed using equipment, which will not rip, tear or otherwise damage the filter cloth. Any damaged areas shall be promptly repaired at the contractor's expense. The material shall be screeded to give a finished surface, which is within one (1) inch of the specified thickness.

Riprap shall be placed to conform to the details shown on the accepted plans. The larger size stones shall be placed first and roughly arranged in close contact. The toe trench and foundation course shall be closed first. The spaces between the larger stones shall then be filled with smaller stone of suitable size, so placed as to leave the surface evenly stepped, conforming to the contour required. The finished surface shall be even and tight and shall not vary from the planned surface by more than one-quarter (¼) foot per foot of depth. The material may be machine placed with sufficient handwork to accomplish the requirements noted herein.

Where riprap is to be grouted, the stones shall be laid with care to prevent earth and sand from filling the joints. Grout and concrete must be removed from exposed rock for aesthetic purposes. Joints shall be filled with grout and the surfaces swept with a stiff broom. The work shall be protected and kept moist during hot weather for at least three (3) days after grouting or coated with a clear membrane-curing compound. Grout shall consist of one (1) part cement and three (3) parts aggregate, by volume. The Portland cement shall be Type II and aggregate shall be two (2) parts sand and one (1) part gravel passing a three-eighths (3/8) inch square mesh screen. The amount of water in the mix shall be such as to permit gravity flow into the interstices with limited spading and brooming.

Except when approved in writing by the Public Works Director or designee, the developer/contractor shall cease all grouting or placement of concrete into which riprap is to be placed when the descending air temperature in the shade and away from artificial heat falls below thirty-five degrees Fahrenheit (35°F), and there is frost in the subgrade. When concreting is permitted during cold weather, the temperature of the mix shall not be less than sixty degrees Fahrenheit (60°F) at the time of placing. The contractor shall not place filter cloth, stabilization material, or riprap on frozen ground.

7.02.14 INSPECTIONS

All public improvements shall be inspected by the City of Evans inspector.

7.02.15 TESTING

All storm drain pipe and appurtenances shall be cleaned and TV video tested. TV video test results shall be submitted to the City of Evans Engineering Division within ten (10) working days after completion of testing.

Should the City find that the completed testing fails, the City may halt construction until the storm line is repaired and meets current Standards and Specifications.

All smooth wall interior corrugated exterior HDPE storm drain piping shall be fully (100%) tested with a ninety-five (95) percent of inside (base) diameter of pipe size mandrel per AASHTO M252 (4" to 10" diameter) and AASHTO M294 (12" to 60" diameter). Whereas HDPE pipe achieves strength from appropriate bedding, mandrel testing shall be performed after trench backfill and prior to any paving.

Chapter 3: Streets – Details

Detail No.	Detail Title
S-1	BIKE PATH
S-2	BUS STOP
S-3	CONCRETE REPAIR
S-4	CONCRETE TRANSVERSE JOINT
S-5	CROSS-PAN
S-6	CUL-DE-SAC
S-7	CURB & GUTTER – TYPE 2 II-B
S-8	CURB & GUTTER – TYPE 2 B & IB
S-9	CURB & GUTTER – TYPE 2 MS MODIFIED
S-10	CURB & GUTTER – D – 1A
S-11	CURB RAMP – AT T INTERSECTION
S-12	CURB RAMP – DETACHED ADJOINING ATTACHED SIDEWALK
S-13	CURB RAMP – ATTACHED SIDEWALK
S-14	CURB RAMP – DETACHED SIDEWALK – STREET CORNER
S-15	CURB RAMP – DETACHED SIDEWALK
S-16	DETACHED SIDEWALK
S-17	DRIVEWAY APPROACH – ATTACHED SIDEWALK
S-18	DRIVEWAY APPROACH – DETACHED SIDEWALK
S-19	EMERGENCY STORM WATER OVERFLOW STRUCTURE
S-20	MANHOLE RAISING
S-21	ROADWAY SECTION – GATEWAY ARTERIAL
S-22	ROADWAY SECTION – ARTERIAL
S-23	ROADWAY SECTION – MAJOR COLLECTOR
S-24	ROADWAY SECTION – COMMERCIAL COLLECTOR
S-25	ROADWAY SECTION – MINOR COLLECTOR
S-26	ROADWAY SECTION – LOCAL
S-27	ROADWAY SECTION – RURAL LOCAL
S-28	ROADWAY SECTION – ALLEY
S-29	SIDEWALK CHASE
S-30	STREET INTERSECTION APPROACH – COLLECTOR & ARTERIAL
S-31	STREET INTERSECTION APPROACH – LOCAL & COLLECTOR
S-32	TRENCH EXCAVATION & BACKFILL
S-33	WATER VALVE RAISING – POTABLE WATER
S-34	WATER VALVE RAISING – NONPOTABLE WATER
S-35	TYPICAL UTILITY LOCATION CROSS SECTION
S-36	SIGHT DISTANCE TRIANGLE SETBACKS

Chapter 4: Water – Details

Detail No.	Detail Title
WA-1	AIR & VACUUM RELIEF VALVE
WA-2	BLOWOFF ASSEMBLY INSTALLATION
WA-3	CONCRETE ENCASEMENT
WA-4	CONDUIT & STORM SEWER CROSSING
WA-5	COPPER TRACER WIRE ON PVC PIPE
WA-6	FIRE HYDRANT
WA-7	METER SETTING FOR ¾” AND 1” METER
WA-8	METER SETTING FOR 1½” AND 2” METER
WA-9A-D	METER SETTING FOR 3” AND LARGER
WA-10	METER SETTING FOR NON-POTABLE IRRIGATION
WA-11	PIPE INTERSECTIONS AND DEAD-ENDS
WA-12A	PRESSURE RELIEF VALVE – PLAN VIEW
WA-12B	PRESSURE RELIEF VALVE – SECTION VIEW
WA-13	STREAM OR DRAINAGEWAY CROSSING
WA-14A-C	THRUST BLOCKS
WA-15	UTILITY CROSSING
WA-16	WATER LINE BEDDING
WA-17	WATER LINE TRENCH CROSS SECTION
WA-18	WATER SERVICE CONNECTION
WA-19	WATER VALVE BOX – POTABLE WATER
WA-20	WATER VALVE BOX – NONPOTABLE WATER

Chapter 5: Non-Potable Water – Details

Detail No.	Detail Title
NP-1	AIR & VACUUM RELIEF VALVE
NP-2	BLOWOFF ASSEMBLY INSTALLATION
NP-3	CONCRETE ENCASEMENT
NP-4	CONDUIT OR STORM SEWER CROSSING
NP-5	COPPER TRACER WIRE ON PVC PIPE
NP-6A-B	CROSS-CONNECTION
NP-7	METER SETTING FOR NON-POTABLE IRRIGATION
NP-8	METER SETTING FOR 1½” AND 2” METER
NP-9A-D	METER SETTING FOR 3” AND LARGER
NP-10	NONPOTABLE IRRIGATION LINE BEDDING
NP-11	NONPOTABLE IRRIGATION SERVICE CONNECTION
NP-12	NONPOTABLE IRRIGATION VALVE BOX
NP-13	PIPE INTERSECTIONS AND DEAD-ENDS
NP-14	STREAM OR DRAINAGEWAY CROSSING
NP-15A-3	THRUST BLOCKS
NP-16	TRENCH CROSS SECTION
NP-17	UTILITY CROSSING

Chapter 6: Sewer – Details

Detail No.	Detail Title
WW-1	DROP MANHOLE – INSIDE DROP
WW-2	DROP MANHOLE – OUTSIDE DROP
WW-3	GREASE AND SAND INTERCEPTOR
WW-4	MANHOLE RING AND COVER
WW-5	MANHOLE
WW-6	SANITARY SEWER BEDDING
WW-7	SANITARY SEWER CONNECTION
WW-8	SANITARY SEWER LINE & UNDERDRAIN TRENCH CROSS-SECTION
WW-9	SANITARY SEWER FLOW LINE CHANNELS
WW-10	SERVICE WYE
WW-11	UNDERDRAIN CLEANOUT



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CONSTRUCTION PLANS CHECKLIST

1. GENERAL DRAFTING STANDARDS

- Maximum sheet size shall be 22 inches x 34 inches for construction plans.
- Maximum sheet size shall be 24 inches x 36 inches for plats and annexation maps
- All text shall be legible. No text shall be printed over other text.
- Text should be relocated from areas with congestion or numerous line types.
- No text shall be less than 0.10 in height.
- All existing improvements, including lot lines, ROW lines, etc., shall be dashed or grey.
- Any existing improvements, contours, lot lines, ROW lines, etc. shall continue past the boundary lines at least 50 feet.
- Each sheet shall have a title block with the name of the subdivision, sheet purpose, and sheet number.
- Original and revision dates on all sheets. Sheets containing plan views shall contain a north arrow, bar scale and written scales for horizontal and vertical if appropriate.
- The boundary should always be in a heavy line type.
- Acceptance signature blocks shall be included only on the cover sheet.
- Plans shall be checked, sealed, signed, and dated by a PE.
- Include UNCC “Call before you dig” graphic and phone number on each page of the plans.

2. COVER SHEET

- Project Name
- All general notes for entire project.
- Vicinity or location map with site denoted and streets, parks schools, etc. labeled.
- Legend
- Benchmark description including reference to datum (NAVD88). Descriptions shall be sufficient to provide for locating monuments. All plans shall use the City of Evans Coordinate system
- Basis of bearings, section, or control line information including all aliquot corners.
- Sheet Index.
- List of Contacts.
- Engineer’s signature block.
- Owner, engineer, and developer’s name, address, and telephone numbers.
- City acceptance signature block.

3. BASE DRAWING, GENERAL CONTENTS FOR ALL PLAN, AND PLAN AND PROFILE SHEETS

- Horizontal Scale: 1 inch = 50 feet or larger. Vertical Scale: 1 inch = 5 feet or larger.
- Match lines labeled with corresponding sheet number.
- Existing and proposed ROW, easements, and property lines, on and adjacent to the site.
- Label street names. Denote all lot numbers and blocks.
- Curb and gutter, sidewalk, and alleys.
- Beginning station tied and referenced to section line or control line.
- Index map depicting sheet location within overall site.

4. PHASING PLAN - IF APPLICABLE

- Denote the phases in heavy lines and large lettering.
- Draw and label any temporary traffic signage required for proposed phasing.

5. GRADING PLAN

- Existing site topography extending a minimum 50 feet past property limits.
- Existing and proposed curb and gutter, sidewalk, bike paths, alleys, and other improvements including irrigation ditches, drainage swales, and structures.
- Location of fixed objects and physical features (wetlands, trees, poles, fences, buildings, retaining walls, etc.).
- Label all improvements such as structures. Cross-sections and details may be necessary to adequately describe improvements.
- Show and label driveway grades and dimensions.
- 100-year floodplain and floodway lines and flood elevations if applicable.
- Label all proposed and existing top of foundation elevations on and adjacent to the site.
- Existing contours (2.0-foot maximum interval).
- Proposed contours (2.0-foot maximum interval). Line types should be heavier than the existing and labels should be different from existing. Index contours should be heavier than others. Show match with existing contours.
- Label street slopes, grade breaks, and approximate high and low point locations.
- Spot elevations at all property corners.
- Survey control points with elevations and coordinates.
- Drainage designation for each lot. Show drainage flow arrows and include FHA drainage designation (“A”, “B”, or “G”) for each lot.
- Where parking lots, special entrances, trash enclosures, special structures, etc., are to be constructed, spot elevations should be added at all points where curb or concrete directions change.
- Do not include existing or proposed utilities.

6. EROSION CONTROL PLAN

- Proposed silt fence and other erosion control devices.
- Detail measures to be taken to limit both wind- and water-borne erosion
- Proposed temporary and permanent BMPs

7. OVERALL OR MASTER UTILITY PLAN

- Existing utilities both on and adjacent to site.
- Proposed utilities (including irrigation systems) on and adjacent to the site. Draw proposed utilities in a heavier weight than the existing. Include all manholes, fire hydrants, valves, inlets, irrigation structures, etc.
- Proposed points of connection for water and sewer.
- Proposed abandonment of any existing lines.
- Draw at an appropriate scale so utilities are distinct and drawing is not cluttered.

8. SIGNAGE, STRIPING AND LIGHTING PLAN

- The signage, striping, and lighting items set forth on this sheet shall be set in a heavier line weight and shall be appropriately labeled.
- Pavement markings shall include lane lines, cross walks and stop bars, lettering, and symbols. Dimension lane widths.
- A sign table shall be included listing all signs, their MUTCD designation, and number required.

9. STREET PLAN AND PROFILE PLAN

- Existing street improvements for full width of street plus 50' beyond construction limits.
- Proposed street improvements, curb and gutter, sidewalk, bike paths, and alleys. Curb types, pan widths, etc., should be denoted on the plan.
- Limits of construction noted.
- Curve layout information including radius, length of curve, central or deflection angle, stationing of point of curvature (PC) and point of tangent (PT).
- Plan view shall denote ROW widths, flow line to flow line widths, flow line spot elevations at intersections, cul-de-sacs, eyebrows, and the beginning and ending of horizontal curves along with stationing at any alignment changes. If plan is too cluttered with spot elevations, intersection details shall be provided.
- Proposed storm sewer inlets shall be denoted in the plan view.
- Profile view shall contain a minimum of one profile, that being the centerline. Whenever the street cross section varies from the standard section, other profiles or cross-sections should be added to clarify, including flow line profiles for curb returns and cul-de-sacs. Cross-sections shall be provided for arterial and major collector streets, as well as for widening of existing streets.
- Profiles shall extend a minimum 100 feet beyond limits of construction. Cross-sections shall extend a minimum 25 feet beyond construction limits. Profiles for arterial streets shall extend to the nearest major intersection
- If centerline profile is used, a distance and slope should be denoted on the profile view for all horizontal curves at flow lines.
- Existing and proposed profiles should be shown and labeled. Existing profiles shall be in a dashed line type. Vertical curve data shall include beginning and ending grades, length of curve, stationing for point of vertical curvature (PVC), point of vertical inflection (PVI) and point of vertical tangent (PVT).
- Do not include existing or proposed contours or utilities in plan view.

10. UTILITY PLAN AND PROFILE

- Separate plan and profile sheets shall be provided for all (public and private) water, sanitary sewers, storm sewers, stormwater channels, non-potable water, and irrigation pipelines and ditches.
- Show all existing and proposed utilities including valves, fire hydrants, manholes, inlets, and appurtenances in the plan view.
- Draw proposed subject utility with a heavy line weight.
- Draw and label any proposed connections to the existing systems.
- Draw and label any proposed and existing service connections, by station, in the plan view.
- Include any benchmarks and horizontal control points.
- Label and draw the pipe alignment with stationing, pipe size, and type of material, pipe class and length between fittings or manholes on the plan and profile views.
- Profiles should accurately depict the existing and proposed grades above pipes.
- The profiles should depict all proposed crossings with other existing or proposed utilities. Label all crossings with the type of utility and size and elevation if known.
- The profiles for the water lines shall denote the top of pipe elevations for all fittings.
- The profiles for sewer lines shall denote manhole rim elevations along with the various invert elevations.
- Show and label stations that correspond to any pipe appurtenances including air relief valves, pressure reducing valves, blow-offs, lift stations, and clean-outs.
- Show any special thrust restraint.

11. DETAIL SHEETS

- Typical sections shall be provided for all streets showing all improvements and dimensions. This shall include the pavement design.
- Include special details for any item not clearly described or labeled in the Construction Plans or Design Criteria manuals. This is particularly true for drainage channels, rip-rap areas, irrigation structures, retaining walls, and all other non-standard structures, etc.
- Include all appropriate City of Evans Details.

12. GENERAL NOTES

The following general notes shall be included on construction plans as applicable:

- All work within the public ROW or easement shall conform to the City of Evans Construction and Design Specifications.
- The Contractor is responsible for obtaining all required permits prior to commencement of any work on the project. A permit from Public Works is required for all construction in public ROW or easements. A preconstruction conference shall be held with City representatives before a permit will be issued.
- The Contractor shall notify the City Project Representative at least 24 hours prior to desired inspection.
- It is the contractor's responsibility to notify the owner/developer, and the City, of any problems in conforming to the accepted plans for any element of the proposed improvements, prior to its construction.
- It is the responsibility of the Developer during construction activities to resolve construction problems due to changed conditions, or design errors encountered by the Contractor during the progress of any portion of the project. If, in the opinion of the City, the modifications proposed by the Developer, to the accepted plans, involve significant changes to the character of the work, or to the future contiguous public or private improvements, the Developer shall be responsible for resubmitting the revised plans to the City of Evans for acceptance prior to any further construction related to that portion of the project. Any improvements not constructed in accordance with the accepted plans, or the accepted revised plans, shall be removed and reconstructed according to the approved plan.
- The Contractor shall be solely and completely responsible for the conditions at and adjacent to the job site, including safety of all persons and property, during the performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours. The duty of the City to conduct construction review of the Contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures in, on, or near the construction site
- The Contractor shall provide all lights, signs, barricades, flag persons, or other devices necessary to provide for public safety in accordance with the current Manual on Uniform Traffic Control Devices.
- The Contractor is responsible for the protection of all survey monuments. Any monument that must be destroyed for construction shall be replaced by a registered land surveyor. The Contractor shall engage the services of a licensed Surveyor prior to disturbing any monuments.
- Prior to final placement of surface pavement, all underground utility mains shall be installed, tested and accepted, and service connections stubbed out beyond the property line, when allowed by the utility. Service from public utilities and from sanitary sewers shall be made available for each lot in such a manner that will not be necessary to disturb the street pavement, curb, gutter, and sidewalk when connections are made.
- Copies of record drawing plans shall be submitted to the City of Evans prior to initial acceptance of the public improvements.

SCHEDULE FOR QUALITY CONTROL SAMPLING AND TESTING

IDENTIFICATION	TYPE OF TEST REQUIRED	MINIMUM SAMPLING/TESTING FREQUENCY
Sewer/Water Line Compaction	Moisture/Density Curve	One per soils type
	% Compaction % Moisture	Mainline: One test every 200 l.f. every 2-ft lift Water Service: One test per service. Sewer Service: Minimum of two tests per service or at inspectors' discretion. Water Valve/Manhole: Two tests each lift. Test opposite sides.
Storm Sewer Compaction	Moisture/Density Curve	One per soils type
	% Compaction % Moisture	Mainline: One test every 200 l.f. every 2-ft lift Service: One test per service. Every other lift
Structural Backfill	Moisture/Density Curve	One per soils type
	% Compaction % Moisture	1 per 100 yd ³ or fraction there of. Minimum 1 per structure.
	Gradation	1 per 200 yd ³ or fraction there of.
Embankment Compaction	Moisture/Density Curve Gradation	One per soils type
	% Compaction % Moisture	One test per 450 yd ³ or fraction there of, and/or each lift placed shall be tested.
Filter Material/Bed Course Material	Gradation	One per type
Aggregate Base Course	Moisture/Density Curve Gradation	One per class
	% Compaction % Moisture	One test every 250 l.f. staggered and on center line.
Hot Bituminous Pavement	Design Check	One per project
	Extraction/Gradation	One sample each day. Depending on project size.
	Marshall/Rice	At least one sample per project
	Density	One core per 500 l.f.
Conc. Sampling & Testing for Structure Concrete	Slump Air Content Temperature Compressive Strength	One slump, air content, temp. & 5 cylinders for each 100 yd ³ or fraction there of or at the inspector's discretion (2 @ 7 Days. 2 @ 28 Days)
	Gradation	One per source
Concrete Sampling & Testing for Sidewalks, Bike paths	Slump Air Content Temperature Compressive Strength	One slump; air content, temp. and 5 cylinders for each 1000 yd ² Placed or fraction there of or at inspector's discretion (1 @ 7 Days. 2 @ 28 Days)
	Gradation	One per source
Conc. Sampling & Testing for Curb & Gutter	Slump Air Content Temperature Compressive Strength	One slump, air content, temp. & 5 cylinders for each 1500 l.f. or fraction there of or at the inspector's discretion (2 @ 7 Days. 2 @ 28 Days)
	Gradation	One per source

CITY OF EVANS TRAFFIC IMPACT STUDY POLICY

Introduction

A Traffic Impact Study (TIS) is required for any new development or redevelopment in the City of Evans. The City, at its own discretion, may waive this requirement or request simple trip generation information, rather than a complete TIS, if the development is expected to generate less than 200 vehicles per day or 20 vehicles per hour during a peak hour. A trip generation analysis shall be prepared using the Institute of Transportation Engineers *Trip Generation Manual* to determine the number of trips that a development will generate.

If the land use is not listed in the *Trip Generation Manual*, an alternate method approved by the City will be acceptable. This trip generation analysis shall be prepared for all developments and will be used to document the number of trips if less than 200 per day or 20 per hour and submitted to the City. If the number of trips is greater than 200 vehicles per day or 20 vehicles in the peak hour, the trip generation analysis will be included in the TIS. The City reserves the right to require TIS to address specific areas even if the number of trips is less than 200 per day or 20 per peak hour.

The TIS will address the additional traffic that will be generated by the development and its impact upon the City's roadway system. A Colorado Licensed Professional Engineer with Traffic Engineering expertise shall prepare or supervise and certify the preparation and quality of the TIS. Final Reports must be stamped by a Colorado Licensed Professional Engineer with Traffic Engineering expertise.

Scoping Meeting

Before a TIS is prepared, a scoping meeting shall be held with the City Staff. This meeting can be done via phone call unless the City decides that the details of the proposed development need to be discussed in a meeting. The scoping meeting will be used to discuss the proposed development and any phasing of the development that may be involved.

At this meeting, the area to be studied by the TIS will be determined and study intersections identified.

Items to be addressed by TIS

1. Existing Conditions

The number of lanes shall be identified on existing roadways being studied. The roadway classification shall be identified (from the Transportation Master Plan or State Highway Access Code) and the posted speed limit on the roadways shall be noted. Existing daily volumes on adjacent roadways shall be shown. AM and PM turning movement volumes shall be shown at study intersections.

A Level of Service (LOS) analysis shall be conducted at the study intersections to document existing LOS. The LOS shall be identified for all directions and 95% queue lengths noted.

2. Short-term Background Condition

In order to determine future conditions, a growth rate for the existing traffic must be identified. This growth rate can come from City Traffic counts, CDOT projections or consultant knowledge. The growth rate needs to be approved by the City.

Short-term is defined as the time the development reaches full build out. This is normally 2 years, but it can be much longer for phased developments.

To estimate the short-term background condition, existing traffic volumes are increased using 2 years of the growth factor, or longer for phased developments. The short-term background condition indicates the condition of the studied intersections at the time the development is fully built out, without the development traffic.

A Level of Service (LOS) analysis shall be conducted at the study intersections to document the short-term background LOS at the intersections. The LOS shall be identified for all directions and 95% queue lengths noted.

3. Long-term Background Condition

The long-term condition represents the background condition in 20 years. The existing traffic volumes are increased by the 20-year growth factor to represent traffic in 20 years, without the development traffic.

A Level of Service (LOS) analysis shall be conducted at the study intersections to document the long-term background LOS at the intersections. The LOS shall be identified for all directions and 95% queue lengths noted.

4. Trip Generation and Distribution

The daily and peak hour trips generated by the development should be estimated using the Institute of Transportation Engineers *Trip Generation Manual*. If the land use is not listed in the manual, the trips should be estimated based upon the usage of the development.

Any trip reductions due to internal trips or pass-by traffic must be approved by the City.

The peak hour trips are then distributed to the roadways based upon a distribution analysis. The distribution assumptions should be described in the TIS.

For significant land development projects, the TIS should address traffic circulation within the development. This part of the TIS shall address whether on-site vehicular circulation is safe and effective.

5. Short-term Total Traffic

The short-term total traffic is the short-term background traffic plus the development traffic. This represents the traffic that will be at the studied intersections when the development has been built out.

A Level of Service (LOS) analysis shall be conducted at the study intersections to document the short-term total traffic LOS. The LOS shall be identified for all directions and 95% queue lengths noted.

6. Long-term Total Traffic

The long-term total traffic is the long-term background traffic plus the development traffic. This represents the traffic that will be at the studied intersections in 20 years when the development has been built out.

Appendix B



A Level of Service (LOS) analysis shall be conducted at the study intersections to document the long-term total traffic LOS. The LOS shall be identified for all directions and 95% queue lengths noted.

Conclusions and Recommendations

The TIS should identify any traffic impacts that the proposed development may cause. These impacts could be an increase in LOS caused by the development, or the need for an auxiliary lane.

The Adequate Public Facilities regulation (Chapter 18.07.050) defines the general LOS requirements that a development must meet. The TIS should address this LOS requirement.

The TIS should also recommend measures to mitigate the impacts identified by the development. The improvements should be identified and the timing of the improvements in relationship to the development construction should be stated. If a phased development is being studied, the improvements necessary for each phase should be listed.



STANDARD UTILITY EASEMENT FORM – PERMANENT/TEMPORARY CONSTRUCTION EASEMENT

CITY OF EVANS

PERMANENT UTILITY EASEMENT AND TEMPORARY CONSTRUCTION EASEMENT AGREEMENT

THIS AGREEMENT is made and entered into this ____ day of _____, 20____, by and between _____ ("Grantor")

whose legal address is _____ and the City of Evans, Colorado ("City"), whose legal address is 1100 37th Street; Evans, Colorado 80620.

I. CONVEYANCES OF REAL PROPERTY

For and in consideration of the sum of **Ten Dollars** and other good and valuable consideration, the receipt and adequacy of which is hereby acknowledged, Grantor, subject to the Terms and Conditions set forth below, hereby grants and conveys to the City, its successors and assigns, the following real property interests:

A. Permanent Utility Easement.

1. A Permanent Easement and right-of-way to install, operate, maintain, repair, reconstruct, replace, inspect and remove, at any time and from time to time utilities including, but not limited to, **a storm sewer line**, including all underground and surface appurtenances thereto and to improve and maintain a suitable slope or grade, together with a right-of-way or access on along, and in all of the hereinafter described easement across those certain lands which are situated in the County of Weld; State of Colorado, being more fully described on **Exhibit A** and depicted on **Exhibit B**, attached hereto and by this reference made a part hereof ("the Permanent Easement"). The Grantor further grants to the City:
2. The right of ingress and egress from said Permanent Easement over and across adjacent lands of the Grantor by means of roads and lanes thereon: provided, that if any portion of said lands is or shall be subdivided and dedicated roads or highways on such portion shall extend to said easements, said right of ingress and egress on said portion shall be confined to such dedicated roads and highways, or other comparable access;
3. The right from time to time to enlarge, improve, reconstruct; relocate and replace any improvements, slopes, and grades, or structures constructed hereunder with any other number or type of utility facilities, slopes and grades, or other structures either in the original, location or at any alternate location within said Permanent Easement.

THIS IS A TEMPLATE ONLY – NOT TO BE USED AS WRITTEN. MODIFY AS NEEDED AND AGREED TO BY ALL INTERESTED PARTIES FOR THE SPECIFIC NEEDS OF THE EASEMENT BEING TRANSFERRED AND DEDICATED.

4. The right to use gates and all fences which now cross or may hereafter cross said Permanent Easement.
5. The right to mark the location of said easements by suitable markers set in the ground; provided that permanent markers shall be placed in locations which will not interfere with any reasonable use Grantor may make of said Permanent Easement.
6. The right to cut and clear trees, brush, debris and other obstructions on the easements that might interfere with the construction, operation and maintenance of the City's facilities on and in the easements.
7. The right to assign the easements at will of the City of other governmental entities without the consent of the Grantor.

B. Temporary Construction Easement

1. Term and Rental. A Temporary Construction Easement as described in **Exhibit C** and depicted on **Exhibit D**, incorporated herein by this reference (the "Temporary Construction Easement"). The Temporary Construction Easement shall be for a term of six (6) consecutive months and shall begin five (5) days after the City gives written notice to the Grantor that the Temporary Construction Easement is needed for construction. The Grantor also grants to the City, the option to extend the Temporary Construction Easement for a period not to exceed one (1) year after the initial six-month term. As a condition of the granting of this temporary easement, the City agrees to restore said lands within said temporary easement, including landscaping, fences, or other improvements to a level comparable with the original condition.
2. Scope. The Temporary Construction Easement may be used to reconstruct or relocate existing private improvements, to remove improvements acquired by the City, to reshape or regrade adjacent ground surfaces, and for other uses incidental to the construction of public improvements within the permanent easements and fee parcels owned or possessed by the City.

II. TERMS AND CONDITIONS

Grantor and City agree that the Easements granted to the City above are made and shall remain subject to the following Terms and Conditions for so long as such interests may exist:

A. Improvements Within Easements

1. Grantor shall not construct or place any structure of building fence, street, light, power pole, yard light, mail box or sign, temporary or permanent, or shrub, tree woody plant or nursery stock of any kind on any part of the Permanent Easement, or on the Temporary, Construction Easement during its term if the same in any way impairs the City's right to access, without the City's express written approval.

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2. Any structure or building fence, street light, power pole, yard light, mail box or sign, temporary or permanent, or shrub, tree, woody plant or nursery stock of any kind situated on any of the Easements without City approval shall be removed by the Grantor or Grantor's successors upon written demand by the City or may be removed by the City without liability for damages arising therefrom.
3. Grantor shall not impound water or other substances on or abate the property nor store or dispose of any dangerous, toxic or hazardous substance on or under the property.

B. Subjacent and Lateral Support: Earth Cover

Grantor shall take no action which would impair or in any way modify the earth cover over, or the lateral, or subjacent support for the aforementioned improvements and appurtenances within the Permanent Easement without obtaining the specific written permission of the City.

C. Rights Reserved by Grantor: Exclusivity of Permanent Easement

1. Subject to paragraphs II.A and II.B. above, Grantor hereby retains the right to undisturbed use and occupancy of so much of the property that has been made subject to the Permanent and Temporary Construction Easements, insofar as such use and occupancy is consistent with and does not impair any rights granted to the City respecting the use of said Easements; provided, however, the City's right to use and occupy the sub-surface of the property subject to the Permanent Easement is hereby declared and agreed to be exclusive and Grantor shall not grant a right to or otherwise permit anyone to place any facilities of whatsoever nature below the surface of the Permanent Easement without express written approval of the City.

D. Title Verification by City: Grantor's Warranty

1. Grantor warrants that Grantor has full right and lawful authority to convey the real property interests contained in the Permanent and Temporary Easement granted above, and promises and agrees to indemnify and defend the City in the exercise of any rights granted to City under this Agreement against any defect in Grantor's title to the property involved or Grantor's right to make any of the grants herein contained.

E. Agreements Binding: Run with Grantor's Property

1. Each and every one of the benefits and burdens of this Agreement shall inure to and be binding upon the respective legal representatives, heirs, executors, administrators, successors and assigns of the parties hereto.
2. The Easements herein granted touch and concern the real property of the Grantor and shall be deemed covenants running with said property.

F. Restoration

THIS IS A TEMPLATE ONLY – NOT TO BE USED AS WRITTEN. MODIFY AS NEEDED AND AGREED TO BY ALL INTERESTED PARTIES FOR THE SPECIFIC NEEDS OF THE EASEMENT BEING TRANSFERRED AND DEDICATED.



STANDARD UTILITY EASEMENT FORM – PERMANENT ONLY

CITY OF EVANS

PERMANENT UTILITY EASEMENT

THIS AGREEMENT is made and entered into this ____ day of _____, 20 __, by and between _____ ("Grantor")

whose legal address is _____ and the City of Evans, Colorado ("City"), whose legal address is 1100 37th Street; Evans, Colorado 80620.

I. CONVEYANCES OF REAL PROPERTY

For and in consideration of the sum of **Ten Dollars** and other good and valuable consideration, the receipt and adequacy of which is hereby acknowledged, Grantor, subject to the Terms and Conditions set forth below, hereby grants and conveys to the City, its successors and assigns, the following real property interests:

A. Permanent **Utility** Easement.

1. A Permanent Easement and right-of-way to install, operate, maintain, repair, reconstruct, replace, inspect and remove, at any time and from time to time utilities including, but not limited to, **a storm sewer line**, including all underground and surface appurtenances thereto and to improve and maintain a suitable slope or grade, together with a right-of-way or access on along, and in all of the hereinafter described easement across those certain lands which are situated in the County of Weld; State of Colorado, being more fully described on **Exhibit A** and depicted on **Exhibit B**, attached hereto and by this reference made a part hereof ("the Permanent Easement"). The Grantor further grants to the City:
2. The right of ingress and egress from said Permanent Easement over and across adjacent lands of the Grantor by means of roads and lanes thereon; provided, that if any portion of said lands is or shall be subdivided and dedicated roads or highways on such portion shall extend to said easements, said right of ingress and egress on said portion shall be confined to such dedicated roads and highways, or other comparable access;
3. The right from time to time to enlarge, improve, reconstruct; relocate and replace any improvements, slopes, and grades, or structures constructed hereunder with any other number or type of utility facilities, slopes and grades, or other structures either in the original, location or at any alternate location within said Permanent Easement.
4. The right to use gates and all fences which now cross or may hereafter cross said Permanent Easement.

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5. The right to mark the location of said easements by suitable markers set in the ground; provided that permanent markers shall be placed in locations which will not interfere with any reasonable use Grantor may make of said Permanent Easement.
6. The right to cut and clear trees, brush, debris and other obstructions on the easements that might interfere with the construction, operation and maintenance of the City's facilities on and in the easements.
7. The right to assign the easements at will of the City of other governmental entities without the consent of the Grantor.

II. TERMS AND CONDITIONS

Grantor and City agree that the Easements granted to the City above are made and shall remain subject to the following Terms and Conditions for so long as such interests may exist:

A. Improvements Within Easements

1. Grantor shall not construct or place any structure of building fence, street, light, power pole, yard light, mail box or sign, temporary or permanent, or shrub, tree woody plant or nursery stock of any kind on any part of the Permanent Easement, if the same in any way impairs the City's right to access, without the City's express written approval.
2. Any structure or building fence, street light, power pole, yard light, mail box or sign, temporary or permanent, or shrub, tree, woody plant or nursery stock of any kind situated on any of the Easements without City approval shall be removed by the Grantor or Grantor's successors upon written demand by the City or may be removed by the City without liability for damages arising therefrom.
3. Grantor shall not impound water or other substances on or abate the property nor store or dispose of any dangerous, toxic or hazardous substance on or under the property.

B. Subjacent and Lateral Support: Earth Cover

Grantor shall take no action which would impair or in any way modify the earth cover over, or the lateral, or subjacent support for the aforementioned improvements and appurtenances within the Permanent Easement without obtaining the specific written permission of the City.

C. Rights Reserved by Grantor: Exclusivity of Permanent Easement

1. Subject to paragraphs II.A and II.B. above, Grantor hereby retains the right to undisturbed use and occupancy of so much of the property that has been made subject to the Permanent Easement insofar as such use and occupancy is consistent with and does not impair any rights granted to the City respecting the use of said Easement; provided, however, the City's right to use and occupy the sub-surface of the property subject to the Permanent Easement is hereby declared and agreed to be exclusive and Grantor shall not

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grant a right to or otherwise permit anyone to place any facilities of whatsoever nature below the surface of the Permanent Easement without express written approval of the City.

D. Title Verification by City: Grantor’s Warranty

1. Grantor warrants that Grantor has full right and lawful authority to convey the real property interests contained in the Permanent granted above, and promises and agrees to indemnify and defend the City in the exercise of any rights granted to City under this Agreement against any defect in Grantor's title to the property involved or Grantor's right to make any of the grants herein contained.

E. Agreements Binding: Run with Grantor’s Property

1. Each and every one of the benefits and burdens of this Agreement shall inure to and be binding upon the respective legal representatives, heirs, executors, administrators, successors and assigns of the parties hereto.
2. The Easements herein granted touch and. concern the real property of the Grantor and shall be deemed covenants running with said property.

F. Restoration

1. City shall restore the surface of any ground it may disturb in the course of exercising any' of its rights under the Permanent Easement to substantially the same condition that existed prior to such use by the City, subject to the limits set forth in this Agreement.
2. The City shall have a reasonable amount of time to make any restorations required under this paragraph.

G. Miscellaneous

1. The City shall have the right to assess the Grantor the cost of correcting condition created by the Grantor in violation of this Agreement
2. The parties hereto agree that neither has made or authorized any agreement with respect to the subject matter of this instrument other than expressly set forth herein and no oral representation, promise, or consideration different from the terms herein contained shall be binding on either party or its agents or employees.
3. Whenever used herein, the singular number shall include the plural, the plural the singular; and the use of any gender shall be applicable to all genders.

THIS IS A TEMPLATE ONLY – NOT TO BE USED AS WRITTEN. MODIFY AS NEEDED AND AGREED TO BY ALL INTERESTED PARTIES FOR THE SPECIFIC NEEDS OF THE EASEMENT BEING TRANSFERRED AND DEDICATED.

APPENDIX B



GRANTOR:

STATE OF COLORADO)
) ss.
COUNTY OF WELD)

The forgoing was acknowledged before me this _____ day of _____, 20____,
by _____.

WITNESS S my hand and official seal.
My commission expires: _____

Notary Public

STATE OF COLORADO)
) ss.
COUNTY OF WELD)

ATTEST:

CITY OF EVANS, COLORADO

By: _____

By: _____

City Clerk

Mayor

***THIS IS A TEMPLATE ONLY – NOT TO BE USED AS WRITTEN. MODIFY AS NEEDED AND
AGREED TO BY ALL INTERESTED PARTIES FOR THE SPECIFIC NEEDS OF THE
EASEMENT BEING TRANSFERRED AND DEDICATED.***

EROSION CONTROL NOTES

EROSION CONTROL MEASURES MUST BE IN PLACE PRIOR TO ANY LAND DISTURBING ACTIVITY COMMENCES.

A VEHICLE TRACKING CONTROL STRIP 25' X 50' X 6" WITH 1 ½" TO 3" ROCK IS TO BE PLACED AND MAINTAINED BY THE GENERAL CONTRACTOR AT ALL ACCESS POINTS INTO THE CONSTRUCTION SITE.

A 20' X 20' CONCRETE WASH OUT AREA OR APPROVED EQUAL SHALL BE ESTABLISHED NEAR THE EXIT TO THE SITE. THE AREA SHALL BE FENCED WITH ORANGE SAFETY FENCING ON THREE SIDES AND HAVE AN EARTHEN BERM, OR DEPRESSION CUT INTO THE GRADE TO PREVENT WATER AND CONCRETE FROM LEAVING THE AREA. A SIGN DIRECTING ALL CONCRETE TRUCKS TO THE WASHOUT MUST BE ERECTED AT ALL ENTRANCES TO THE SITE. THE GENERAL CONTRACTOR IS RESPONSIBLE FOR REMOVING ALL DEBRIS FROM THE WASHOUT AREA PRIOR TO LEAVING THE SITE ONCE INITIAL SITE CONSTRUCTION IS COMPLETE. BURYING OF THE DEBRIS IS STRICTLY PROHIBITED.

SILT FENCE OR APPROVED EQUAL SHALL BE PLACED ALONG THE DOWN-GRADIENT PERIMETER OF SITE.

THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ALL EROSION CONTROL MEASURES AND SHALL BE RESPONSIBLE FOR ANY AND ALL FINES ASSOCIATED WITH THE DISCHARGE OF SEDIMENTS, EROSION, OR POLLUTANTS LEAVING THE SITE AS A RESULT OF CONSTRUCTION ACTIVITY.

NO SOIL STOCKPILE SHALL EXCEED 10 FEET IN HEIGHT. ALL SOIL STOCKPILES SHALL BE PROTECTED FROM SEDIMENT TRANSPORT BY SURFACE ROUGHENING, WATERING, AND PERIMETER SILT FENCING OR EARTHEN BERM. ANY SOIL STOCKPILES REMAINING AFTER THREE MONTHS FROM THE COMMENCEMENT OF CONSTRUCTION ACTIVITIES SHALL BE SEEDED WITH A TEMPORARY COVER CROP OR REMOVED FROM THE SITE.

ONCE FINAL GRADING IS COMPLETE, ALL AREAS DISTURBED BY CONSTRUCTION ACTIVITIES SHALL BE RIPPED BY A GRADER IN CORN FURROW FASHION OR SEEDED. THE FURROWS SHALL BE PERPENDICULAR TO THE GRADE OF THE LAND. IT IS THE RESPONSIBILITY OF THE DEVELOPER/OWNER TO MAINTAIN THIS EROSION CONTROL MEASURE FOR THE DURATION OF THE 2 YEAR WARRANTY PERIOD.

ALL AREAS DISTURBED BY CONSTRUCTION ACTIVITIES THAT WILL REMAIN AS OUTLOTS, OPEN SPACE, DETENTION PONDS, FOREBAYS, OR TRAILS SHALL RECEIVE 4 INCHES OF TOPSOIL AND SHALL BE SEEDED. SOIL PREPARATION, FERTILIZER, COMPOST, SEEDING, AND MULCHING WILL BE REQUIRED. SEED TAGS WILL BE COLLECTED BY THE CITY OF EVANS.

GRASS SEED SHALL BE PLANTED WITH A GRASS SEED DRILL (NOT A GRAIN DRILL) AT A DEPTH OF ½" TO ¾". BROADCAST SEEDING OF GRASS SEED IS NOT ACCEPTABLE. STRAW MULCH SHALL BE SPREAD AND CRIMPED INTO THE SOIL AT A RATE OF 4,000 LBS/ACRE. HYDROSEEDING AND HYDROMULCHING IS ACCEPTABLE IN LIEU OF DRILL SEEDING AND CRIMPING OF MULCH STRAW, ONLY IN AREAS THAT ARE INACCESSABLE TO LANDSCAPING EQUIPMENT, AND MUST BE APPROVED BY THE CITY OF EVANS PRIOR TO USE.

THE DEVELOPER/OWNER IS RESPONSIBLE FOR HIRING A CONTRACTOR TO REMOVE ALL TEMPORARY EROSION CONTROL MEASURES ONCE CONSTRUCTION IS COMPLETE AND ALL OPEN SPACE AREAS, OUTLOTS, DETENTION PONDS, FOREBAYS, AND TRAIL CORRIDORS ARE STABILIZED WITH AT LEAST 80 PERCENT GROWTH OF SEEDED GROUND COVER.

GENERAL CONSTRUCTION NOTES

1. THE GENERAL CONTRACTOR SHALL GIVE THE CITY OF EVANS AT LEAST 24 HOURS ADVANCE NOTICE BEFORE BEGINNING CONSTRUCTION. A PRE-CONSTRUCTION MEETING WITH THE CITY OF EVANS IS THE PREFERRED METHOD OF NOTIFYING THE CITY OF CONSTRUCTION ACTIVITY.
2. ALL CONTRACTORS AND SUBCONTRACTORS SHALL HAVE A SET OF APPROVED CONSTRUCTION DOCUMENTS ON SITE AT ALL TIMES.
3. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE STANDARDS AND SPECIFICATIONS OF THE CITY OF EVANS, AND THE APPROVED PROJECT DOCUMENTS.
4. THE GENERAL CONTRACTOR SHALL CALL THE UTILITY NOTIFICATION CENTER OF COLORADO (UNCC) AT 1-(800)-922-1987, OR THE NATIONWIDE UTILITY CONTACT NUMBER (811), TO REQUEST LOCATES OF ALL UNDERGROUND UTILITIES AT LEAST 48 HOURS PRIOR TO COMMENCEMENT OF ANY LAND DISTURBING ACTIVITY.
5. ALL VERTICAL AND HORIZONTAL DATUM INFORMATION SHOULD BE OBTAINED USING THE EVANS GEODETIC SURVEY CONDUCTED BY ALBERS, DREXEL & POHLY, INC. JANUARY 9, 1998. A COPY OF FINAL COORDINATES, ELEVATIONS, AND MONUMENT DESCRIPTIONS CAN BE OBTAINED BY CONTACTING THE CITY OF EVANS ENGINEERING DIVISION AT (970) 475-1160.
6. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATIONS AND PROTECTION OF ALL EXISTING UTILITIES SHOWN, ALL EXISTING UTILITIES NOT SHOWN, AND ALL PROPOSED UTILITIES ON THESE PLANS.
7. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING ADJACENT IMPROVEMENTS FROM DAMAGE AND EROSION. ANY ADJACENT IMPROVEMENT DAMAGED DURING CONSTRUCTION SHALL, AT A MINIMUM, BE RESTORED TO A STATE EQUAL TO ITS PRECONSTRUCTION STATE.
8. THE GENERAL CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS TO COMPLETE WORK, AND SHALL COMPLY WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS.
9. IDENTIFYING THE NEED FOR A PERMIT, PREPARING THE APPLICATION, AND PAYING THE SUBMITTAL AND REVIEW FEES NECESSARY TO SECURE PERMITS WILL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR. A COPY OF ALL PERMITS MUST BE ON SITE AT ALL TIMES.
10. ALL CONSTRUCTION ACTIVITIES MUST COMPLY WITH THE STATE OF COLORADO PERMITTING PROCESS FOR STORM WATER DISCHARGE, ASSOCIATED WITH CONSTRUCTION ACTIVITY. FOR INFORMATION, CONTACT THE COLORADO DEPARTMENT OF PUBLIC HEALTH, AND ENVIRONMENT, WATER QUALITY CONTROL DIVISION, SQCD-PE-B2, 4300 CHERRY CREEK DRIVE SOUTH, DENVER, COLORADO 80246-1530, ATTENTION PERMITS AND ENFORCEMENT SECTION. (303) 692-3500. THE WATER QUALITY PERMITTING PAGE CAN BE ACCESSED AT www.cdphe.state.co.us/wq/permitsunit/wqcdpmt.html .
11. IF DEWATERING IS TO BE USED, THEN A STATE CONSTRUCTION DEWATERING DISCHARGE PERMIT IS REQUIRED IF DISCHARGE IS INTO A STORM SEWER, CHANNEL, IRRIGATION DITCH, OR ANY WATERS OF THE UNITED STATES.
12. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE GEOTECHNICAL SOILS REPORT AND PAVEMENT DESIGN REPORT, PRODUCED, OR REFERENCED FOR THIS PROJECT.
13. THE GENERAL CONTRACTOR SHALL PERFORM THE WORK ACCORDING TO ALL CITY, COUNTY, STATE, AND FEDERAL SAFETY AND HEALTH REGULATIONS. IN PARTICULAR, THE "TRENCHING" AND "OPEN EXCAVATION" OPERATIONS SHALL COMPLY WITH ALL CURRENT O.S.H.A. REGULATORY REQUIREMENTS.
14. ALL MATERIALS AND CONSTRUCTION SHALL CONFORM TO THE CITY OF EVANS STANDARDS AND SPECIFICATIONS LATEST REVISION THEREOF. A CURRENT COPY CAN BE DOWNLOADED FROM THE CITY OF EVANS WEBSITE AT www.evanscolorado.gov .

15. THE CITY OF EVANS FOLLOWS ALL TRAFFIC CONTROL STANDARDS SET FORTH IN THE CURRENT EDITION OF THE “MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES” (MUTCD).
16. A TRAFFIC CONTROL PLAN MUST BE SUBMITTED AND APPROVED FOR ANY AND ALL UTILITY WORK PERFORMED WITH THE CITY OF EVANS RIGHT-OF-WAY. TRAFFIC CONTROL PLANS CAN BE EMAILED TO THE ENGINEERING DIVISION ATTENTION MARK OBERSCHMIDT moberschmidt@evanscolorado.gov
17. ALL STREET LIGHTING SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS SET FORTH IN THE CITY OF EVANS RESIDENTIAL NEIGHBORHOOD DESIGN STANDARDS.
18. ALL PLANTINGS SHALL UTILIZE THE CITY OF EVANS PARKS AND RECREATION APPROVED LANDSCAPING PLANTING LIST.
19. ALL SEEDING SHALL UTILIZE THE CITY OF EVANS IRRIGATION DESIGN GUIDELINES AND THE LAWN AND GRASS SPECIFICATIONS SECTION 02930.
20. ALL WORK INCLUDING WARRANTY WORK, SHALL BE INSPECTED BY A CITY REPRESENTATIVE WHO SHALL HAVE AUTHORITY TO HALT CONSTRUCTION WHEN PROPER CONSTRUCTION PRACTICES ARE NOT BEING ADHERED TO.
21. THERE SHALL BE NO WORK PERFORMED ON THE WEEKENDS, OR HOLIDAYS EXCEPT BY APPROVAL OF THE CITY OF EVANS WITH A MINIMUM OF 24 HOURS NOTICE.
22. THE GENERAL CONTRACTOR SHALL NOTIFY ALL RESIDENTS IN WRITING PRIOR TO ANY DISRUPTION IN SERVICE. THE NOTICES MUST HAVE THE GENERAL CONTRACTORS PHONE NUMBER AND THE NAME OF A CONTACT PERSON, AND EMERGENCY PHONE NUMBER FOR AFTER HOUR CALLS. NOTICES SHALL NOT BE LEFT IN MAILBOXES UNLESS PROPERLY SENT THROUGH THE U.S. POST OFFICE.
23. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING THEIR OWN DISPOSAL SITE FOR ALL DISPOSED MATERIALS.
24. THE ENGINEER WHO HAS PREPARED THESE PLANS, BY EXECUTION AND/ OR SEAL HEAROF DOES HEREBY AFFIRM RESPONSIBILITY TO THE CITY OF EVANS, AS A BENEFICIARY OF SAID ENGINEER’S WORK, FOR ANY ERRORS OR OMISSIONS CONTAINED IN THESE PLANS. ACCEPTANCE OF THESE PLANS BY THE CITY OF EVANS SHALL NOT RELIEVE THE ENGINEER WHO HAS PREPARED THESE PLANS OF SUCH RESPONSIBILITY.

GENERAL UTILITY NOTES

1. IT IS THE GENERAL CONTRACTORS RESPONSIBILITY TO MAINTAIN ANY TEMPORARY ROADWAY PATCHES THAT MAY OCCUR IN ORDER TO REOPEN A ROADWAY WHILE CONSTRUCTION ACTIVITY PROGRESSES, UNTIL SUCH TIME A PERMANENT PATCH CAN BE INSTALLED.
2. DURING CONSTRUCTION WHENEVER ANY PIPELINE IS LEFT UNATTENDED, TEMPORARY PLUGS SHALL BE INSTALLED AT ALL OPENINGS. TEMPORARY PLUGS SHALL BE WATERTIGHT, AND OF SUCH DESIGN AS TO PREVENT CHILDREN AND ANIMALS FROM ENTERING THE PIPE.
3. THE GENERAL CONTRACTOR SHALL NOTIFY ALL RESIDENTS IN WRITING PRIOR TO ANY DISRUPTION IN SERVICE. THE NOTICES MUST HAVE THE GENERAL CONTRACTORS PHONE NUMBER, THE NAME OF A CONTACT PERSON, AND AN EMERGENCY PHONE NUMBER FOR AFTER HOUR CALLS. NOTICES SHALL NOT BE LEFT IN MAILBOXES UNLESS PROPERLY SENT THROUGH THE U.S. POST OFFICE.
4. PIPE SHALL BE LAID UPSTREAM WITH THE SPIGOT ENDS POINTING DOWNSTREAM. ALL PIPES SHALL BE PLACED TRUE TO LINE AND GRADE WITH ENDS ABUTTING, CAREFULLY CENTERED, AND WITH A SMOOTH INVERT AT THE JOINT.
5. COMPACTION OF ALL UTILITY TRENCHES INCLUDING DRY UTILITIES SHALL BE PERFORMED TO 95% DENSITY OF THE STANDARD PROCTOR +/- 2%.
6. THE CONTRACTOR SHALL PROVIDE 4" PVC SLEEVES FOR DRY UTILITIES CROSSING THE ROADWAY RIGHT-OF-WAY. THE LOCATIONS AND AMOUNTS SHALL BE DETERMINED BY THE INDIVIDUAL UTILITY COMPANIES BUT SHALL APPEAR ON THE MASTER UTILITY PLAN OF THE NEW DEVELOPMENT. VERIFY LOCATIONS WITH ALL UTILITY COMPANIES SUPPLYING SERVICES TO THE DEVELOPMENT.
7. ALL CURB STOP BOXES (MUELLER VALVES) SHALL BE PLACED WITHIN UTILITY EASEMENTS IN FRONT YARDS LOCATED AT THE PROPERTY LINE.
8. ALL POTABLE WATER, NON-POTABLE WATER, AND SANITARY SEWER SERVICES SHALL HAVE THEIR APPROXIMATE LOCATIONS STAMPED IN THE CONCRETE CURB AND GUTTER WITH THE INITIALS "W", "NP", AND "S" RESPECTIVELY. ADDITIONAL STAMPS FOR GAS "G" AND ELECTRIC "E" MAY ALSO BE NECESSARY AND ARE AT THE DISCRETION OF THE CONTRACTOR TO PERFORM.

GRADING NOTES

1. GRADES SHOWN ON PLANS ARE FINISHED GRADES. FOR SUBGRADE ELEVATIONS, REFER TO THE PAVING SECTIONS AND DETAILS.
2. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE GEOTECHNICAL REPORT PRODUCED OR REFERENCED FOR THIS PROJECT.
3. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE STORM WATER DISCHARGE PERMIT ISSUED FOR THIS PROJECT.
4. EROSION CONTROL MEASURES OUTLINED ON THE EROSION CONTROL/GRADING PLAN MUST BE IN PLACE PRIOR TO COMMENCEMENT OF ANY LAND DISTURBING ACTIVITY. (STOCKPILING, STRIPPING, GRADING, ETC.)
5. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE STANDARDS AND SPECIFICATIONS OF THE CITY OF EVANS, AND THE APPROVED PROJECT CONSTRUCTION DOCUMENTS.
6. A VEHICLE TRACKING CONTROL STRIP IS TO BE PLACED AND MAINTAINED BY THE GENERAL CONTRACTOR AT ALL ACCESS POINTS TO THE CONSTRUCTION SITE.
7. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ALL EROSION CONTROL MEASURES AND SHALL BE RESPONSIBLE FOR ANY AND ALL FINES ASSOCIATED WITH THE DISCHARGE OF SEDIMENTS, EROSION, OR POLLUTANTS LEAVING THE SITE AS A RESULT OF CONSTRUCTION ACTIVITY.
8. NO SOIL STOCKPILE SHALL EXCEED 10 FEET IN HEIGHT. ALL SOIL STOCKPILES SHALL BE PROTECTED FROM SEDIMENT TRANSPORT BY SURFACE ROUGHENING, WATERING, AND PERIMETER SILT FENCING OR EARTHEN BERM. ANY SOIL STOCKPILES REMAINING AFTER THREE MONTHS FROM THE COMMENCEMENT OF CONSTRUCTION ACTIVITIES SHALL BE SEEDED WITH A TEMPORARY COVER CROP OR REMOVED FROM THE SITE.
9. THE GENERAL CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE PLAN ALIGNMENT AND GRADE IN ALL ROADWAYS, PARCELS/LOTS, OPEN SPACES, DITCHES, SWALES, DETENTION PONDS, AND FOREBAYS SO THAT ALL DRAINAGE IS DIRECTED IN A POSITIVE FLOW TO ALL DRAINAGE STRUCTURES INDICATED ON THE CONSTRUCTION PLANS AT THE COMPLETION OF CONSTRUCTION.
10. ALL UTILITIES (NON-POTABLE WATER LINES, POTABLE WATER LINES, SANITARY SEWER LINES, STORM DRAINAGE, DRY UTILITY CROSSINGS (GAS, ELECTRIC, TELEPHONE, AND CABLE T.V.), MANHOLES, AND INLETS) WITHIN THE ROAD RIGHT-OF-WAY SHALL BE INSTALLED PRIOR TO ROADWAY SUBGRADE PREPARATION.
11. SUBGRADE SHALL BE RIPPED, COMPACTED, AND SHAPED PER CITY STANDARDS AND SPECIFICATIONS. THE CITY OF EVANS ENGINEERING DIVISION SHALL BE NOTIFIED 24 HOURS IN ADVANCE TO SCHEDULE A PROOF ROLL OF ALL SUBGRADE WHERE ROADWAYS, SIDEWALKS, PANS, APRONS, CURB AND GUTTER, AND OTHER PUBLIC IMPROVEMENTS WILL BE PLACED.
12. ALL PARKWAYS, AND PROPERTIES ADJACENT TO SIDEWALKS, SHALL BE BACKFILLED AND COMPACTED IN A TIMELY MANNER TO PREVENT WEATHER RELATED STANDING WATER FROM ENTERING THE ROADWAY SUBGRADE. THE GENERAL CONTRACTOR SHALL BE HELD LIABLE FOR ANY AND ALL DAMAGE CAUSED BY FAILURE TO BACKFILL THESE AREAS IN A TIMELY MANNER.
13. TESTING DATA BY A THIRD-PARTY TESTING COMPANY FOR COMPACTION OF ALL UTILITY TRENCHES, SUBGRADE, AND BASE MATERIAL IS TO BE SUBMITTED TO THE CITY OF EVANS IN A TIMELY MANNER. EMAIL REPORTS TO THE ENGINEERING DIVISION ATTENTION MARK OBERSCHMIDT AT moberschmidt@evanscolorado.gov

LANDSCAPING NOTES

1. ALL AREAS DISTURBED BY CONSTRUCTION ACTIVITIES THAT WILL REMAIN AS OUTLOTS, OPEN SPACE, DETENTION PONDS, FOREBAYS, OR TRAILS SHALL RECEIVE 4 INCHES OF TOPSOIL AND SHALL BE SEEDED. SOIL PREPARATION, FERTILIZER, COMPOST, SEEDING, AND MULCHING WILL BE REQUIRED.
2. ALL PLANTINGS REQUIRED SHALL UTILIZE THE CITY OF EVANS PARKS AND RECREATION APPROVED LANDSCAPING PLANTING LIST.
3. ALL SEEDING SHALL UTILIZE THE CITY OF EVANS LAWN AND GRASS SPECIFICATIONS.
4. GRASS SEED SHALL BE PLANTED WITH A GRASS SEED DRILL (NOT A GRAIN DRILL) AT A DEPTH OF ½” TO ¾”. BROADCAST SEEDING OF GRASS SEED IS NOT ACCEPTABLE. STRAW MULCH SHALL BE SPREAD AND CRIMPED INTO THE SOIL AT A RATE OF 4,000 LBS/ACRE. HYDROSEEDING AND HYDROMULCHING IS ACCEPTABLE IN LIEU OF DRILL SEEDING AND CRIMPING OF MULCH STRAW, ONLY IN AREAS THAT ARE INACCESSABLE TO LANDSCAPING EQUIPMENT, AND MUST BE APPROVED BY THE CITY OF EVANS PRIOR TO USE.
5. ALL PLANTINGS REQUIRED BY THE PLANNING DIVISION APPROVED LANDSCAPING PLAN SHALL UTILIZE THE CITY OF EVANS PARKS AND RECREATION APPROVED LANDSCAPING PLANTING LIST.
6. ALL SEEDING REQUIRED BY EITHER THE CITY OF EVANS ENGINEERING DIVISION, OR PLANNING DIVISION SHALL UTILIZE THE CITY OF EVANS PARKS AND RECREATION IRRIGATION DESIGN GUIDELINES.

NON-POTABLE WATER LINE NOTES

1. ALL NON-POTABLE WATER LINE CONSTRUCTION SHALL CONFORM TO THE CITY OF EVANS STANDARDS AND SPECIFICATIONS CURRENT TO THE DATE OF CONSTRUCTION.
2. ALL NON-POTABLE WATER LINE PIPE SHALL BE CONSTRUCTED OF PURPLE POLYVINYL CHLORIDE PIPE (PVC).
3. ALL PVC PIPE SHALL BE MANUFACTURED IN ACCORDANCE WITH AWWA C-900 AND C-905, LATEST REVISIONS, WITH THE FOLLOWING ADDITIONAL REQUIREMENTS AND OR EXCEPTIONS. ALL AWWA CLASS 150 PIPE SHALL MEET THE REQUIREMENT OF AWWA DR-18 AND AWWA CLASS 200 SHALL MEET THE REQUIREMENT OF AWWA DR-14. SOLVENT CEMENT JOINTS ARE STRICTLY PROHIBITED. EACH LENGTH OF PIPE WILL BE A STANDARD LAYING LENGTH OF 20 FEET. RANDOM LENGTHS SHALL NOT BE ACCEPTABLE.
4. PIPE THAT WILL BE STORED OUTSIDE FOR MORE THAN 30 DAYS SHALL BE COVERED WITH AN OPAQUE MATERIAL, AND AIR CIRCULATION PROVIDED TO PROTECT THE PIPE FROM EXPOSURE TO WEATHERING ELEMENTS.
5. THE MINIMUM DIAMETER FOR NON-POTABLE WATER MAINS IN RESIDENTIAL AREAS, INCLUDING CUL-DE-SACS, SHALL BE 4 INCHES AND SIZED BY DEMAND. COMMERCIAL DEVELOPMENT REQUIREMENTS ARE REVIEWED ON AN INDIVIDUAL BASIS.
6. ALL NON-POTABLE WATER MAINS, AND WATER SERVICES SHALL HAVE A MINIMUM COVER OF 4.5 FEET, AND A MAXIMUM COVER OF 5.5 FEET.
7. ALL PVC PIPE SHALL HAVE COPPER TRACER WIRE PLACED ON TOP OF THE PIPE AND DAYLIGHTED AT EVERY OTHER VALVE BOX LOCATION.
8. PIPE DEFLECTION FOR DUCTILE IRON PIPE 6 INCHES TO 12 INCHES IN DIAMETER SHALL BE 5 DEGREES AND 3 DEGREES FOR PIPE 14 INCHES TO 64 INCHES. PIPE DEFLECTION FOR PVC PIPE SHALL BE NO GREATER THAN 3 DEGREES.
9. ALL MAINS SHALL BE INSTALLED IN DEDICATED STREETS. NON-POTABLE WATER LINES ARE TO MAINTAIN A 5 FOOT MINIMAL HORIZONTAL SEPARATION (EDGE TO EDGE) BETWEEN SANITARY SEWER LINES, AND 10 FOOT MINIMAL HORIZONTAL SEPARATION (EDGE TO EDGE) BETWEEN POTABLE WATER LINES.
10. DURING CONSTRUCTION WHENEVER THE NEW NON-POTABLE WATER LINE PIPE IS LEFT UNATTENDED TEMPORARY PLUGS MUST BE INSTALLED AT ALL OPENINGS.
11. VALVES SHALL NOT BE LOCATED IN CONCRETE AREAS, SUCH AS SIDEWALKS, CROSSPANS, APRONS, OR CURB AND GUTTER. ONCE ASPHALT PAVING IS COMPLETE ALL VALVES SHALL BE RAISED TO ¼ INCH BELOW FINAL PAVEMENT GRADE AND HAVE A 12 INCH CONCRETE COLLAR PLACED AROUND THE VALVE LID FOR REINFORCEMENT. THE CONCRETE COLLAR SHOULD BE MEASURED FROM THE OUTSIDE DIAMETER OF THE VALVE LID.
12. NON-POTABLE WATER VALVES SHALL BE LOCATED AT THE PERCEPTIBLE INTERSECTION OF PROPERTY LINES AT ALL CROSS STREETS, AND AT STRATEGIC LOCATIONS, TO ENSURE THAT NO MORE THAN 600 FEET OF MAIN OR ONE RESIDENTIAL BLOCK MAY BE OUT OF SERVICE FOR ANY ONE SINGLE BREAK.
13. ALL NON-POTABLE WATER VALVE LIDS SHALL BE CAST DUCTILE IRON, TRIANGULAR IN SHAPE, AND LABELED WITH THE WORDING "IRRIGATION".
14. AIR VACUUM RELEASE VALVES ARE REQUIRED AT ALL HIGH POINTS LOCATED WITHIN THE NON-POTABLE SYSTEM.
15. BLOWOFFS TO THE NON-POTABLE SYSTEM ARE TO BE LOCATED WITHIN CUL-DE-SACS, DETENTION PONDS, OR OPEN SPACE AREAS FOR EASY ACCESS TO PRIME THE SYSTEM EACH IRRIGATION SEASON.

16. ALL BENDS, TEES, PLUGS, DEAD-ENDS, WET TAPS, AND BLOWOFF ASSEMBLIES SHALL BE RESTRAINED WITH CONCRETE THRUST BLOCKS.
17. ALL RESIDENTIAL NON-POTABLE WATER SERVICES SHALL BE 1 INCH TYPE "K" COPPER AND USE COMPRESSION FITTINGS ONLY. UNLESS OTHERWISE NOTED, OR APPROVED.
18. NON-POTABLE WATER SYSTEMS ARE TO BE IDENTIFIED AT ALL ENTRANCES INTO A NEW DEVELOPMENT WITH WARNING SIGNS. THE WARNING SIGNS SHALL BE A REFLECTIVE WHITE BACKGROUND WITH RED LETTERING AND A RED BORDER. THE SIGN SHALL READ "NON-POTABLE WATER IN USE FOR IRRIGATION, NOT FOR CONSUMPTION, OR PLAY"
19. NON-POTABLE WATER LINE TESTING DOCUMENTS ARE REQUIRED TO BE SUBMITTED TO THE CITY OF EVANS ENGINEERING DIVISION IN A TIMELY MANNER. TYPICAL TESTING DATA INCLUDES BUT ARE NOT LIMITED TO THIRD PARTY PRESSURE TESTING, AND TRENCH COMPACTION TESTING.
20. ALL NEW NON-POTABLE WATER LINES ARE TO BE ISOLATED, TESTED, AND APPROVED BY THE CITY OF EVANS ENGINEERING DIVISION PRIOR TO OPENING THE NEW LINE.
21. NON-POTABLE WATER VALVE ELEVATIONS ARE APPROXIMATE AND ARE NOT TO BE TAKEN AS FINAL ELEVATIONS.

PROJECT CONTROL NOTES

1. ALL VERTICAL AND HORIZONTAL DATUM INFORMATION SHALL BE OBTAINED USING THE EVANS GEODETIC SURVEY CONDUCTED BY ALBERS, DREXEL & POHLY, INC. JANUARY 9, 1998. A COPY OF FINAL COORIDINATES, ELEVATIONS, AND MONUMENT DESCRIPTIONS CAN BE OBTAINED BY CONTACTING THE CITY OF EVANS AT (970) 475-1160.
2. ALL PROPERTY PINS, INTERSECTION MONUMENTS, AND SECTION CORNERS DISTURBED DURING CONSTRUCTION MUST BE REFERENCED AND REPLACED UNDER THE SUPERVISION OF A LICENSED SURVEYOR.
3. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR REPLACING LOST OR DAMAGED PROPERTY PINS, INTERSECTION MONUMENTS, AND SECTION CORNERS DUE TO CONSTRUCTION ACTIVITY.
4. ALL INTERSECTION MONUMENTS AND SECTION CORNERS THAT ARE LOCATED WITHIN A ROADWAY SHALL HAVE A MONUMENT BOX PLACED OVER THE MONUMENT AND SHALL HAVE A ONE FOOT CONCRETE COLLAR PLACED AROUND THE BOX FOR PROTECTION AND EASY ACCESS.

ROADWAY IMPROVEMENT NOTES

1. IMPROVEMENT PROJECTS WHICH DO NOT HAVE A DEVELOPER'S AGREEMENT SHALL BE REQUIRED BY THE CITY OF EVANS TO EXECUTE AN APPLICATION AND PERMIT FOR EXCAVATION / CONSTRUCTION IN PUBLIC RIGHT OF WAY.
2. CONCRETE AND ASPHALTIC MIX DESIGN SHALL BE SUBMITTED BY THE SUPPLIER AND APPROVED BY THE CITY OF EVANS PRIOR TO ROADWAY CONSTRUCTION.
3. ALL EXISTING CURB AND GUTTER, SIDEWALK, AND ADA RAMPS DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED AT THE GENERAL CONTRACTOR'S EXPENSE, PRIOR TO ACCEPTANCE OF COMPLETED IMPROVEMENTS.
4. WHEN AN EXISTING STREET IS TO BE CUT, THE STREET MUST BE RESTORED TO A CONDITION EQUAL TO OR BETTER THAN ITS ORIGINAL CONDITION. SAW CUTS SHOULD BE A CLEAN STRAIGHT VERTICAL LINE PARALLEL OR PERPENDICULAR TO THE FLOW OF TRAFFIC. PATCHES SHALL BE 1 INCH GREATER IN DEPTH THAN THE EXISTING ASPHALT MATERIAL THAT WAS REMOVED.
5. ALL LARGE PATCHES (GREATER THAN 10' WIDE AND 20' LONG) SHALL BE PAVED WITH BY AN ASPHALT LAY-DOWN MACHINE. IN STREETS WHERE MORE THAN ONE CUT IS MADE, AN OVERLAY OF THE ENTIRE STREET WIDTH, INCLUDING THE PATCHED AREA MAY BE REQUIRED.
6. STREET SUBGRADES SHALL BE SCARIFIED THE TOP 12 INCHES AND RE-COMPACTED PRIOR TO SUB-BASE INSTALLATION. NO BASE MATERIAL SHALL BE LAID UNTIL THE SUBGRADE HAS BEEN INSPECTED BY SCHEDULING A PROOF ROLL WITH THE CITY OF EVANS AND APPROVED BY THE CITY OF EVANS ENGINEERING DIVISION.
7. PRIOR TO PAVEMENT INSTALLATION BASE MATERIAL SHALL BE INSPECTED BY A PROOF ROLL SCHEDULED WITH THE CITY OF EVANS AND APPROVED BY THE CITY OF EVANS ENGINEERING DIVISION.
8. VALVE BOXES, MANHOLES, CLEANOUTS, AND SURVEY MONUMENT BOXES ARE REQUIRED TO BE BROUGHT UP TO THE SUBGRADE LEVEL PRIOR TO PAVEMENT INSTALLATION. ALL LOCATIONS AND DISTANCES OF THE VALVE BOXES AND MANHOLES SHOULD BE CLEARLY LABELED ON THE CURB AND GUTTER IN WHITE PAINT. ONCE THE PAVEMENT IS INSTALLED ALL VALVE BOXES, MANHOLES, CLEANOUTS, AND SURVEY MONUMENT BOXES SHALL BE RAISED TO ¼" BELOW ASPHALT GRADE AND HAVE A ONE FOOT CONCRETE COLLAR INSTALLED AROUND THE OUTER DIAMETER OF THE FITTINGS.
9. NUCLEAR GAUGE TESTING DATA BY A THIRD-PARTY TESTING COMPANY FOR COMPACTION AND MOISTURE CONTENT OF ALL UTILITY TRENCHES, SUBGRADE, AND BASE MATERIAL IS TO BE SUBMITTED TO THE CITY OF EVANS IN A TIMELY MANNER. EMAIL REPORTS TO moberschmidt@evanscolorado.gov.
10. CONCRETE CURB AND GUTTER, SIDEWALKS, AND STREET PAVING SHALL NOT BEGIN UNTIL ALL TESTING DATA HAS BEEN RECEIVED BY THE CITY OF EVANS, AND SUBGRADE PROOF ROLLS BY THE CITY OF EVANS ENGINEERING DIVISION HAS BEEN COMPLETED.
11. NUCLEAR GAUGE TESTING DATA BY A THIRD-PARTY TESTING COMPANY FOR COMPACTION, VOIDS, AND SEGREGATION OF THE ASPHALT MAT IS TO BE SUBMITTED TO THE CITY OF EVANS IN A TIMELY MANNER. EMAIL REPORTS TO moberschmidt@evanscolorado.gov.
12. THE GENERAL CONTRACTOR SHALL MAINTAIN ALL NECESSARY BARRICADES, PERMANENT SIGNS, TEMPORARY SIGNS, PAVEMENT MARKINGS, AND OTHER TRAFFIC CONTROL DEVICES DAILY DURING CONSTRUCTION AND BETWEEN PHASES OF CONSTRUCTION.
13. THE ROADWAY AND RELATED WORK AREAS SHALL BE LEFT WITH A CLEAN AND FINISHED APPEARANCE. IN NO CASE SHALL MATERIAL REMOVED FROM THE RIGHT-OF-WAY BE STOCKPILED AND LEFT IN SUCH A MANNER AS TO POSE A HAZARD TO THE PUBLIC. THE GENERAL CONTRACTOR SHALL REMOVE ALL DEBRIS FROM THE SIDEWALKS, CURB AND GUTTERS, PANS, AND DRIVEWAYS AT THE CONSTRUCTION SITE AND DISPOSE OF THE DEBRIS IN AN APPROPRIATE LOCATION.

SANITARY SEWER NOTES

1. ALL SANITARY SEWER PIPE SHALL MEET THE EXTRA STRENGTH MINIMUM REQUIREMENTS OF ASTM D-3034, SDR-35, OR LATEST REVISION THEREOF. ALL SANITARY SEWER PIPE JOINTS SHALL BE INTEGRAL BELL AND SPIGOT WITH RUBBER O-RING TYPE GASKETS PER ASTM C-443.
2. REFER TO THE GEOTECHNICAL REPORT PERTAINING TO THIS PROJECT TO DETERMINE WHETHER OR NOT UNDERDRAINS WILL BE REQUIRED. IF UNDERDRAINS ARE REQUIRED INSTALLATION SHALL CONFORM TO THE CITY OF EVANS STANDARDS AND SPECIFICATIONS.
3. MANHOLES SHALL BE CONSTRUCTED OF PRE-CAST CONCRETE. CONCRETE BASES SHALL BE POURED IN PLACE, CLASS A CONCRETE. AND HAVE A MINIMUM THICKNESS OF 8 INCHES. PRE-CAST BASES MAY BE USED IN PLACE OF POURED IN PLACE BASES.
4. SANITARY SEWER MANHOLES SHALL HAVE A MINIMUM 48 INCH INSIDE DIAMETER. ALL CONES SHALL BE ECCENTRIC. PRE-CAST MANHOLE RISERS AND CONES SHALL BE MANUFACTURED IN ACCORDANCE WITH ASTM DESIGNATION C-478.
5. WHEN AN INSIDE DROP MANHOLE IS UTILIZED, THE INSIDE DIAMETER OF THE MANHOLES SHALL BE INCREASED 12 INCHES FROM THE REQUIRED MANHOLE SIZE.
6. A DROP MANHOLE SHALL BE CONSTRUCTED AT ALL MANHOLES WHERE THE INCOMING PIPE INVERT IS MORE THAN TWO FEET ABOVE THE MANHOLE INVERT.
7. THE MANHOLE BARRELS SHALL BE WATERTIGHT AT ALL JOINTS AND RISER SECTIONS. THE PREFERRED JOINT SEALING COMPOUND SHALL BE "RAMNEK" OR AN APPROVED EQUAL.
8. MANHOLE STEPS SHALL BE ALUMINUM, OR PLASTIC-COATED STEEL, AND SHALL BE PLACED 16 INCHES ON CENTER, ALIGNED AWAY FROM THE INVERT. THE FIRST STEP SHALL BE A MAXIMUM DISTANCE OF 24 INCHES FROM THE FINAL GRADE.
9. MANHOLE INVERTS SHALL BE FORMED AS INDICATED IN THE SANITARY SEWER FLOW LINE CHANNEL DETAIL WW-9 TO ENSURE SMOOTH FLOW THROUGH THE MANHOLE.
10. THE MAXIMUM DISTANCE BETWEEN MANHOLES SHALL BE 500 FEET.
11. ALL PIPES ENTERING THE MANHOLE SHALL BE COMPLETELY GROUTED AROUND THE OUTSIDE DIAMETER OF THE PIPE AND THE MANHOLE WALLS.
12. ALL SANITARY SEWER MANHOLE LIDS SHALL BE CAST DUCTILE IRON AND LABELED WITH THE WORDS "SANITARY SEWER".
13. ALL SANITARY SEWER PIPE AND APPURTENANCES SHALL BE CLEANED AND TESTED AFTER BACKFILL OPERATIONS HAVE BEEN COMPLETED.
14. SANITARY SEWER TESTING DOCUMENTS ARE REQUIRED TO BE SUBMITTED TO THE CITY OF EVANS IN A TIMELY MANNER. TYPICAL TESTING DATA INCLUDES BUT ARE NOT LIMITED TO THIRD PARTY PRESSURE TESTING, TRENCH COMPACTION TESTING, TV VIDEO INSPECTION, AND VACUUM MANHOLE TESTING.
15. MANHOLE ELEVATIONS ARE APPROXIMATE AND ARE NOT TO BE TAKEN AS FINAL ELEVATIONS. THE PAVING CONTRACTOR SHALL USE NO MORE THAN FOUR CONCRETE ADJUSTMENT RINGS, OR AN APPROVED EQUAL TO MATCH FINAL PAVEMENT ELEVATIONS.

STORM DRAINAGE NOTES

1. ALL CONSTRUCTION ACTIVITIES MUST COMPLY WITH THE STATE OF COLORADO PERMITTING PROCESS FOR “STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY”. FOR INFORMATION CONTACT THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT, WATER QUALITY CONTROL DIVISION, SQCD-PE-B2, 4300 CHERRY CREEK DRIVE SOUTH, DENVER, COLORADO 80246-1530, ATTENTION PERMITS AND ENFORCEMENT SECTION. (303) 692-3575. THE WATER QUALITY PERMITTING PAGE CAN BE ACCESSED AT WWW.CDPHE.STATE.CO.US/WQ/PERMITSUNIT/WQCDPMT.HTML.
2. IF THE CONSTRUCTION SITE IS ONE ACRE OR GREATER IN SIZE, OR IF ANY FORM OF DE-WATERING IS TO BE USED ON THE CONSTRUCTION SITE, THEN PROOF OF A STORM WATER DISCHARGE PERMIT FROM THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT IS REQUIRED TO BE SUBMITTED TO THE CITY OF EVANS PRIOR TO BEGINNING ANY CONSTRUCTION ACTIVITY.
3. THE GENERAL CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS TO COMPLETE WORK, AND SHALL COMPLY WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS.
4. THE GENERAL CONTRACTOR SHALL GIVE THE CITY OF EVANS AT LEAST 24 HOURS ADVANCE NOTICE BEFORE BEGINNING CONSTRUCTION. A PRE-CONSTRUCTION MEETING WITH THE CITY OF EVANS IS THE PREFERRED METHOD OF NOTIFYING THE CITY OF CONSTRUCTION ACTIVITY.
5. ALL STORM WATER CONSTRUCTION SHALL CONFORM TO THE CITY OF EVANS STANDARDS AND SPECIFICATIONS CURRENT TO THE DATE OF CONSTRUCTION. A CURRENT COPY CAN BE DOWNLOADED FROM THE CITY OF EVANS WEBSITE AT www.evanscolorado.gov.
6. ALL STORM WATER PIPE SHALL BE CONCRETE REINFORCED PIPE AND SHALL MEET ASTM C-76 CLASS III STANDARDS, UNLESS NOTED, OR APPROVED OTHERWISE. ALL STORM WATER PIPE JOINTS SHALL BE INTEGRAL BELL AND SPIGOT WITH RUBBER O-RING TYPE GASKETS PER ASTM C-361.
7. STORM SEWER MANHOLES SHALL BE 4 FOOT DIAMETER FOR 30 INCH PIPE OR LESS, AND 5 FOOT DIAMETER FOR 36 INCH PIPE OR LARGER. FOR SIZES ABOVE 36 INCH, CONCRETE JUNCTION BOXES, OR PRE-CAST MANHOLE TEES MUST BE DETAILED BY THE DESIGN ENGINEER.
8. ALL PIPES ENTERING THE MANHOLE SHALL BE COMPLETELY GROUTED WITH NON-SHRINK GROUT AROUND THE OUTSIDE DIAMETER OF THE PIPE AND THE MANHOLE WALLS.
9. ALL STORM SEWER MANHOLE LIDS AND STORM SEWER INLET LIDS SHALL BE CAST DUCTILE IRON AND BEAR THE “FISH” LOGO WITH THE WORDING “NO DUMPING DRAINS TO RIVER”.
10. MANHOLE TESTING MAY BE NECESSARY IF THE MANHOLE IS LOCATED WITHIN AN AREA OF HIGH GROUND WATER.
11. MANHOLE ELEVATIONS ARE APPROXIMATE AND ARE NOT TO BE TAKEN AS FINAL ELEVATIONS. THE PAVING CONTRACTOR SHALL USE NO MORE THAN 4 CONCRETE ADJUSTMENT RINGS, OR AN APPROVED EQUAL TO MATCH FINAL PAVEMENT ELEVATIONS.
12. ALL MANHOLE OR INLET STATIONING REFERS TO THE CENTER OF THE MANHOLE, OR THE CENTER OF THE INLET. ALL PIPE LENGTHS ARE MEASURED TO THE CENTER OF THE MANHOLE AND THE INSIDE EDGE OF THE INLET.
13. THE CITY OF EVANS SHALL NOT BE RESPONSIBLE FOR THE MAINTENANCE OF STORM DRAINAGE FACILITIES LOCATED ON PRIVATE PROPERTY. MAINTENANCE OF ONSITE DRAINAGE STRUCTURES AND FACILITIES SHALL BE THE RESPONSIBILITY OF THE DEVELOPER / OWNER UNTIL THE FINAL ACCEPTANCE OF THE PROJECT IS COMPLETE.

STREET LIGHTING NOTES

1. ALL STREET LIGHTING SHALL CONFORM TO THE CITY OF EVANS MUNICIPAL CODE CHAPTERS 18.31, 18.32, AND 18.33.
2. THE STREET LIGHTING PLAN SPECIFYING THE NUMBER, TYPE AND APPROXIMATE LOCATION OF STREET LIGHTS MUST BE INCLUDED WITH THE FINAL PLAT, AND THEY MUST ALSO APPEAR ON ANY SITE PLAN SHEETS SUBMITTED TO THE PLANNING DIVISION FOR REVIEW OF ANY NEW DEVELOPMENT. THE CITY OF EVANS ENGINEERING DIVISION ALSO REQUIRES STREET LIGHTING TO BE SHOWN ON THE MASTER UTILITY PLAN SHEET OF NEW DEVELOPMENT CONSTRUCTION PLANS.
3. ALL RESIDENTIAL SUBDIVISIONS AND COMMERCIAL PROPERTIES SHALL PROVIDE ORNAMENTAL STREET LIGHTING, AS APPROVED BY THE CITY OF EVANS.
4. ORNAMENTAL STREET LIGHTING AND ASSOCIATED UNDERGROUND STREET-LIGHTING SUPPLY CIRCUITS ARE THE SOLE RESPONSIBILITY OF THE GENERAL CONTRACTOR AND THEIR SUBCONTRACTORS.
5. THE MINIMUM REQUIREMENTS SHALL BE SEVEN THOUSAND LUMEN LAMPS AT A MAXIMUM SPACING OF FOUR HUNDRED FEET, AND BLACK IN COLOR. THE APPROVED ORNAMENTAL LIGHTING IS SUPPLIED BY MOUNTAIN STATES LIGHTING P.O. BOX 449 CONIFER, COLORADO 80433 (303) 838-4430.
6. THE CITY OF EVANS HAS TWO STANDARD DETAILS FOR NEW STREET LIGHTING WITHIN CITY LIMITS. ONE DETAIL IS FOR RESIDENTIAL/LOCAL STREETS (EVNS-5-13-MAD), AND ANOTHER DETAIL IS FOR ARTERIAL/COMMERCIAL STREETS (EVNS-11-22-TFP12). CONTACT THE CITY OF EVANS FOR COPIES OF EACH DETAIL.

TRAFFIC SIGNING & PAVEMENT MARKING NOTES

1. THE CITY OF EVANS FOLLOWS ALL TRAFFIC SIGNAGE AND PAVEMENT MARKING STANDARDS SET FORTH IN THE CURRENT EDITION OF THE “MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES” (MUTCD).
2. ROADWAY TRAFFIC SIGNAGE HAS BEEN DETERMINED BY INFORMATION AVAILABLE AT THE TIME OF CONSTRUCTION PLAN REVIEW AND APPROVAL. PRIOR TO INITIATION OF THE WARRANTY PERIOD, THE CITY OF EVANS RESERVES THE RIGHT TO REQUIRE ADDITIONAL SIGNAGE IF IT DETERMINES THAT AN UNFORSEEN CONDITION WARRANTS SUCH ACCORDING TO THE MUTCD, OR THE CDOT STANDARD PLANS M & S STANDARDS.
3. ALL SIGNAGE SHALL FALL UNDER THE REQUIREMENTS OF THE TWO-YEAR WARRANTY PERIOD FOR NEW CONSTRUCTION.
4. LOCATIONS OF EXISTING SIGNS ARE APPROXIMATE. THE GENERAL CONTRACTOR SHALL COORDINATE WITH THE CITY OF EVANS TO DETERMINE IF EXISTING SIGNS NOT SHOWN ON THE CONSTRUCTION PLANS SHALL BE RESET OR REMOVED.
5. ALL SIGNS AND PAVEMENT MARKINGS SHALL BE FURNISHED AND INSTALLED IN ACCORDANCE WITH MUTCD STANDARDS.
6. THE DEVELOPER / CONTRACTOR INSTALLING THE SIGNS SHALL BE RESPONSIBLE FOR LOCATING AND PROTECTING ALL UNDERGROUND UTILITIES.
7. STREET AND AVENUE SIGNS SHALL BE EXTRUDED ALUMINUM 6” X 30” MINIMUM, CITY OF EVANS STANDARD REFLECTIVE GREEN BACKGROUND WITH WHITE BLOCK LETTERING, CITY LOGO, AND NUMBERING.
8. ALL SIGNS SHALL BE MOUNTED WITH VANDAL-PROOF BOLTS.
9. ALL SIGNS SHALL BE INSTALLED ON UNISTRUT TELES PAR TYPE PERFORATED POSTS WITH ANCHORS AT THE PROPER HEIGHT AS PER CURRENT MUTCD STANDARDS.
10. UNISTRUT TELES PAR TYPE POSTS SHALL MEET OR EXCEED THE FOLLOWING:
 - a. POSTS – 1 ¾” X 1 ¾”, 12 GAUGE, ASTM SPECIFICATION NUMBER A4446, GRADE A, DRILLED ON 1” CENTERS.
 - b. ANCHORS – 2” X 2”, 12 GAUGE, ASTM SPECIFICATION NUMBER A4446, DRILLED ON 1” CENTERS.
 - c. ALL POSTS AND ANCHORS SHALL BE GALVANIZED TO ASTM SPECIFICATION A52 COATING DESIGNATION G90.
11. STRIPING HAS BEEN DETERMINED BY INFORMATION AVAILABLE AT THE TIME OF CONSTRUCTION PLAN REVIEW AND APPROVAL. PRIOR TO INITIATION OF THE WARRANTY PERIOD, THE CITY RESERVES THE RIGHT TO REQUIRE ADDITIONAL STRIPING IF THE CITY ENGINEER DETERMINES THAT AN UNFORSEEN CONDITION WARRANTS SUCH ACCORDING TO THE MUTCD OR THE CDOT STANDARD PLANS M & S STANDARDS.
12. ALL STRIPING SHALL FALL UNDER THE REQUIREMENTS OF THE TWO-YEAR WARRANTY PERIOD FOR NEW CONSTRUCTION. (EXCEPT NORMAL TRAFFIC WEAR ON TRAFFIC MARKINGS)
13. ALL SURFACES SHALL BE THOROUGHLY CLEANED PRIOR TO INSTALLATION OF STRIPING OR MARKINGS TO PREPARE THE PAVEMENT SURFACE FOR PROPER ADHESION. ALL SYMBOLS, INCLUDING ARROWS, ONLYS, CROSSWALKS, STOP BARS, ETC. SHALL BE PRE-FORMED THERMO-PLASTIC PER THE CITY OF EVANS STANDARDS.
14. MARKINGS THAT MUST BE VISIBLE AT NIGHT SHALL BE RETROREFLECTIVE UNLESS AMBIENT ILLUMINATION ASSURES THAT THE MARKINGS ARE ADEQUATELY VISIBLE.
15. PARKING LOT STRIPING AND REQUIRED ACCESS AISLES FOR ADA ACCESSIBLE SPACES SHALL BE REFLECTIVE WHITE LINES TO INDICATE THE PARKING STALLS. PARKING DIRECTIONAL SYMBOLS SHALL ALSO BE REFLECTIVE WHITE PER MUTCD STANDARDS.

16. REMOVAL OF EXISTING PAVEMENT MARKINGS SHALL BE ACCOMPLISHED BY A METHOD THAT DOES NOT MATERIALLY DAMAGE THE SURFACE OR TEXTURE OF THE PAVEMENT. THE PAVEMENT MARKINGS SHALL BE REMOVED TO THE EXTENT THAT THEY WILL NOT BE VISIBLE UNDER DAY OR NIGHT CONDITIONS. UNDER NO CIRCUMSTANCES SHALL BLACK PAINT BE USED TO COVER EXISTING MARKINGS, OR MISTAKES IN STRIPING.

POTABLE WATER LINE NOTES

1. ALL WATER LINE CONSTRUCTION SHALL CONFORM TO THE CITY OF EVANS STANDARDS AND SPECIFICATIONS CURRENT TO THE DATE OF CONSTRUCTION. A CURRENT COPY CAN BE DOWNLOADED FROM THE CITY OF EVANS WEBSITE AT www.evanscolorado.gov.
2. ALL WATER LINE PIPE SHALL BE CONSTRUCTED OF EITHER DUCTILE IRON PIPE, OR POLYVINYL CHLORIDE (PVC) PIPE. TRANSMISSION LINES 16 INCHES AND LARGER SHALL BE DUCTILE IRON PIPE, STEEL, OR PRE-TENSIONED CONCRETE STEEL CYLINDER PIPE.
3. ALL PVC PIPE SHALL BE MANUFACTURED IN ACCORDANCE WITH AWWA C-900 AND C-905, LATEST REVISIONS, WITH THE FOLLOWING ADDITIONAL REQUIREMENTS AND / OR EXCEPTIONS. ALL AWWA CLASS 150 PIPE SHALL MEET THE REQUIREMENT OF AWWA DR-18 AND AWWA CLASS 200 SHALL MEET THE REQUIREMENT OF AWWA DR-14. SOLVENT CEMENT JOINTS ARE STRICTLY PROHIBITED. EACH LENGTH OF PIPE WILL BE A STANDARD LAYING LENGTH OF 20 FEET. RANDOM LENGTHS SHALL NOT BE ACCEPTABLE.
4. PIPE THAT WILL BE STORED OUTSIDE FOR MORE THAN 30 DAYS SHALL BE COVERED WITH AN OPAQUE MATERIAL, AND AIR CIRCULATION PROVIDED TO PROTECT THE PIPE FROM EXPOSURE TO WEATHERING ELEMENTS.
5. THE MINIMUM DIAMETER FOR WATER MAINS IN RESIDENTIAL AREAS, INCLUDING CUL-DE-SACS, SHALL BE 8 INCHES. ALL SCHOOLS, SHOPPING CENTERS, BUSINESS PARKS, INDUSTRIAL PARKS, AND HIGH-DENSITY RESIDENTIAL AREAS SHALL BE LOOPED WITH MAINS AT LEAST 8 INCHES IN DIAMETER.
6. ALL WATER MAINS, FIRE HYDRANTS, AND WATER SERVICES SHALL HAVE A MINIMUM COVER OF 4.5 FEET, AND A MAXIMUM COVER OF 5.5 FEET.
7. ALL PVC PIPE SHALL HAVE COPPER TRACER WIRE PLACED ON TOP OF THE PIPE AND DAYLIGHTED AT A LOCATOR BOX LOCATED BEHIND ALL FIRE HYDRANTS.
8. PIPE DEFLECTION FOR DUCTILE IRON PIPE 6 INCHES TO 12 INCHES IN DIAMETER SHALL BE 5 DEGREES AND 3 DEGREES FOR PIPE 14 INCHES TO 64 INCHES. PIPE DEFLECTION FOR PVC PIPE SHALL BE NO GREATER THAN 3 DEGREES.
9. ALL MAINS SHALL BE INSTALLED IN DEDICATED STREETS. POTABLE WATER LINES ARE TO MAINTAIN A 10 FEET MINIMAL HORIZONTAL SEPARATION (EDGE TO EDGE) BETWEEN SANITARY SEWER LINES, AND NON-POTABLE WATER LINES.
10. DURING CONSTRUCTION WHENEVER THE NEW WATER LINE PIPE IS LEFT UNATTENDED TEMPORARY PLUGS MUST BE INSTALLED AT ALL OPENINGS.
11. WATER LINE DISINFECTION SHALL BE ACCOMPLISHED USING TABLET-FORM HYPOCHLORITE OR BY CONTINUOUS FEED. THE HYPOCHLORITE TABLET SHALL BE AFFIXED TO THE INSIDE (TOP) OF PIPE WITH AN APPROVED ADHESIVE. DOSAGE SHALL BE CALCULATED FOR CONCENTRATION OF CHLORINE EQUAL TO 25 MG PER LITER OF WATER VOLUME OF INSTALLED PIPE. REFER TO TABLE 5.04 OF THE EVANS STANDARDS AND SPECIFICATIONS TO CALCULATE THE DOSE OF CHLORINE REQUIRED.
12. VALVES SHALL NOT BE LOCATED IN CONCRETE AREAS, SUCH AS SIDEWALKS, CROSSPANS, APRONS, OR CURB AND GUTTER. VALVES SHALL BE INSTALLED AT A DISTANCE OF 5 FEET FROM TEES AND CROSSES. INSTALL DUCTILE IRON PIPE BETWEEN THE TEE / CROSS AND THE VALVE. REFER TO DETAIL WA-11.
13. ONCE ASPHALT PAVING IS COMPLETE ALL VALVES SHALL BE RAISED TO ¼ INCH BELOW FINAL PAVEMENT GRADE AND HAVE A 12 INCH CONCRETE COLLAR PLACED AROUND THE VALVE LID FOR REINFORCEMENT. THE CONCRETE COLLAR SHOULD BE MEASURED FROM THE OUTSIDE DIAMETER OF THE VALVE LID.
14. ALL WATER VALVE LIDS SHALL BE CAST DUCTILE IRON AND LABELED WITH THE WORD "WATER".

15. ALL BENDS, TEES, PLUGS, DEAD-ENDS, WET TAPS, FIRE HYDRANTS, AND BLOWOFF ASSEMBLIES SHALL BE RESTRAINED WITH CONCRETE THRUST BLOCKS.
16. THE STANDARD FIRE HYDRANT ASSEMBLY SHALL INCLUDE A SWIVEL TEE WITH GATE VALVE, RESTRAINED JOINTS, THRUST BLOCKS, AND USE 6 INCH DUCTILE IRON PIPE TO THE HYDRANT.
17. THE MAXIMUM DISTANCE BETWEEN FIRE HYDRANTS SHALL BE 500 FEET IN RESIDENTIAL AREAS, AND 300 FEET IN BUSINESS AREAS.
18. FIRE HYDRANT BRANCH LINES SHALL BE INSTALLED AT 90 DEGREES TO THE STREET MAINS. THE HYDRANT SHALL BE SET AT THE END OF THE BRANCH LINE AND SHALL FACE THE BRANCH LINE. FIRE HYDRANTS SHALL BE SET SO THAT THE MAIN PUMPER VALVE NUT IS BETWEEN 21 INCHES TO 25 INCHES ABOVE FINISHED GRADE.
19. ALL RESIDENTIAL WATER SERVICES SHALL BE ¾ INCH TYPE "K" COPPER AND USE COMPRESSION FITTINGS ONLY. UNLESS OTHERWISE NOTED, OR APPROVED.
20. WATER LINE TESTING DOCUMENTS ARE REQUIRED TO BE SUBMITTED TO THE CITY OF EVANS IN A TIMELY MANNER. TYPICAL TESTING DATA INCLUDES BUT ARE NOT LIMITED TO THIRD PARTY PRESSURE TESTING, BACTERIAL TESTING, HIGH AND LOW CHLORINE TESTING, AND TRENCH COMPACTION TESTING.
21. THE CITY OF EVANS IS RESPONSIBLE FOR COLLECTING AND SENDING THE BACTERIAL WATER SAMPLE TO THE WELD COUNTY HEALTH DEPARTMENT FOR TESTING. THE CITY OF EVANS ALSO CONDUCTS THE HIGH AND LOW CHLORINE TESTING. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO SCHEDULE ALL TESTING.
22. ALL NEW WATER LINES ARE TO BE ISOLATED, TESTED, AND APPROVED BY THE CITY OF EVANS PRIOR TO OPENING THE NEW LINE TO THE EXISTING WATER SYSTEM.
23. WATER VALVE ELEVATIONS ARE APPROXIMATE AND ARE NOT TO BE TAKEN AS FINAL ELEVATIONS.

APPROVED PRODUCT LISTING – WATER DISTRIBUTION

PART 1 PART 1 - GENERAL

1.1 DESCRIPTION:

- A.** This section lists the required manufacturers and/or products for projects constructed in the City of Evans

PART 2 PIPE BORING AND JACKING

A. CASING SEALS

1. Pipeline Seal and Insulator Co., Model W.
2. Or City approved equal.

B. CASING CHOCKS

1. Cascade Waterworks.
2. Power Seal
3. Or City approved equal.

PART 3 DUCTILE IRON PIPE

A. MECHANICAL JOINTS RESTRAINTS:

1. Megalug Series 1100, manufactured by EBAA Iron, Inc
2. GripRing, manufactured by Romac Industries, Inc
3. Uniflange Series 1400, manufactured by Ford Meter Box Co., Inc.

B. PUSH-ON JOINTS RESTRAINTS:

1. Megalug Series 1700, by EBAA Iron, Inc
 2. Uniflange Series UFR 1390-C, manufactured by Ford Meter Box Co., Inc
 3. Romac 600 Series Style 611 manufactured by Romac Industries, Inc.
-

PART 4 PLASTIC PRESSURE PIPE

A. PVC Pressure Pipe (4" through 12")

1. Conform to AWWA C-900. Larger pipe AWWA C-905.
2. O.D. Base: Cast Iron equivalent
3. Pressure Class: 150 psi, 18 DR (minimum)
4. Joints: Bell ends with elastomeric gaskets. Solvent cement joints are strictly prohibited.

B. TRACER WIRE SPLICES:

1. Copper: #12 stranded, water-tight insulation for direct bury

C. LOCATOR STATION BOXES WITH LID LABELED "LOCATOR STATION":

1. Equal to cathodic protection test station termination box
2. Tyler 6855 Series
3. East Jordan Iron Works (EJIW) 8555 Series
4. Or City approved equal

D. MECHANICAL JOINTS RESTRAINTS:

1. Megalug Series 2000PV or Series 2000SV, manufactured by EBAA Iron Inc
2. PVC Ring Lock Series 3500, manufactured by Star Pipe Products, L.P.
3. Uniflange Series 1500, manufactured by Ford Meter Box Co., Inc.

E. PUSH-ON JOINTS RESTRAINTS:

1. Megalug Series 1600 with Type 304 stainless steel tie bolts, manufactured by EBAA Iron Inc.
 2. Uniflange Series UFR1390-C with Type 304 stainless steel tee bolts, manufactured by Ford Meter Box Co., Inc.
 3. Romac 600 Series Style 611 with Type 304 stainless steel tee bolts, manufactured by Romac Industries, Inc.
-

PART 5 VALVES

A. GATE VALVES:

1. Mueller
2. American Flow Control
3. Clow
4. M & H Valve Company
5. US Pipe.

B. BUTTERFLY VALVES:

1. Mueller
2. Pratt
3. American Darling (Val-Matic)
4. DeZurick
5. M & H Valve Company.

C. VALVE BOXES:

1. Tyler 6860 series

D. AIR RELIEF/VACUUM RELIEF VALVES:

1. Crispin Universal Air Valve, by Multiplex Manufacturing
2. Apco Combination Air Release Valve, by Valve and Primer Corporation
3. CAV Combination Air Release and Vacuum Valve, G.A. Industries Inc
4. Or City approved equal.

PART 6 FIRE HYDRANTS

A. FIRE HYDRANTS:

1. Waterous by American Flow Control, Pacer Model, Traffic Model
WB67- 250
 2. Or City approved equal
-

PART 7 SERVICE LINES, METERS AND APPURTENANCES

A. Water Service Pipe

1. Type K copper

B. TAPPING SADDLES:

1. Ford.
2. Or City approved equal

C. CORPORATION STOPS

1. Ford
2. Or City approved equal

D. COUPLINGS

1. Ford
2. Dresser
3. Or City approved equal

E. CURB STOPS

1. Ford, Mueller, or
2. A-Y McDonalds compression type only or
3. As City approved equal.

F. CURB BOXES FOR CURB STOPS

1. Mueller; top threads adjustable height
2. Or City approved equal

G. METERS AND STRAINERS

1. Sensus
 2. No Substitutions
-

H. METER SETTERS

1. 5/8 x 3/4-inch copperhorns (interior meter settings):
 - a Ford
 - b Or City approved equal
2. 5/8 x 3/4-inch copper setters (exterior meter settings):
 - a Ford
 - b Or City approved equal
3. 1-inch copperhorns (interior meter settings):
 - a Ford
 - b Or City approved equal
4. 1-inch copper setters (exterior meter settings):
 - a Ford
 - b Or City approved equal
5. 1 1/2-inch and 2-inch meter setters:
 - a Ford.
 - b Or City approved equal

I. METER PITS

1. 3/4-inch and 1-inch meter pits:
 - a Mid States Polyethylene,
 - b Or City approved equal
 2. Covers and lids for 3/4-inch and 1-inch meter pits:
 - a Ford; #W3 cover with a WA3L-TP lid.
 - b Or City approved equal
 3. 3-inch extensions for 3/4-inch and 1-inch meter
-

pits: a Mid States Polyethylene,

b Or City approved equal

J. METER VAULTS

1. Meter vaults for 1 ½-inch and larger meters

are: a AMCOR Precast Concrete MH

b Or City approved equal.

2. Meter pit and vault covers for 1 ½-inch and larger meters

are: a Casting Incorporated #MH-125-24 AL-WATER.

b Or City approved equal.

K. BACKFLOW PREVENTERS

1. FEBCO

2. Or City approved equal.

END OF SECTION

APPROVED PRODUCT LISTING – SANITARY SEWER

PART 1 GENERAL

1.1 DESCRIPTION:

- A.** This section lists the required manufacturers and/or products for projects constructed in the City of Evans

PART 2 WASTEWATER COLLECTION SYSTEMS

A. PIPE MATERIALS

1. Polyvinyl Chloride (PVC) Pipe
 - a Pipe and fittings: 4” through 15”, ASTM D3034; 18” through 27”, ASTM F-679; Type PSM, SDR 35
 2. Joints: ASTM D3212, push-on with an O-ring rubber gasket conforming to ASTM Designation D3034. Solvent cement joints are strictly prohibited.
 3. Pipe lengths: maximum pipe length shall be twenty (20) feet and no shorter than twelve and one half (12 ½) feet, except service tees and closure pieces.
 4. Markings: All sizes of PVC pipe shall have the SDR rating, the A.S.T.M. Specification, nominal diameter, and name or trademark of the manufacturer imprinted on the outside of the pipe.
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B. MANHOLE MATERIALS

1. Cast-In-Place Bases
 - a All concrete shall be 4,500 psi at 28 days, Class II concrete
2. Pipe penetration gaskets
 - a Kor-N-Seal, Dukor Company
 - b PS-10, Press Seal Gasket Corp
 - c A-Lok, A-Lok Corp
 - d Lock Joint Flexible Manhole Sleeve, Interpace Corp
 - e Or City approved equal
3. Barrels, Cones, and Grade Rings
 - a Material: Precast Concrete, ASTM C478
 - b Cement: Type II
4. Ring and Cover – Grey Iron (ASTM A48 with asphalt varnish coat applied at foundry)
 - a Neenah R-1706
 - b Or City approved equal
5. Polypropylene Steps: ASTM C478
 - a M.A. Industries (PS-2-PFS)
 - b Or City approved equal
6. Pre-formed Plastic Gaskets.
 - a "Rub'r-Nek: K.T. Snyder Co
 - b "Kent Seal", Hamilton-Kent Manufacturing Co
 - c GS #79, 44, or 4, General Sealants
 - d ConSeal, CS202
 - e Or City approved equal
 - f "Ram-Nek" is not acceptable

END OF SECTION
