

CITY OF SALIDA

DESIGN CRITERIA MANUAL
FOR
WATER, SEWER, AND STREETS



PREPARED BY CITY OF SALIDA
DEPARTMENT OF PUBLIC WORKS

Effective January 1, 2017



FORWARD

The City of Salida's Design Criteria Manual for Water, Sewer, and Streets provides guidance for the design and review of public improvements. The City of Salida's Standard Specifications for Construction provide criteria for construction of public improvements.

These documents are intended to provide consistency through the design, review, and construction of facilities and to maintain a high level of quality in public improvements.

These documents are not intended to limit the innovativeness of design engineers or the experience of contractors. Users are encouraged to submit their ideas for improvements to these documents.

A handwritten signature in black ink that reads "David Lady".

David Lady, P.E.
Director of Public Works

SECTION 1.00 - GENERAL PROVISIONS

1.1 ENGINEERED DESIGN

A Registered Professional Engineer licensed to practice in the State of Colorado shall design all road, water, and sewer public infrastructure improvements and any system modifications within the City of Salida.

A. PLAN SUBMISSION

All water and sewer designs shall be submitted to the City on 24" x 36" sheets and electronic PDF's for review and approval prior to construction.

B. CITY APPROVAL

All designs must be approved by the City prior to commencement of construction. City approval will be given when, in the reviewer's opinion, the proposed plans conform to the City specifications and otherwise meet the needs of the City and applicable engineering standards.

C. AS-BUILT DRAWINGS

When construction has been completed to the satisfaction of the City, the Project Engineer shall submit As-Built Drawings of the project to the City.

D. CERTIFICATE OF COMPLETION

Upon approval and acceptance of the As-Built Drawings by the City, a Certificate of Completion for the project will be issued. The system may then be placed in service.

E. NOTICE OF ACCEPTANCE

Upon request by the Contractor after completion of the warranty period, and after correction of any deficiencies, the City will issue a Notice of Acceptance, relieving the Contractor of any further responsibility for the work.

1.2 AS-BUILT DRAWINGS

- A. Prior to issuance of the Certificate of Completion by the City of improvements, the Developer or Contractor shall provide the City with two sets of "AS-BUILT" drawings, one on 24" x 36" sheets; the other in digital form. These drawings shall have been prepared and signed by the Project Engineer, and shall show in sufficient detail all actual "as constructed" station numbers, elevations, dimensions, offsets, and details needed to locate, maintain, and connect to the facilities. Manholes, valve boxes, buried tees, wyes, ells, and services shall be located by station number and offset from centerline. Additionally, water and sewer line appurtenances shall be surveyed by a licensed surveyor. The basis shall be City control points with Northing and Easting and elevation of the appurtenance. This data shall be provided to the City in an electronic format (AutoCAD) and .shp files in State Plane Coordinate system.
- B. Satisfactory "AS-BUILT" drawings must be delivered to Public Works before the City will (1) accept the work; (2) issue a Certificate of Completion, (3) release final payment for work performed for the City; (4) issue a Certificate of Occupancy; or (5) issue a lien release for property served by the work. Failure to submit AS-BUILT drawings acceptable to the City may result in termination of City water and sewer service.

SECTION 2.00 - WATER DISTRIBUTION SYSTEM MATERIALS AND INSTALLATION

2.1 SCOPE

Water distribution systems in the City of Salida shall be designed and constructed in accordance with the standards of the American Water Works Association (AWWA), the Ductile Iron Pipe Research Association (DIPRA), the pipe manufacturer's recommendations, and with this specification. All applicable ANSI/AWWA standards apply including but not limited to: C150/A21.50, C150A21.51, C600, C651, AWWA C900 and AWWA C905. The latest editions are applicable.

American Water Works Association

6666 West Quincy Avenue

Denver, Colorado 80235

Handbook of Ductile Iron Pipe, Sixth Edition

Ductile Iron Pipe Research Association

245 Riverchase Parkway East

Birmingham, Alabama 35244

2.2 GENERAL

- A. Materials shall be in accordance with technical specifications and Section 02512 (Site Water Distribution).
- B. Piping for water transmission, distribution and service lines up to 5-ft beyond the meter pit to be installed in easements or public right-of-way under the jurisdiction of the City, shall be designed, fabricated and installed per engineered plans as approved by the City and as hereinafter specified. The specific requirements for excavation and resurfacing over pipelines are detailed elsewhere in these Standard Specifications. Select fill and bedding for water line installations shall be strictly adhered to and followed. The City of Salida Public Works Department or the City Engineer will inspect all installations prior to backfill.
- C. Private unmetered water mains and private hydrants shall be prohibited. Private mains constructed solely for fire line service to buildings may be reviewed and approved on a case by case basis.
- D. Some existing water main lines within the City of Salida are ductile iron. The City of Salida reserves the right to require ductile iron piping for sections of new water main line within the developed portion of the City that will connect to ductile iron at both ends. The intent is to avoid having a distribution system with PVC products sandwiched between ductile iron water main lines.
- E. PVC main line piping shall include tracer wire. See paragraph 8 under PVC piping.
- F. Contractors and developers shall provide as-built record drawings for all water main line installations. Water main line valves, tees and appurtenances shall be survey located and the coordinates provided to the City via the record drawings. The City will provide the coordinate base and datum for this work. (refer to section 2 I)
- G. Water main extensions shall be designed to make continuous loops, connecting to the City water system in at least two points wherever possible to provide alternate sources of supply

2.3 DESIGN CRITERIA

- A. The City will designate connection points for new pipeline extensions, and will provide the project designer with available information on existing pipe size and system pressure at those connection points. The Project Engineer shall size the water main extensions to provide adequate flow rates to properly serve the population of proposed development. New distribution lines shall be no less than 8-inch diameter. All design calculations and design criteria shall be submitted to the City for review and approval by the City Engineer.
- B. All offsite improvements necessary to accommodate new improvements shall be the responsibility of the developer/applicant.
- C. Water mains shall generally be placed on street centerlines or as determined by the Public Works Director. Water mains shall be installed to maintain five feet (5') of cover from the top of the pipe to the final finished street or landscaped area grade.
- D. Water main extensions for developments of 20 units or more shall be designed to make continuous loops, connecting to the City water system in at least two points to provide redundancy of supply.
- E. In Residential Areas, fire hydrants shall be installed a maximum of 500 linear feet apart, measured along the street, generally at each intersection, with a travel distance of no more than 250 lf from any point on the street to the nearest hydrant. In Business, Commercial, Industrial, and High Density Residential Areas hydrants will be located in conformance with the Uniform Fire Protection Code. Where practical, hydrants shall be set on the side of the street closest to an inbound fire truck. Hydrant locations must be approved by the Public Works Director and by the Fire Chief. The Project Engineer will stake the location and elevation for all hydrants. In general, hydrants will be set centered between the curb and the sidewalk, with the bottom of the hydrant base flange set 1" to 3" above top back of curb.
- F. Service line and meter sizing shall be in accordance with AWWA Manual M22.
- G. Meter Sizing Summary based on GPM calculated using the City of Salida Spreadsheet (see spreadsheet file) referencing AWWA M22 criteria is as follows:

Figure 1-0

Meter Sizing			
Meter Sizing		Service Size Min*	Meter Design Capacity (gpm)
5/8 "x 3/4 "	0.625	1	25
3/4 "	0.75	1	35
1 "	1	1.5	70
1 1/2 "	1.5	2	120
2 "	2	3	170
3 "	3	3	250
4 "	4	4	400
6 "	6	6	800
*HDPE for 2" and smaller services			
**Min service size shown above. Actual service sizing shall comply with AWWA M22 with respect to velocity and pressure loss requirements			
***Service sizing / tap sizing requirements per AWWA M22 provided herein are minimum up to the meter. Service sizing up to the fixture shall be based on flow rate and pressures set forth in adopted building code requirements			
***Tap fees are assessed based on EQR per City code and not based on sizing determined above.			

Water Demand Estimate and Meter Sizing Using Fixture Values			
(Based on AWWA M22 Manual, Second Edition)			
Project			
Residential, Non-Residential, M.F.	Residential Multi-Family		
Pressure Zone at Project	60		
Fixture or Appliance	Fixture Value (at 60 psi)	Number of Fixtures	Subtotal Fixture Value
Toilet (tank)	4		0
Toilet (flush valve)	35		0
Urinal (wall or stall)	16		0
Urinal (flush valve)	35		0
Shower (single head)	2.5		0
Sink (lavatory)	1.5		0
Kitchen Sink	2.2		0
Utility Sink	4		0
Dishwasher	2		0
Bathtub	8		0
Clothes Washer	6		0
Hose connections (with 50 ft of hose)			
1/2 in.	5		0
5/8 in.	9		0
3/4 in.	12		0
Miscellaneous			
Bedpan washers	10		0
Drinking fountains	2		0
Dental units	2		0
Combined Fixture Value			0
Demand (gpm) - See Curves			0
Pressure Adjustment Factor			1
Total Adjusted demand (gpm)			0
Minimum Meter Size			5/8 "x 3/4"
Service Line Velocity (fps)			0.0
Minimum Service Size (HDPE)			1"
Approved by:			
calculated			
user inputted			

Figure 1-1

(.xls available for design)

SECTION 3.00 – SANITARY SEWER SYSTEM MATERIALS AND INSTALLATION

3.1 SCOPE

Sewage collections systems in or for the City of Salida shall be designed and constructed in accordance with the standards promulgated by the Water Quality Control Division of the Colorado Department of Public Health, by the Uni-Bell PVC Pipe Association, and by this specification.

Design Criteria Considered in the Review of Wastewater Treatment Facilities

Policy 96-1

Colorado Department of Public Health & Environment

Water Quality Control Division

4300 Cherry Creek Drive South

Denver, Colorado 80222-1530

Handbook of PVC Pipe 5th Edition

Uni-Bell PVC Pipe Association

2711 LBJ Freeway, Suite 1000

Dallas, Texas 75234

3.2 GENERAL

- A. Materials shall be in accordance with technical specifications and Section 02412 (Site Sanitary Sewer).
- B. Mains and public facilities to be installed in easements or public right-of-way under the jurisdiction of the City, shall be designed, fabricated and installed per engineered plans as approved by the City and as hereinafter specified. The specific requirements for excavation and resurfacing over pipelines are detailed elsewhere in these Standard Specifications. Select fill and bedding for water line installations shall be strictly adhered to and followed. The City of Salida Public Works Department or the City Engineer will inspect all installations prior to backfill.
- C. All offsite improvements necessary to accommodate new improvements shall be the responsibility of the developer/applicant.
- D. Low pressure sanitary sewer system shall be prohibited unless approved on a case by case basis as private infrastructure. Public lift stations shall also be prohibited.
- E. Contractors and developers shall provide as-built record drawings for all public main installations. Mains, manholes, and appurtenances shall be survey located and the coordinates provided to the City via the record drawings. The City will provide the coordinate base and datum for this work. (refer to section 2 I)

3.3 DESIGN CRITERIA

The main collection system for all developments shall be designed and constructed by the developer. Design of the system shall be the responsibility of the developer (or owner) with all plans and design calculations subject to review and approval by the City.

A. PIPELINE MATERIALS

1. All public sewerage collection pipelines shall be constructed of Polyvinyl Chloride (PVC) pipe manufactured in conformance with ASTM D-3034 (SDR 35), having a nominal inside diameter not less than 8".

B. PIPELINE SIZES

1. Sewer collection pipelines shall be sized to carry the Design Flows based upon service area population estimates by the Project Engineer. Should the City conclude that a proposed new pipeline will ultimately serve a larger area and population than is included in an individual project; the City may direct the Project Engineer to design a larger pipeline. .
2. Multiple buildings within a single lot shall each require a singular water and sewer lateral connected to a mainline.
3. The Project Engineer shall design all sewer pipelines. In the absence of defensible design criteria to the contrary, the design shall be based upon the following sewage flow criteria:
 - a. **Average flow** shall be determined by the following:
 - i. Residential - on a basis of 3.5 people per residence and 100 gallons per day per person
 - ii. Multi-family Areas - on a basis of 300 gallons per day per living unit.
 - iii. Commercial Areas - on a basis of 4600 gallons per day per acre or actual usage, whichever is greater. Design criteria for commercial areas shall meet the International Plumbing Code requirements.
 - iv. Industrial Areas - on a basis of 5040 gallons per day per acre or actual usage, whichever is greater. Design criteria for industrial areas shall meet the International Plumbing Code requirements.
 - b. **Peak Flow:** The average flow shall be multiplied by a peaking factor to obtain the peak design flow. The Project Engineer shall submit his peaking factor calculations and assumptions to the City with the plans.
 - c. **Infiltration** shall be estimated using the following method. The larger result obtained using these calculations shall be added to the peak flow to determine the design flow.
 - i. A factor of 75 gallons per inch diameter of pipe per day multiplied by the total length of pipe in miles and the diameter in inches.
 - ii. Engineering estimate based on soils report(s) and proximity of sewer lines to seasonal ground water table.
 - d. **Design Flow:** The sum of the peak flow and the infiltration allowance shall be used to calculate pipeline size.

C. CALCULATIONS

The Project Engineer shall provide the City with copies of his estimates and calculations.

D. GREASE TRAP REQUIREMENTS:

1. For all commercial developments concerning the preparing of food, all fats, oils and grease (FOG) shall be directed through an appropriately designed interceptor or trap. Said device shall be

designed and constructed per the latest edition of the International Plumbing Code. Public Works will require that operators of grease traps maintain maintenance records for all grease traps and provide these to the City upon request. Waste grease transporters must be registered with the Colorado Department of Public Health and Environment and provide evidence of this registration to the City along with maintenance records.

3.4 LOCATION, COVER AND SEPARATION

- A. Sewer mains shall generally be located under streets, south and west of street centerlines, or on centerlines of alleys. Sewer mains shall not be designed or installed in easements outside of public rights of way unless written permission is obtained from the City and an easement is provided to the City for all appurtenances that may require City maintenance.
- B. Sewer mains shall be located a minimum of ten (10) feet horizontally from existing or proposed water mains.
- C. Manhole locations shall be shown on the plans by street station number and lateral offset from centerline.
- D. Sewer mains shall be designed deep enough to serve basements and lower level bathroom facilities wherever possible. The Project Engineer shall endeavor to place all sewers 7' below finished street grade. At a minimum, all sewers shall be at least three and one-half (3 1/2) feet deep, measured from the top of the pipe to the proposed finish street grade. Where possible, sewers shall be installed deep enough to accommodate all future extensions and connections that can be foreseen.

3.5 ALIGNMENT AND SLOPE

- A. Sewer mains shall be designed such that the full flowing velocity is not less than two (2) feet per second, or greater than ten (10) feet per second. Sewer mains shall be designed so that the pipeline between any two adjacent manholes is on a straight line.

MINIMUM SEWER SLOPE

Minimum Slope in Feet

<u>Sewer Size</u>	<u>per 100 Feet</u>
8-inch	0.40
10-inch	0.30
12-inch	0.28
14-inch	0.25

- B. For all pipelines greater than 14 inches, the maximum velocity at any flow depth shall not exceed 10 feet per second. Minimum velocity, when flowing 75% full shall not be less than 2 feet per second.
- C. The minimum slope of the sewer line shall be 0.5% within 200 linear feet both upstream and downstream of all manholes angled greater than 45 degrees.

SECTION 4.00 - MINIMUM STREET DESIGN AND ACCESS CRITERIA

4.1 GENERAL

A. INTRODUCTION

The purpose of this document is to specify established standard principles and practices to be used in the design and construction of streets in order to provide for uniformity of streets within the City of Salida and to ensure the safety of the general public. Designs of streets for construction within the City of Salida shall be approved by the City prior to such construction. The design factors, formulas, and tables are intended to serve as guidelines for street design. All streets shall be designed and drawings stamped by a Colorado Registered Professional Engineer.

Unless modified herein, all designs shall comply with the CDOT (Colorado Department of Transportation) *Pavement Design Guide*, (2013 or latest edition). Other manuals recommended for reference include *A policy on Geometric Design of Highways and Streets* (6th or most current editions). This is also known as the AASHTO "Green Book" and *Guidelines for Geometric Design of Very Low Volume Local Roads* (ADT < 400) both published by AASHTO (American Association of Street Highway and Transportation Officials). Deviation from the requirements of these criteria must be approved by the Public Works Director.

B. STREET CLASSIFICATIONS

The following classifications shall be utilized in determining the criteria under which a street is to be designed.

1. **Local Streets** – Provide primary access to abutting properties.
 - a. Commercial
 - b. Residential
2. **Collector Streets** – Carry traffic from local streets to Arterial Streets, Highways and Principle generators within the community, such as neighboring shopping centers, schools and recreation areas.
3. **Arterial Streets** – Designed for the movement of through traffic and heavy local traffic. Arterials generally connect major traffic generators. In most instances, parking is not allowed on arterials. Having greater than 2000 vehicle trips per day.

C. SOILS AND MATERIALS TESTING

1. All soils and material testing shall be done by a soil/material-testing firm under the supervision of a Colorado Registered Professional Engineer.
2. Improvements made within City ROW shall include soils testing and identification of the existing sub surface conditions. A soils report shall be submitted to the City with recommendations for structural section. Structural sections shall designed in accordance to Section 3, H
3. Improvements within City ROW shall be observed and inspected during construction by a soil/material-testing firm. The work of the field technician shall be supervised by a Colorado registered professional engineer. The testing shall include all subgrade and all materials making up the structural section including the rigid or flexible pavement per the approved design. The firm will be required to provide quality control testing results to the City as the work progresses.

All tests shall meet CDOT requirements. The City shall be notified of any failed tests or unsuitable soils on site. Reports shall be provided to the City on a monthly basis at minimum.

4. If unsuitable soils are encountered, a modified design shall be submitted by engineer responsible for the design to the City for approval.
5. The City may not accept projects or may require a longer warranty period if there are test failures or testing has not been completed according to the requirements of this section or recommendations by the soils-testing firm.

D. DESIGN SPEED

1. The choice of design speed is influenced principally by the character of terrain, type of roadway and traffic volume.
2. Design speeds to be utilized for street design in the City of Salida are listed in Table 3.

E. RIGHT OF WAY

1. The width of rights-of-way (ROW) required depends on the proposed or future street classification, topography in the area, and other physical controls. Minimum ROW widths are listed in Table 2.
2. Additional ROW width may be required to facilitate future widening and other improvements as traffic and development warrants or where it is necessary to meet side slope requirements. A meeting to discuss this with the Salida Community Development Director during the planning and design stage is recommended.

F. PATCHING

Patching on streets in which a trench has been excavated shall consist of a 'T' patch. 'T' patch will be done so that after trench is filled and compacted a strip of asphalt twelve (12) inches wider than trench shall be cut out and replaced with new asphalt. Patch depth shall be the depth of existing asphalt but in no case less than 2 inches. On all cuts within the City ROW the pavement shall be cut by either saw or wheel to neat straight lines.

4.2 BASIC DESIGN PARAMETERS

Roadways shall be designed using the standards in the CDOT *Pavement Design Guide* unless otherwise modified herein. Items not covered in either source shall use *A policy on Geometric Design of Highways and Streets (6th or most current editions)*. This is also known as the AASHTO "Green Book".

A. SIGHT DISTANCE

A primary consideration in the design of a street is to provide adequate sight distance for safe and efficient operation. There are two types of sight distance to be considered, that required for visibility at an intersection, and that required for stopping. AASHTO standards shall be met for these types of sight distance.

B. HORIZONTAL ALIGNMENT

1. *Standard for Curvature*-Table 3 gives minimum centerline radii for curves. The table is based on design speed only. Increased radii may be required if minimum sight distances are not satisfied.
2. *Superelevation*-Refer to the CDOT Design Guide, latest edition. For low speed Local Streets superelevation is generally not used. Consult with the City if superelevation is considered.

3. *Small Deflection Angles*-For small deflection angles, curves should be of sufficient length to avoid the appearance of an angle in the road.
4. *Reversing Curves*-True reversing curves shall not be used in the City of Salida except as noted herein. In cases where curves in opposite directions must be used, a tangent between shall be used. A minimum 100-foot tangent shall be used if at all possible between reverse curves to facilitate steering and control. Lesser tangent lengths may be considered with deflection angle curves less than 10 degrees.
5. *Broken Back Curves*-Broken back curves consisting of two curves in the same direction joined by a tangent less than 50 feet shall not be used in the City of Salida, except on local streets with prior approval from the City Engineer.
6. *Coordination with Vertical Alignment*-To avoid the possibility of introducing serious traffic hazards, coordination is required between horizontal and vertical alignment. Particular care must be exercised to maintain proper sight distances at all times.
7. *Pavement Transition*-A pavement transition is the area of variable pavement width encountered when changing from one roadway width, or section, to another. All pavement transitions shall be based on the following formula:

$$L = WS^2 / 60$$

Where: L = length of transition or taper (in feet)

S = posted speed limit (in mph)

W = offset in feet

C. VERTICAL ALIGNMENT

1. *Grade Line*-The grade line is a reference line by which the elevation of the pavement and other features of the roadway are established. The grade line shall coincide with the street centerline for all streets.
2. *Grade*-The minimum and maximum grades as measured at the centerline shall be 0.5% and 7%, respectively.
 - a. Excessive changes in grade which create a roller coaster effect shall not be permitted. Connections with existing streets shall be smooth transitions and existing grades shall be shown in the design for at 150 feet on all sides of a connection.
3. *Vertical Curves*-Properly designed vertical curves should provide adequate sight distance, safety, comfortable driving, good drainage, and pleasing appearance. Vertical curves in the City of Salida shall be parabolic curves.

SECTION 5.00 - CROSS SECTION ELEMENTS

5.1 CONCRETE PANS, CURBS AND GUTTERS (CONCRETE DRAINAGE)

A. GENERAL

Minimum grade in all concrete drainage systems shall be 0.5% measured along flowline. Concrete drainage systems shall be used when justified by sound engineering reasons based on the following:

1. Where required for proper drainage.
2. Where needed for channelization, pavement edge delineation, control of access, pedestrian safety, or other means of improving traffic flow and safety.

B. TYPES

For specifications on types of concrete drainage systems available refer to these Standards and in some cases to CDOT Standard Plans—M & S Standards, latest edition. Refer to these types as specified in that publication on any plans submitted to the City.

C. CROSS PANS

1. Cross pans for drainage, located at stop intersections, shall be a minimum of 4 foot at stop signs and 6 foot on through streets and/or shall be designed to carry the 25 year storm within the structure. Depths shall not be greater than 1-in per 1-ft in width.
2. Cross pans are not allowed on Collector streets unless specifically approved by the Public Works Director.
3. Cross pans are not allowed on Arterial streets.
4. Cross pan approaches shall be designed using the appropriate design speeds as given in these specifications.
5. Crown transitions where approaching a cross pan or an intersecting street shall be at maximum of one percent change 25 feet.

D. LOCATION

Where concrete drainage systems are used, street width requirements shall be measured from lip of concrete to lip of concrete. The Public Works Director shall be consulted on the type of concrete drainage to be used at any location in the City.

E. CONCRETE CLASS AND ADDITIVES

Concrete used for concrete drainage and sidewalks shall meet the following minimum requirements.

1. *MixDesign* – A mix design shall be submitted to the City for all concrete to be used within City ROW.
2. *Strength* – Minimum 4000 psi.
3. *Fibers* – “Fibermesh” fibers or approved substitute shall be added to the concrete for strength, at the rate of 1.5 pounds of fiber per cubic yard of concrete. The use of fiber mesh, if used in lieu of reinforcing steel shall be accounted for in the design by the project engineer.

5.2 TRAVEL LANE STANDARDS

A. CROSS SLOPE

1. Cross slope on all streets shall be a minimum of 2.0 percent measured from street centerline to edge of asphalt or concrete. In areas of minimum centerline grade, 3.0 percent shall be considered.
2. Temporary unpaved streets shall be crowned to 3.0 percent.
3. When existing streets are overlaid, the maximum cross slope shall not exceed 4.0 percent measured as above.
4. Width
 - a. Street and alley asphalt widths depend on the total number of traveled lanes. Minimums are listed in Table 2.

5.3 SHOULDER STANDARDS

A. WIDTH

The width of improved shoulder will vary with the use and location. The improved shoulder shall consist of 6 inches of compacted road base at grade with the improved roadway surface. If parking is to be allowed by the City 8 foot shoulders shall be used. If parking is not allowed then 3 foot shoulders shall be used and the roadway shall be signed designating no parking. The decision to allow or not allow parking shall be made by the City of Salida.

B. SIDE DITCHES

Side ditches shall be used in all cut sections. All roadside swales shall be sized to handle the historical 25-year storm flows tributary to the street, unless alternate routes for the major runoff are provided. Culvert sizes shall be designed to carry the 25-year historical flows (streets that are State Highways shall follow CDOT guidelines). The slope from the edge of the shoulder to the bottom of the side ditch shall not exceed 3:1

C. SIDE SLOPES

Side slopes shall not exceed 2:1, unless otherwise approved by the City Engineer. Where slopes equal to or greater than 2:1 are used, special provisions for erosion control and re-vegetation shall be made. Any proposal to deviate from a maximum 2:1 slope shall be accompanied by a geotechnical engineering dealing with the slope treatment being proposed.

5.4 MINIMUM CULVERT DIAMETERS

A. SIZE

All culverts installed shall be sized to handle the 25-year (historical) storm flows. the minimum allowable culvert size shall be 12 inches. All culverts shall be installed with flared end sections. HDPE flared end sections shall have a design concrete collar.

B. COVER

Minimum cover over all culvert shall be 12 inches from top of pipe to finish road grade, unless otherwise approved by the Public Works Director.

C. TYPE

For City drainage systems either smooth wall high density polyethylene (HDPE) or reinforced concrete pipe (RCP) shall be used.

5.5 RETAINING WALLS

Where necessary to meet required side slope grades, walls may be utilized.

A. HEIGHT

Retaining walls may not exceed 6 feet in height. If a greater height is needed, the wall must be stepped in maximum 6-foot increments with a minimum 4-foot shelf.

B. LOCATION

Retaining walls may not be located closer than ten (10) feet from the traveled lanes (maximum separation is desired).

C. DESIGN

Retaining wall must be designed by a Colorado Registered Professional Engineer and are subject to City review and approval.

5.6 GUARDRAIL

Guardrail requirements shall be as specified in the CDOT Roadway Design Manual, latest edition. Corten steel shall be used for all guardrail installations unless otherwise approved by the City.

5.7 SIGNS

All signs and street markings shall be designed, constructed and placed in accordance with the Manual of Uniform Traffic Control Devices, latest edition, unless otherwise approved by the City.

5.8 PAVEMENT

A. GENERAL

1. Design of the pavement structure is the determination of the thickness of sub-bases, bases, and surfacing to be placed over sub grade soils. The basic purpose is the selection of the most suitable, available materials and their most advantageous use.
2. Pavement shall be designed for a 20-year life and designed by a Colorado Registered Professional Engineer based on design traffic loading (equivalent single axel loads).

B. TYPE OF SURFACING

Both bituminous pavement and concrete are acceptable surfacing for use on streets in the City of Salida. The determination as to which type of surfacing to use is based on several factors including:

1. Traffic loading and volume
2. Soils in the area
3. Life cycle cost analysis
4. Performance of similar materials in the area

C. THICKNESS DESIGN

Thickness design shall be in accordance with the procedures as outlined in the CDOT Pavement Design Guide, latest edition. All new streets constructed in the City of Salida must be designed per these methods or other methods acceptable to the Public Works Director.

D. MINIMUM BASE AND ASPHALT THICKNESS

The pavement design shall be used unless the designed thickness is less than the minimum allowable according to the street classification found in Table 2.

E. MINIMUM BASE AND CONCRETE PAVING THICKNESS

Minimum shall be per design analysis based on the CDOT Pavement Design Guide. The minimum shall be 8" for design loading of 1,000,000 equivalent single axel loads (ESAL's) or more and a minimum of 6" for less than 1,000,000 ESAL's. Driveways and approaches shall have a minimum of 6" unless design structural section dictates additional thickness.

F. COMPACTION

All asphalt shall be compacted to 92% - 96% modified proctor.

G. PORTLAND CEMENT CONCRETE PAVEMENT

Concrete shall conform to CDOT requirements for Class "P". "Fiber-mesh" fiber or approved substitute shall be added to the concrete, for strength, at the rate 1.5 pounds of fiber per cubic yard of concrete.

SECTION 6.00 - OTHER ELEMENTS OF DESIGN

6.1 INTERSECTION

A. MINIMUM ANGLE OF INTERSECTION

Intersections shall approximate right angles as closely as possible. The minimum angle allowed for any type of intersection shall be 70 degrees.

B. RADIUS

All intersection shall have a paved radius on all four corners with minimum radius as in Table 1.

C. CROSS STREET STANDARD

All local streets intersecting an Arterial Street shall be constructed to Collector Street standards for a distance of 200 linear feet as measured from the edge of the Arterial ROW. This shall include street width (asphalt and base) and ROW width.

D. GRADES

Grades at intersections shall not exceed two percent (2%) at any point for 100 feet from the edge of the intersecting street, nor shall the grade exceed four percent (4%) overall for 200 feet from the same edge. Maximum grades may be increased beyond five percent (5%) for short distances in extreme terrain, or when existing conditions warrant, when approved by the City of Salida.

E. SEPARATION

1. A proposed street and an existing street which intersect a common third street shall have a centerline no closer than one hundred twenty five feet (125') from one another
2. Any two (2) proposed streets which intersect a common third street shall have a centerline no closer than two hundred fifty feet (250') from one another.
3. No more than two (2) streets shall intersect at any point. A street shall have a minimum straight distance of one hundred feet (100') from the intersection before it may be curved.
4. The length of local streets between intersections shall be a maximum of four hundred feet (400').

6.2 CUL-DE-SACS AND DEAD ENDS

A. CUL-DE-SACS

Cul-de-sacs shall not exceed three hundred feet (300') in length, unless it can be shown, to the satisfaction of the City, that a longer cul-de-sac would not create safety problems. Cul-de-sacs shall have a minimum paved radius of forty-five feet (45') at the closed end. Cul-de-sacs shall be located at least forty feet (40') from intersections.

B. DEAD-END STREETS

Dead-end streets (except for cul-de-sacs) shall be prohibited unless they are designed to connect with future streets on adjacent land that has not been platted. In such case a temporary turn around of at least 80 foot in diameter shall be provided. Use of a hammerhead type turn may be considered in special cases if approved by the Public Works Director.

C. GENERAL

Cul-de-sacs and Dead-end streets shall meet the minimum design standards as in the 2000 International Fire Code, Appendix D, or latest edition and shall be approved by the City Fire Chief.

6.3 PARKING SPACES

A. SIZE OF PARKING STALLS

1. 30 degree to 90 degree—The minimum size for this type of parking shall accommodate an 18.5' by 9' rectangle within the stall.
2. Parallel spaces—Shall be 22' as measured along the street and 8 feet wide
3. Handicap Stalls—Shall be a minimum 8' wide by 18.5' long, with a 5' accessibility lane or 8' accessibility lane for vans. Handicap stalls placed on an angle shall accommodate an 8' wide by 18.5' long rectangle within the stall and accessibility lane as measured perpendicular to the stall.

6.4 DRIVEWAYS (ACCESSES)

A. GENERAL

The term driveway or access are interchangeable terms and refer to the specific locations granted to properties adjacent to City ROW for the purpose of accessing the property through City ROW from City streets for all purposes including parking areas, dumpster enclosures, garages, etc.

B. INTENT OF REQUIREMENTS

Driveway spacing and widths have been established for aesthetic, maintenance purposes, and safety reasons.

C. REQUIREMENTS

A combination of these factors and others such as sight distance and safety has governed the following.

1. *Proximity to an intersection* – Driveways accessing City ROW near an intersection of an Arterial shall be a minimum of 50' and for all other street classifications shall be a minimum of 35' from the intersecting street ROW. When this spacing cannot be achieved (for example, due to lot size or topography) every effort will be made to place the access as far from the intersection as possible.
2. *Access to Single Family* – Only one access will be allowed to single family residences. More than one access will be considered by variance on corner lots.
3. *Widths of Driveways* – The width of any driveway connecting an off-street parking area with a public street, alley, or highway shall fall within the ranges as shown below, as measured within the City ROW

Single-family homes	9 ft min, 16 ft min
Duplexes or Multi-Units	9 ft min, 12 ft min (one way) 24 ft max (two way)
Commercial/Business	12 ft (one way), 24 ft (two way)

- a. *Angle of intersection* – All driveways shall intersect the access street at 90 degrees.
- b. *Access to Arterial Streets*- No driveways will be allowed onto arterial streets unless no other access to the lot exists. New subdivisions will not be approved on which driveways exit onto Arterial streets.

c. *Approved materials* – materials approved for driveways include Class 6 road base: 4000psi natural concrete (no color or stamp allowed); Gravel 1 inch or less; Asphalt.

4. *Exemption and Conformity* – Driveways which are to be repaved (existing driveways) can be done to the previous width. Existing gravel driveways, which are to be paved, shall conform to these requirements.

6.5 PEDESTRIAN/BICYCLE FACILITIES

- A. When pedestrian or bicycle pathway are required by the Planning Department, such facilities shall meet the following requirements.
- B. Minimum sidewalk width shall be five feet, six feet on Collectors and Arterials
- C. Minimum Bike pathway width shall be ten feet wide with one foot compacted road base shoulders 6” thick on each side.
- D. Minimum section for both shall be either four-inch concrete with three inch compacted road base on a prepared subgrade or three inches of asphalt with six inches of road base on a prepared subgrade.
- E. Concrete shall comply with requirement in Section 3, A, 5.
- F. Pedestrian/bicycle pathways shall have handicap ramps in compliance with ADA standards.
- G. Reduced widths for bike paths may be considered where ROW widths are limited.

6.6 TEMPORARY UNPAVED STREETS

Under certain circumstances, the Public Works Director may allow either a delay of final paving of a new street, or a delay in the final lift, until the following construction season to allow sufficient time for roadway stabilization or until a certain percentage of build out occurs. In those cases, all street construction up to and including base work shall be completed. Unpaved streets shall be graded to a three percent crown and then regarded and compacted as required by these standards prior to paving. Unpaved streets will not be accepted by the City for maintenance purposes.

6.7 EROSION CONTROL

A. INTRODUCTION

- 1. Care shall be taken in designing streets to minimize the total area disturbed, as well as to have all disturbed areas replanted to prevent future erosion.
- 2. Developer/contractor must follow all State regulations concerning storm water and erosion control.
- 3. An acceptable erosion control plan must be approved by the City of Salida and utilized by the Contractor to prevent excessive erosion during and after construction. If, in the opinion of the Public Works Director, adequate measures to control erosion are not being taken, the contractor may be ordered to stop all work within City ROW until satisfactory arrangements for control are made.

B. RESEEDING

- 1. All areas disturbed within City ROW during street construction shall be covered with 4 inches of topsoil and reseeded with a native seed mix that is certified free of noxious weeds and approved by the City following completion of the Work.

2. The mix shall be applied to a smooth base area free from foreign matter and excessive amount of rock (three inch diameter or larger). The mix shall be applied at a rate and in a manner as recommended by the seed supplier. Following seeding, all areas shall be fertilized.
3. Reseeding is required unless an alternative is approved by the City during the planning process.
4. Immediately following seeding and fertilizing mulch areas with native hay at a rate of two tons per acre. The hay shall be mechanically crimped into the soil or hand tilled.

C. STEEP SLOPES

1. Any slopes 2:1 or greater shall receive, in addition to all requirements above, an approved soil erosion blanket, approved by the Public Works Director. Slopes greater than 2:1 require specific engineering design and are subject to approval by the City.

6.8 OTHER

Any improvements required on any portion of an existing street, which serves as the access for a new development, shall be designed and paid for by the developer of that new development. New and existing roadways shall be designed or improved to handle the additional traffic volume generated.

SECTION 7.00 - MODIFICATION OF THIS SPECIFICATION

7.1 CHANGES

The City of Salida may edit, amend, improve, or change these Specifications from time to time, as the Public Works Director shall deem necessary and in the best interests of the City. Plans submitted for review subsequent to the effective date of any revisions shall conform to the revised specification.

7.2 PROHIBITION AGAINST RETROACTIVE APPLICATION

Changes to the Specifications shall not be applied retroactively to plans already approved for construction.

TABLE 1

INTERSECTION DESIGN

Design Topic	Street Type			
	<i>Alley</i>	<i>Local</i>	<i>Collector</i>	<i>Arterial</i>
Minimum Curb or Edge of Asphalt Radius (feet)	5	10	15	20

TABLE 2

Street Type	Minimum Dedicated ROW (FT)	Minimum Paved Width (FT)	Minimum Allowable Base and Asphalt
ARTERIAL	100	36 foot paved w/c&g	4 inch asphalt 5 inch base
COLLECTOR	80	36 foot paved w/c&g	3 inch asphalt 4 inch base
LOCAL (COMMERCIAL)	60	36 foot paved w/c&g	4 inch asphalt 5 inch base
LOCAL (RESIDENTIAL)	60	24 foot paved 36-ft paved w/c&g	3 inch asphalt 4 inch base
ALLEYS	20	20 foot paved	3 inch asphalt 4 inch base
CUL-DE-SACS	75 radius	45 foot radius paved	3 inch asphalt 4 inch base
PRIVATE STREETS	N/A	N/A	N/A

TABLE 3

<i>Street Type</i>	<i>DESIGN Speed (MPH) (See Note 1)</i>	<i>Minimum Centerline Radius (FT)</i>	<i>Minimum Tangent Between Curves (FT)</i>
<i>Local</i>	25	75	50
<i>Collector</i>	35	300	150
<i>Arterial</i>	35	300	150

NOTES:

- 1. Design speed is not necessarily posted speed*