ORDINANCE NO. 435

AN ORDINANCE OF THE CITY OF SISTERS AMENDING THE SISTERS MUNICIPAL CODE SECTIONS 12 AND 13, PUBLIC WORKS CONSTRUCTION STANDARDS FOR STREETS, SIDEWALKS, WATER, SEWER, DRAINAGE AND OTHER APPURTENANT FACILITIES, AND DECLARING AN EMERGENCY.

WHEREAS, to provide for uniform construction standards and quality standards, the City of Sisters has adopted Construction Standards for the construction of streets, sidewalks, water, sewer, drainage and appurtenant facilities; and,

WHEREAS, those Construction Standards were last updated by the City on December 12, 2013 per Ordinance 434; and,

WHEREAS, the Construction Standards for the installation of sewer and water infrastructure to and through a property need to be amended to provide for the construction of those improvements at a time and to the standards applicable at the time that infrastructure will actually be used; and,

WHEREAS, this amendment to the Construction Standards is necessary for the health, safety, and welfare of current and future city residents, visitors, and businesses;

NOW, THEREFORE, the City Council of the City of Sisters ordains as follows:

Section 1. The City of Sisters Municipal Code is amended as provided in the attached Exhibit A, which is incorporated into this Ordinance by reference.

Section 2. The City Council finds that it is necessary for the health, protection and safety of the residents of and visitors to the City of Sisters to have this ordinance take effect upon adoption and hereby declares an emergency. This ordinance, therefore, shall become effective on the date of passage.

PASSED by the City Council of the City of Sisters this 13th day of February, 2014 and **APPROVED** by the Mayor this 13th day of February, 2014.

Brad Boyd, Mayor

ATTEST:

Kathy Nelson, City Recorder

EXHIBIT A

CITY OF SISTERS

DESIGN STANDARDS

I. GENERAL

These are the minimum design standards for the City of Sisters. The following standards shall be adhered to unless an exception is granted in writing by the City Engineer. Exceptions will be granted based upon a design that is the functional equivalent of the design parameters listed herein. Street standards are generally in conformance with the American Association of State Highway and Transportation Officials (AASHTO) Geometric Design of Highways and Streets" 2004 Edition. This document is referred to as AASHTO throughout these standards.

II. DESIGN PARAMETERS

A. STREET

1. General

Materials and procedures for street improvements shall conform to the City of Sisters Specifications, Ordinances of the City of Sisters and Oregon Standard Specifications for Construction. Street width, alignment and placement shall meet the requirements of the City of Sisters Development Code. Street widths are shown in Table 1.

Table 1 - City of Sisters Right of Way and Roadway Design and Cross-Section Standards

Functional Class	Width (ft) Pavement standard*	Width (ft) Right of Way*	Travel Lanes	Sidewalks*	Bike Lanes*	Parking*
Residential Alley	20'	20'	n/a	none	shared	none
Residential Local Street with Parking On Both Sides	34' - 36'	44' - 58'	2	6'	shared	both sides
Residential Local Street with Parking On One Side**	28' - 30'	38' - 52'	2	6'	shared	one side
Standard Local Street (Commercial/Industrial)	26' - 42'	46' - 70'	2	6' - 8'	shared	optional
Neighborhood Route (With Bike Lanes)	48'	60' - 80'	2	6' - 8'	5'	both sides
Neighborhood Route	38'	60' - 80'	2	6' - 8'	shared	both sides
Collector (Commercial District - Diagonal Parking)	68'	80'	2	6'	5'	both sides
Collector (Commercial District - Parallel Parking)	48'	60' - 80'	2	6' - 10'	6'	both sides
Standard Collector	34'	44' - 64'	2	6'	6'	none
2-lane Arterial	36'	48' - 72'	2	6' - 8'	6'	none
3-lane Arterial	50'	62' - 86'	3	6' - 8'	6'	none
5-lane Arterial	74'	96' - 110'	5	6 '- 8'	6'	none

Note:
**See Sisters Transportation System Plan (January 2010), Chapter 7 - Motor Vehicle Plan, for further detail and*

explanation of cross section standards.
***"No Parking" signs shall be installed at a minimum of 60' spacing on the side of the street that does not have parking.*

Street alignment, wherever practicable, shall be in alignment with existing streets by continuations of the centerlines thereof. Staggered street alignments resulting in "T'" intersections shall, whenever practical, leave a minimum distance of 200 feet between the centerlines of streets having approximately the same direction.

Streets shall intersect one another at an angle as near to the right angle as is practicable considering topography of the area and previous adjacent layout. Street intersections shall be as near right angles as possible except where topography requires a lesser angle, but in no case shall the acute angle be less than 60°.

The intersection of an arterial or collector street with another street shall have at least 100 feet of tangent adjacent to the intersection unless topography requires a lesser distance. Other streets, except alleys, shall have at least fifty (50) feet of tangent adjacent to the intersection unless topography requires a lesser distance.

Consideration shall be given to future extensions of streets. Where necessary to give access to or permit a satisfactory future subdivision of adjoining land, streets shall be extended to the boundary of the subdivision; and the resulting dead-end streets may be approved without a turn around, subject to City review on a case by case basis. Reserve strips and street plugs may be required to preserve the objectives of street extensions.

2. Slope

Minimum longitudinal slope for drainage control at the gutter line for all streets is 1.0%. A minimum slope of 0.5% may be allowed by the City Engineer where 1% is not practical. A written request is required justifying the need for a variation and describing what will be done to ensure that constructed street grades are not less than design and storm drainage requirements are met.

Maximum street grades are as follows:

Arterials	6%
Collectors and Neighborhood Routes	8%
Local Streets and Alleys	10%

Maximum street grade may be increased up to 2 percent with City Engineer's approval.

To ensure that cross slopes are not exceeded during sidewalk ramp construction, maximum slope through intersections shall be 2%. Detailed slope and elevation information shall be provided for sidewalk ramps and curb returns and shall conform to Public Rights of Way Accessibility Guidelines (PROWAG) published by the Department of Justice. It is highly recommended that design slopes be set lower than the PROWAG maximum to allow for discrepancies during construction.

3. Sight Distance

All streets shall be designed to the following values for adequate safe stopping sight distance at the design speed, according to AASHTO:

15 MPH	80'
20 MPH	115'
25 MPH	155'

30 MPH	200'
35 MPH	250'
40 MPH	305'
45 MPH	360'
50 MPH	425'

4. Vertical Curves

The minimum centerline vertical curve length shall be as determined by AASHTO formulas given below. In general, minimum curve lengths shall be no less than three times the design speed of the roadway. For example, the minimum curve length for a local street designed for 25 mph shall be 75 feet

The minimum lengths of vertical curves shall be calculated from the following relationships.

	CREST CURVES	SAG CURVES
S > L	$L = 2S - \frac{2158}{A}$	$L = 2S - \frac{400 + 3.5\,S}{A}$
S < L	$L = \frac{AS^2}{2158}$	$L = \frac{AS^2}{400 + 3.5\,S}$

WHERE: A = Algebraic difference in grades, percent
S = Design sight distance, feet
L = Length of Vertical curve, feet.

Based on AASHTO Equations for eye height=3.5 feet and object height=2.0 feet

Maximum K for vertical curves on curbed sections shall be K=100 feet to provide adequate drainage.

K=L/A **L** = Length of vertical curve
A = Total change in grade, %

5. Horizontal Curves

The minimum horizontal curve radius shall be designed using the AASHTO side friction factor method for low-speed urban streets and superelevation distribution method 2.

$$R = V^2 / 15\,(e + f)$$

e = Rate of roadway superelevation, ft/ft
f = side friction factor
V = vehicle speed, mph
R = radius of curve, ft

Horizontal curve centerline radii shall in no case be less than the following without City Engineer approval:

Arterials	465 feet
Collectors and Neighborhood Routes	300 feet
Local Streets	180 feet
Alleys	100 feet

6. Superelevation Rate

Superelevation is to be used only as a design element to enhance drivability of horizontal curves on arterial and collector streets. The use of superelevation for other purposes, or on local streets, will require the approval of the City Engineer, will be handled on a case by case basis and will not exceed 2%. The maximum design superelevation for collectors and arterials shall generally be 0.040 ft/ft and minimum superelevation shall be 0.020 ft/ft. Plans incorporating superelevation shall show left and right gutter on the profile and the scale shall be such that these can be distinguished

7. Superelevation Runoff

The designer must be concerned with three profiles in the development of a superelevated section: left gutter, centerline and right gutter. Superelevation shall be obtained by rotating two of these profiles around the third stable profile, usually the centerline, which reflects the overall design.

Particular attention must be paid to the impact on drainage characteristics resulting from superelevation. No more than 25% of a transition section may be placed on the horizontal curve. No transition section shall be less than 100' in length. The minimum transition section lengths shall be determined in accordance with the AASHTO Policy on Geometric Design of Highways and Streets 2004 Edition, Chapter 3 Transition Design Controls. AASHTO Exhibit 3-32 provides runoff length for various design speeds, number of lanes and superelevation rates. Select examples are provided in the table below for a road section with two 12 foot lanes and a superelevation rate of 4 percent (AASHTO Exhibit 3-32).

DESIGN SPEED	MIN. LENGTH
50 mph	96'
45 mph	89'
40 mph	83'
35 mph	77'
30 mph	73'
25 mph	69'

8. Reverse Curves

On all streets having a design speed of greater than 30 mph there shall be a minimum 100' tangent section between reverse horizontal curves. Reverse curve signing shall be shown on the plans.

9. Compound Horizontal Curves

Compound horizontal curves should be avoided on streets having a design speed of greater than 30 mph. If a compound curve is necessary, the ratio of the flatter radius to the sharper radius should not exceed the following:

31 - 49 mph design speed	2 : 1
50 + mph design speed	1.5 : 1

Where the ratio exceeds these limits, a suitable length of spiral or a circular arc of intermediate radius shall be inserted between the two curves.

10. Road Crown

Streets shall typically be crowned with 2% cross slopes. Collector and arterial streets shall be designed with either a crowned or a superelevated section through curves. A shed section on collector and arterial streets is not acceptable. Shed sections on other streets require approval of

the City Engineer.

12. All Weather Service Road Standard

Service roads and utility access roads shall have a minimum width of 10' and be located within right of way or easements having a minimum width of 20'. Minimum structural section shall include 2" asphaltic concrete wearing surface over 6" aggregate base rock. Minimum cross slope shall be 2% for drainage.

13. Curb Radius

The minimum intersection curb radius shall be as follows:

Arterial - Arterial	35'
Local-Local	15'
Local-Collector/Neighborhood Route	20'
Local-Arterial	25'
Collector/Nbrhd Rt-Collector/Nbrhd Rt	25'
Collector/Nbrhd Rt-Arterial	35'

At non-curbed intersections, the edge of pavement radius shall meet the minimum radius requirements shown for curbed intersections.

When evaluating curb radius, designers should consider the location of sidewalk ramps and attempt to line up crosswalks with sidewalks to maintain a straight walking path across intersections. A reduced curb radius may be allowed in areas with high pedestrian traffic to improve crosswalk alignment and visibility. Curb radius less than standard must be approved by the City Engineer.

Where a radius larger than 35' is desired, a 3-centered symmetric compound curve shall be used. Three-centered symmetric compound curves shall be designed only on right-of-way sufficiently large to accommodate 12' minimum between curb face and the property line. The radii of the 3-centered symmetric compound curve shall be 120'-40'-120'. The offset of the 40' radius shall be determined by the design vehicle as follows:

Design Vehicle	Offset
SU	2'
BUS	3'
WB-40	4'
WB-50	5'

14. Street Striping

All street striping shall be shown on the construction plans. Striping shall be designed in accordance with the current ODOT Traffic Line Manual.

15. Street Signs

All street signage shall be shown on construction plans. Street signage must conform with the latest edition of the Manual on Uniform Traffic Control Devices, with the exception of street name signs, which are unique to the City of Sisters. All street signage will typically be installed by the City of Sisters at the developer's expense.

16. Cluster Postal Delivery Boxes

Cluster box locations shall be shown on the plans. US Postal Service must agree on location and type of delivery boxes. Cluster Postal Delivery Boxes should be constructed on residential streets in an area that minimizes impact on abutting properties.

Accessibility: Cluster mailboxes shall meet accessibility requirements in the Americans with Disabilities Act (ADA), Public Right of Way Accessibility Guidelines (PROWAG), and the Oregon Structural Specialty Code Section 1111, including but not limited to the following requirements:

a. Provide a 72 inch wide concrete pad adjacent to cluster mailboxes.
b. Provide a pedestrian access route to adjacent sidewalk.
c. Provide a pedestrian access route to on street parking.

Cluster Postal Delivery Boxes desired along arterial or collector streets should be constructed off public right of way on common ground dedicated to that purpose and provided with appropriate driveway access. Cluster Postal Delivery Boxes shall not be constructed on arterial street right of way. Cluster Postal Delivery Boxes may be constructed on collector street right of way provided that a turnout meeting the following requirements is constructed.

a. The center of the turnout shall be located in the center of a tangent section of the Collector. This tangent section shall have a length of not less than two times the stopping sight distance for the design speed.
b. The required right of way width shall be increased to provide for the parking bay.
c. The bay shall not be located less than the design stopping sight distance from any intersection.
d. The bay of the turnout shall be a minimum of 40' in length and not less than 10' in depth.
e. Tapered approach sections into the bay shall be not less than 10:1.
f. Curb radius in the bay shall be not less than 50' radius.
g. There shall be adequate stopping sight distance on either end of the turnouts into the parking bay.
h. The bay shall be signed with the following:
   10 Minute Parking
   No U-turns (MUTCD # R3-4a or R3-4 with R3-4p)

17. Street Lights

Street lights shall be shown on the construction plans and provided at the following locations or as conditioned by the Community Development Department and/or Planning Commission:

- Intersections
- Cul de sac bulbs if over 200 feet from the intersection
- Mid-block for blocks longer than 400 feet from center of intersection to center of intersection
- High-use driveways and other locations designated by the City Engineer.

**Street lighting requirements in Areas zoned Residential or Multi-Family Residential will be determined through the Land Use process.*
***If the Developer/Owner receives approval to install a different type of Street Light than the City's Old Fashioned Street Light than the Developer/Owner shall be responsible for all on-going maintenance of the approved lighting.*

Poles and fixtures shall conform to the power provider standards and the City of Sisters Dark Skies Code. In the commercial district, the City has developed standards for old fashioned street lighting. Lighting in accordance with standards shall be provided on each block corner. Developer shall be responsible for all costs of street lighting to achieve compliance with developed standards.

Construction plans shall indicate the location of all proposed primary and secondary lines, transformers, pedestal-type connection pints, conduit size and length, power source connections and street light circuits and controls.

18. Asphalt Concrete Pavement

Asphalt concrete pavement depth, classification and asphalt binder shall be as follows for various road classifications:

- Arterials: Five inches (two lifts – 3 inch base, 2 inch top) of level 3, ½" dense-graded mix with PG 64 -28 asphalt binder in both lifts.
- Collectors: Four inches (two lifts) of level 3, ½" dense-graded mix with PG 64 -28 asphalt binder in both lifts.
- Neighborhood Route: Three inches (one lift) of level 2, ½" dense-graded mix with PG 64 -28 asphalt binder in both lifts.
- Local: Three inches (one lift) of level 2, ½" dense-graded mix with PG 64 -28 asphalt binder.
- Alley: Two inches (one lift) of level 2, ½" dense-graded mix with PG 64 -28 asphalt binder.

19. Dead End Streets and Alleys

A turnaround must be provided on all dead end streets, alleys and all weather access roads. Cul de sac requirements for public streets are provided in the standard drawings. Through alleys are encouraged, but where they cannot be provided and the alley is a required emergency access, either a standard cul de sac or alternate turnaround meeting the requirements of the Oregon Fire Code must be provided. Dead end alleys not required for emergency access shall have a hammerhead turnaround, but it is not required to meet Oregon Fire Code requirements.

20. Roundabouts

Roundabouts shall be required at locations indicated on the Sisters Transportation System Plan. All roundabouts shall be designed per the requirements and recommendations of the FHWA Report: Roundabouts, An Informational Guide. Roundabouts located on the state highway system shall comply with all requirements of the Oregon Department of Transportation.

B. Stormwater

1. General

Stormwater systems in the public right of way and private property shall be designed in accordance with the latest version of the Central Oregon Stormwater Manual and City of Sisters Special Provisions listed in this section.

Storm sewer facilities shall be installed in rights of way except in those situations where drainage basins can not be served from the right of way. In those cases an easement will be required

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2. Special Provisions to Central Oregon Stormwater Manual (August 2010 Update)

a. **Preferred BMP** Sediment manholes are a preferred best management practice and should be located immediately upgradient from drywells when used in a treatment train.
b. **Proximity to City Water Supply Well** Drywells may not be placed within the 2-year time of travel zone or within a 500 foot radius from City or community water supply wells.
c. **Drill holes** Drill hole construction for stormwater disposal is not permitted.

3. Storm Sewer Design

a. Minimum diameter pipe for underground storm drains and storm drainage culverts shall be 12 inches.
b. Storm drain velocities shall be no less than 3 feet per second no more than 10 feet per second, flowing full.
c. Storm sewers shall generally conform to the same specifications as sanitary sewers (see Section II C).
d. The maximum distance between storm manholes shall be 400 feet.
e. Manholes shall be provided at every change in pipe grade, every point of change in pipe size, every intersection or junction of storm drains, and the upper end of all lateral storm drains.
f. A drop of 0.20 feet shall be provided through every storm manhole invert.
g. Flanking inlets at sags will not be required provided that the primary inlet is shown to be adequate to capture the design flow.
h. Double-sized catch basins are normally required for inlets. A single catch basin is acceptable for the collection of water where special situations apply.
i. Curb inlet catch basins shall be installed in arterial and collector streets to provide better bicycle routes.
j. Inlets shall be provided at intersections of collectors and arterials. Inlets should be provided at intersections of local streets. These inlets shall be so arranged that water is not directed through the intersection or in certain cases, around a curb return.
k. Inlets should be provided to avoid ice formation on the roadway.
l. Valley gutter intersections may be allowed with approval of the City Engineer in situations such as intersections of short cul-de-sacs with local streets.
m. Storm pipe shall be PVC meeting the requirements of ASTM D3034 or F679 (for pipes 18 inch diameter and larger) except where cover to finish grade is less than 30 inches. Where cover is less than 30 inches, PVC shall meet the requirements of AWWA C900 or C905.

4. Storm Facility Testing

Stormwater facility testing requirements shall be shown on the plans. Testing requirements vary

depending on the type of facility and whether infiltration is accounted for in the design.

a. Information to show on plans: For each drainage facility, provide runoff area in square feet, runoff coefficient used for calculations, peak runoff rate to the facility in cubic feet per second and gallons per minute and total runoff volume to the facility in cubic feet and gallons. For facilities with designs that account for infiltration, also provide the maximum required storage volume and design storage volume in cubic feet and gallons.

b. Testing Procedures: There are three parts to the testing procedure; confirmation of storage volume, infiltration rate and ability to drain within 72 hours. Test methods vary by the type of facility and basis for design as follows:

1) **Drywells:**
   - i. **Storage Volume:** Confirm the storage volume by tracking the quantity of drain rock used with load tickets and measuring the diameter and depth of the drywell. Calculate interior volume of the drywell from the base to the bottom of the lowest pipe. Calculate the storage volume in the drain rock using a void ratio of 35 percent unless a different void ratio is provided by a materials testing lab.
   - ii. **Infiltration Rate:** For drywells with a convenient hydrant, fill the drywell with water from a metered source and adjust the flow rate to maintain the level of water at the top of the barrel section or the base of the inlet pipes (whichever is lower). Measure and record the flow rate at 10 minute intervals. Maintain the flow rate necessary to keep the drywell at the top of the barrel section or pipe invert for one hour. After the one hour period, turn off the water supply and record the depth to the water surface every 10 minutes for one hour. If the drywell cannot be filled, measure the depth to the water surface and record depth and flow rate at 10 minute intervals. Stop filling after 60 minutes and measure and record the depth to the water surface every 10 minutes for one hour. If a hydrant is not readily available, a water truck is required. Place four water truck loads (3,500 to 4,000 gallons) in the drywell within a 2-hour period. After the water has been placed, let the drywell drain and record the depth to the water surface every 10 minutes for one hour.
   - iii. **72-hour Drainage:** Check 72 hours after stopping the flow to see if the drywell has emptied.
2) **Ponds, swales and infiltration galleries:**
   - i. **Storage Volume:** For ponds, swales and other surface facilities, confirm the storage volume with as-built measurements and calculations provided by the project surveyor. For infiltration galleries, track the quantity of drain rock used with load tickets. Calculate the storage volume in the drain rock using a void ratio of 35 percent unless a different void ratio is provided by a materials testing lab.
   - ii. **Infiltration Rate:** For infiltration swales and ponds in general and for infiltration galleries constructed with filter soil placed above the drain rock, measure the infiltration rate at the surface after the filter soil is placed. If the infiltration gallery is designed so that runoff enters directly into the drain rock with filter soil below, measure the infiltration rate of the soil prior to placing the drain rock. Use the single-ring infiltrometer test (Appendix D of the Central Oregon Stormwater Manual) or other test recommended by a Geotechnical Engineer.
   - iii. **72-hour Drainage:** Use the Swale Flood Test described in Appendix 4E of the Central Oregon Stormwater Manual. For sloped swales and swales with check dams, introduce flow at the high end and allow it to overtop each check dam until it pools to a depth of 6 inches in the low end. Check 72 hours after stopping the flow to see if the facility has emptied. Use standpipe to monitor water level in infiltration galleries.

C. SEWER

1. General

Sewer/water line separation and construction is established by Oregon State Health Department Standards. Materials and procedures for sewer facilities shall conform to the City of Sisters Standards and Specifications, D.E.Q. Specifications, and APWA Standard Specifications.

Sewer facilities shall be installed in rights of way except in those situations where, in the determination of the City Engineer, drainage basins can not be served from the right of way. In those cases an easement will be required.

2. Sewer Main

a. Design Parameters

1) **To and Through:** All main lines shall be extended through the property to be served within a Public Right of Way and extend to neighboring property lines on all sides of the property planned for development. However, when the neighboring property line is the city boundary, the following shall apply:
   a. The main line shall be extended as far as necessary (as determined by city staff) to properly serve the property; and
   b. The extension of the main line through the property shall be deferred until such time as the adjacent property is annexed into the city of Sisters. The deferral is not effective until the property owner signs an agreement to extend services through the property following the annexation of adjacent property. This agreement shall be recorded against the property and will be a condition of any development approval. Once the adjacent property is annexed, the property owner will have 120 days to extend the main line through the property to the property line. If the main line is not extended as required, the City may construct those improvements and recover all costs associated with the construction of those improvements, including administrative costs, legal fees, and collection costs. Those costs shall be a lien against the property and a personal obligation of the property owner.
2) **Location** Sewer mains should be located in accordance with the Department of Environmental Quality and OAR Chapter 340, Division 52. Sewer mains shall be located on roadway centerline on tangent sections and as close as practicable to this configuration on curves. Gravity sewer mains from manhole to manhole shall run in a straight alignment.
3) **Sewer Main Stub** Stub outs for the future continuation of the sewer shall terminate at a manhole unless approved by the City Engineer due to unusual circumstances. In phased subdivisions the sewer should be extended to the next adjacent manhole as shown on the master plan to minimize the number of manholes required.
4) **Depth** Minimum cover for all standard sewer lines except sewer services shall be 36".
5) **Minimum Diameter** For gravity sewer, the minimum size shall be 8". Size of pressure lines will be determined by the design engineer. The design engineer shall submit a summary of design criteria for line sizing to the City with construction plans.
6) **Minimum Velocity:** 2 fps for gravity sewers. 3 fps for pressure and inverted siphons
7) **Maximum Velocity:** Velocity shall not exceed 8 fps for pressure sewers.
8) **Minimum Grade (Gravity):** From DEQ design criteria:

Pipe I.D.	Slope (ft/100 ft)
6"	0.60
8"	0.40
10"	0.25
12"	0.19
15"	0.14
18"	0.11

21"	0.09
24"	0.08

9) **Flow Calculation**
   a) **Gravity** Flow calculations will be based on Manning's equation using an n value of 0.013
   b) **Pressure** Flow calculations will be based on the Hazen and Williams equation using the following values for C:

Concrete	120
Cast iron/steel	125
PVC	135

10) **Flow Estimation**
   Domestic waste: 125 gallons per equivalent dwelling unit (EDU)
   Commercial and Industrial: 20,000 SF per EDU
   Schools: Elementary: 10 gallons per student per day
   Middle: 15 gallons per student per day
   High School: 20 gallons per student per day
   Infiltration: Negligible

11) **Peak Factor:** 2.4

12) **Manholes**
   Spacing: Not more than 400' apart
   Design Fall: Not less than 0.1' without prior approval by City Engineer
   External Drop Manhole: Required when fall greater than or equal to 18"
   Dead-end lines: End with a manhole, cleanouts allowed at the upper end of lines not exceeding 250 feet with approval by the City Engineer..
   Diameter: Standard diameter for pipes up to and including 15-inch diameter is 48 inches. For 18-inch and larger pipes and for unusual pipe angles, 60 inch diameter or larger manholes are required to maintain structural integrity. Submit manhole design for pipes sizes 18 inches and larger.

13) **Wet Wells**
   Operating Capacity: The minimum operating capacity of the wet well, from first pump on to pumps off, shall be not less than 5 minutes times one pump flow rate.
   Emergency Capacity: The emergency capacity, from alarm on to an overflow condition, shall be determined on a case by case basis, but in no case shall be less than 30 minutes times the peak flow rate. This 30 minute response time shall generally apply to areas not adjacent to water courses and within 10 road miles of the treatment facility.
   Pump Flow Rate: A single pump flow rate should sufficiently exceed the peak inflow rate to be effective.
   Pump Cycle Times: Pump cycle time, from "pump off" to "pump on" shall not be less than 10 minutes at peak flow and shall take into consideration any line back-draining requirements.

   Design Line Size and Volume Requirements
   Given:

Q_i	=	Peak inflow rate
Q_p	=	Design pumping rate
V_w	=	Working capacity
V_b	=	Back drain volume
V_e	=	Emergency volume for response time

   Wetwell shall be designed for the sum of V_w, V_b and V_e

Conditions:

$Q_p >> Q_i$

For 3" line: 66 gpm $< Q_p <$ 150 gpm

For 4" line: 118 gpm $< Q_p <$ 270 gpm

For 6" line: 265 gpm $< Q_p <$ 600 gpm

$V_e > (30)(Q_i)$ (minimum)

$V_w > (5)(Q_p)$

$V_w > (10)(Q_i) + V_b$

See Section 310 Sewage Pump Stations in the Standards and Specifications for additional design information and equipment specifications.

b. Waterline Crossings

When the sewer line is located above or less than 18" below a crossing waterline, the sewer line shall be constructed of pipe conforming to water pipe standards. AWWA C-900 pipe is acceptable. The minimum length of this strengthened sewer is 20'. It is intended that a section of the water class pipe be centered over the water main and connected to the sewer line with approved PVC couplings.

c. Detection Tape and Wire

Detection tape shall be installed on all non-metallic gravity sewer mains and laterals. Detection tape shall be as manufactured by Allen Systems or an approved equal. One course of detection tape is required at the top of the pipe zone. Detection wire shall be installed on all non-metallic sewer mains and all service connections. The wire shall be a green clad 18 gauge direct bury copper, solid wire. The wire shall be attached to the top of the pipe.

d. Materials

Materials shall conform to the Standard Specifications of the City of Sisters.

e. Construction

Construction shall conform to the City of Sisters Standard Specifications and applicable Standard Drawings. Prior to installing a sewer facility in an unimproved street, the street must be brought to sub-grade to ensure that adequate bury, depth of cover, and utility separation is acquired. In the event the street is to be improved at a later date, the street shall be properly staked to the approved design prior to the commencement of sewer line construction.

3. Sewer Services

All single family residential sewer service laterals shall be a minimum of four (4) inches in diameter and have a clean out at the property line.

All new duplex and multi-family service laterals shall be a minimum of six inches in diameter, except when higher flows require a larger line size. However, existing 4-inch service laterals with clean out may be used to serve duplex or multi-family lots with approval of City Engineer, unless flow rates are greater than the capacity of the existing line.

Commercial and industrial service laterals shall be a minimum of six inches in diameter. However, existing four (4) inch service laterals with clean out may be used, with approval of the City Engineer. Separate and independent building sewers shall be provided for buildings on separate lots or parcels. Sewer services shall be extended at minimum grade or steeper as required to provide gravity service to each building. Sewer services shall not have less than 24" of cover at the property line, 30" minimum cover in street, and shall be located as required to provide gravity service to each lot or parcel.

Pressure sewer services shall be designed by a competent professional. The pump curve with the operating point indicated shall be submitted to the City of Sisters so it may be ascertained that the proposed installation will not conflict with the operation of the City system. Pressure mains shall be a minimum of 3 inches in diameter and all check valves, gate valves will have the capacity to pass a 3 inch ball. It is considered prudent to specify the service line one size larger than the pump outlet.

4. Sanitary Sewer Manholes

Manholes shall be located as shown on the design plans or as directed by the City Engineer, or representative, in a manner to provide complete accessibility and to minimize the possibility of damage from vehicles or injury to pedestrians.

Location of the center of manholes in a vehicle wheel track is not acceptable. Location of the center of manholes within 5 feet of the curb line is not acceptable. Location of manholes outside of paved areas is not generally acceptable. If manholes can not be located in the pavement, then a six inch thick concrete pad 5 foot square centered on the manhole cover must be provided. Pipe stub-outs in manholes for 4" service connections generally will not be allowed, except for manholes at end of line. Service line crown elevation shall match main line crown. Internal drop manholes will not be acceptable for drops equal to or greater than 18 inches. A channel is required from service line connections to the main channel in the manhole base.

Angle between inlet and outlet lines of sewer manholes less than 90° shall be avoided, but if necessary, the invert of the inlet line shall be at or above the crown of the outlet line, but not to exceed 18 inches. Channel construction must allow access for City's closed circuit television camera

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5. Cleanouts

Cleanouts may not be substituted for manholes on sewer mains, except for the upper end of lines not exceeding 250 feet in length with approval by the City Engineer, if the potential does not exist for future line extensions.

6. Access to Sewer Facilities

Where manholes lie outside of the paved right of way, an access road, with dedicated right of way or easement, shall be constructed to provide all weather access to the manhole. This access road shall meet all weather service road standards. Support facilities such as, but not limited, to drainage structures, vehicular turnaround with 38 foot turning radius, or a pad-lockable gate may be required on any manhole location outside of the paved right of way. An exception to the requirement for an access road will be made when no manholes are located in the easement area.

7. Sampling Manholes

A sanitary sewer sampling manhole located at a point accessible at all hours to City personnel is required for each commercial, industrial, or institutional user's service lateral when it is determined by the City Engineer that discharge monitoring will be required as a condition of the City's Industrial Discharge Permit. The sampling manhole shall be constructed upgradient from any discharge into the public sewer system and within an access easement granted to the City. The manhole have a minimum depth of 48", be constructed and maintained at no cost to the City, and when possible be located adjacent to the public right-of-way. If manholes cannot be located in the pavement, then a six inch thick concrete pad 5 foot square centered on the manhole cover must be provided.

8. Grease Interceptor

A grease interceptor compliant with the Oregon Plumbing Specialty Code is required for all facilities where commercial or institutional food preparation or food service is performed. All plumbing fixture drains in the kitchen area shall be routed to the interceptor, including kitchen sinks, bar sinks, hand sinks, garbage disposals, mop sinks, and floor drains. Restroom connections to the interceptor are prohibited.

D. WATER

Materials and procedures for water facilities shall conform to the Standard Specifications of the City of Sisters, Oregon Health Division Administrative Rules, and AWWA standards. Water facilities shall be installed in public rights of way except in those situations where, in the determination of the City Engineer, service areas and/or pressure levels will be better served by an alternate design. In those cases an easement will be required.

1. Main Line

a. To and Through: All main lines shall be extended through the property to be served within a Public Right of Way and extend to neighboring property lines on all sides of the property planned for development. However, when the neighboring property line is the city boundary, the following shall apply:

1) The main line shall be extended as far as necessary (as determined by city staff) to properly serve the property; and
2) The extension of the main line through the property shall be deferred until such time as the adjacent property is annexed into the city of Sisters. The deferral is not effective until the property owner signs an agreement to extend services through the property following the annexation of adjacent property. This agreement shall be recorded against the property and will be a condition of any development approval. Once the adjacent property is annexed, the property owner will have 120 days to extend the main line through the property to the property line. If the main line is not extended as required, the City may construct those improvements and recover all costs associated with the construction of those improvements, including administrative costs, legal fees, and collection costs. Those costs shall be a lien against the property and a personal obligation of the property owner.

b. Looped in General: Lines shall be looped in general, and where the City so specifies.

c. Items Provided by City: Hot taps, lateral installation and meters will be provided and installed by the City of Sisters at the developer's expense.

d. Minimum Size
The minimum size for mainline shall be 8 inches. Lines must be sized to provide the following required fire flows at fire hydrants, with a minimum residual pressure of 20 psi:

Residential	1,500 gpm
Commercial/Industrial	2,500 gpm

Higher flow rates shall be required when requested by the Fire Department having jurisdiction, in accordance with the Oregon Fire Code.

All main lines shall end with a fire hydrant for maintenance purposes. Hydrant lines may be 6" if total length is less than 400 feet, and the line serves only one hydrant. Hydrant runs longer than 400 feet or serve more than one hydrant will require a minimum 8" line. A fire flow analysis will be required to determine the size for lines longer than 400 feet or serve more than one hydrant.

Minimum pressure at the corporation stop shall not be less than 20 psi during maximum flow conditions, including open hydrants. If minimum pressures cannot be maintained, developer will be responsible for constructing a high level water system to increase pressures to levels approvable by the City.

e. Required Information on Drawings
All drawings that include water and sewer mains submitted for review by the City Engineer shall

have the street station and offset, size, number, and type of fittings specified at the location they occur. Specifying only the deflection angle of the line, e.g. 30°, is not acceptable.

f. Location

Water mains shall have a minimum 10 foot horizontal separation from parallel underground utilities unless written approval of the City Engineer is obtained. Separation from sewer lines shall be in accordance with OAR 333-61-0050.

g. Service Lines

A separate water service, including meter, shall be required for each lot of record. All services shall have a corporation stop, two angle meter stops, meter, meter box, and 6" extension with meter reader lid.

Service lines are to terminate in an approved meter box. Service lines shall be constructed, complete and with all incidentals to the terminus of the meter box, to be located directly behind the sidewalk or, if there is no sidewalk, directly behind the curb. An approved meter shall be installed in the meter box. All services shall be provided with a saddle or tee at the main.

The minimum service line shall be 3/4" diameter for one residence. Line sizing for commercial and industrial users shall be determined on a case by case basis, in accordance with the Uniform Code

A back flow prevention device, as approved by the Oregon State Health Division and the City of Sisters, shall be installed on all Commercial and Industrial service lines, all fire service lines and as directed by City Ordinance and Oregon Specialty Plumbing Code latest edition. Backflow devices shall be installed at the property line unless otherwise approved by the City Engineer.

h. Valves

Valves in water mains shall be located in the street right-of-way, preferably in intersections unless otherwise approved. Maximum distance between valves is 1,000 feet on transmission mains and 500 feet on distribution mains. Valves will be provided so as to minimize the number needed to be closed to isolate sections of line and minimize the number of customers impacted by shutdowns. A cross will normally require 3 or 4 valves, and a tee 2 or 3 valves. Valves are required on the end of lines for future extension. Valves shall be installed on flanged tees or crosses, unless otherwise approved by City Engineer. No valve shall be located closer than 3 feet from existing or proposed gutter line. All valves shall conform to AWWA Standards. All intersections shall have approved valving. Butterfly valves shall be used on all waterlines 10" or larger; or where 18" of cover to the top of a gate valve body cannot be obtained. Where valves are located outside of paved areas they shall be provided with a concrete collar not less than 24" square. Valve clusters may be set in a single collar provided there is not less than 12" from the edge of the valve to the edge of the collar.

i. Detection Tape and Wire

Detection wire and tape shall be installed on all main, service, fire and hydrant lines. Detection tape shall be as manufactured by Allen Systems or an approved equal. One course of detection tape shall be installed 12" above the pipe. Detection wire shall be a Blue 18 gauge UF bury solid copper wire located within 6" of the top of the pipe. The wire shall have electrical continuity and a lead shall be brought to within of the surface in valve stacks. Wherever there is a splice, it shall be repaired according to manufacturer's recommendation.

j. All Weather Access

Where water facilities requiring maintenance access lie outside paved right of way, a paved access pad sufficient for service equipment to operate without blocking the traveled way shall be provided. Where water facilities (such as fire hydrants and valves) lie away from paved right of way, an all weather access road shall be constructed to provide all weather access to the facilities. This access road shall be paved. Support facilities such as, but not limited to, drainage structures, vehicular turnaround with a 38 foot radius, or a pad-lockable gate may be required on any water

facility location.

k. Thrust Restraint
Thrust restraint shall be provided for water fittings. Generally, concrete thrust blocks shall be utilized for thrust restraint. Concrete thrust block details are provided in the standard drawings.

2. Meters
Only City-approved water meters and meter boxes may be installed.

3. Fire Hydrants

a. General
Each hydrant shall be connected to the main with a 6-inch branch controlled by an independent 6-inch gate valve bolted to a flanged tee. On hydrant lines over one hundred (100) feet long, a second valve shall be required within 10 feet of the hydrant. No other lines are allowed to be connected to this 6 inch fire hydrant line unless the line is upsized to 8 inches and flow calculations have been provided that show the line can provide the required fire flow and peak domestic flow simultaneously.

b. Location
Hydrants shall be placed at maximum 400' intervals. Reduced spacing intervals may be required by the Fire Department having jurisdiction. Hydrants shall be located as shown on the plans or as directed by the City Engineer, in a manner to provide complete accessibility and to minimize the possibility of damage from vehicles or injury to pedestrians. The hydrant barrel shall be set as shown in the standard drawings.

Hydrant design and installation shall be such that the hydrant can be excavated and repaired without danger of the hydrant valve blowing off the line or causing the main line to be taken out of service. This requirement may result in the installation of a second hydrant valve at the mainline tee, or joint and fitting restraints. Hydrant valves shall be located reasonably close to the hydrant as indicated in the drawings so as to be obvious in the event of an emergency.

c. Staking
All hydrants shall have two reference points (swing ties) indicating the face of hydrant and tops of curb and face of curb. These reference points are the responsibility of the Design Engineer and he/she shall be responsible for position of such prior to construction.

d. Concrete Pad
A concrete pad shall be installed around the barrel as specified in the standard drawings.

e. Bollards
All hydrants located in areas vulnerable to traffic shall be protected by bollards. The design and location shall be approved prior to installation.

E. UTILITIES

1. Prohibition on Cutting Recently Constructed Streets

No open cut for utilities will be allowed within 2 years of completion of a street construction project, unless approved by City Engineer. If permitted within two years of pavement installation, additional paving and/or improved backfill will be required. This may include, removal to centerline or full width of street, full street overlays, grinding and inlay or controlled density backfill.

2. Utility Conduit

Where any utility is not completely installed by the time of the sub-grade inspection, provisions such as utility conduit placed under all areas to be improved, shall be implemented to protect the improvement. This installation shall be acceptable to the affected utility and the City of Sisters. Conduit banks shall be spaced no greater than 300' apart and not less than one per block.

3. Shared Trenches

Underground utilities shall not be located closer than 10 feet horizontally from any water or sewer main. With special permission from the City Engineer this separation may be reduced, but should never be less than 5 feet. Utility crossings of water or sewer mains shall be as close to perpendicular as practicable. The minimum cover for all utility conduits is 24" in the Public Right of Way.

4. Utilities in Public Rights of Way

a. General

Utility companies shall construct facilities in City of Sisters public rights of way in strict accordance with City of Sisters Standards and Specifications. Utility companies and their agents shall cooperate with the City of Sisters Engineering Division to provide for City inspection of their facilities during construction to insure that City of Sisters facilities are not damaged during construction. If a city facility is damaged during construction, it shall be repaired or reconstructed to current City standards. Public Utility easements shall be required adjacent to all city street rights of way for power, communication and gas lines.

b. Plan Submittal

Utility companies must submit plans and profiles of any proposed work in City of Sisters Public rights of way for review by the City of Sisters Engineering Division. These plans must be approved by the City of Sisters before start of construction. Emergency work requiring immediate action shall be exempted from this requirement. All existing underground utilities shall be shown on these plans and shall have been field located by the appropriate utility company through the "one call" network. Failure to field locate existing utilities on the plans will be cause for the City to deny permission to work in the public right of way.

5. Trench Patching in Paved Right of Way Areas

Trench backfill and patching in pavement areas shall conform to the Standards and Specifications.

6. Trench Backfill

Trench backfill shall conform to the Standards and Specifications.

F. IRRIGATION

1. General

Irrigation laterals shall be installed in culvert pipe to the outside limits of public and utilities improvements in right of ways. The construction shall conform to the requirements of the Irrigation Company and the City of Sisters. Where requirements may conflict or differ, the requirement providing the highest level of control, security, and/or integrity shall govern the construction.

2. Materials

Pipe used for irrigation in City right of way shall meet the requirements of AWWA C900 or C905.

III. DRAWINGS

A. SUBMITTAL

For information concerning the process of submitting plans, see Section 03 of the Development Provisions.

B. PLAN SCALE & SIZE

The drawing scale shall be such as to clearly show the proposed improvements and any conflicts with existing or proposed improvements. Where clarity is not compromised, it is preferred that street, sewer and water be combined on one drawing to better disclose the potential for utility conflicts. Plan views shall incorporate a grid to assist in the determination of distance and elevation of improvements. The preferred scale for combined drawings showing multiple facilities is 1" = 20'. Depending on the amount of information shown on the drawings, the scale may be increased to 1" = 40'. Smaller scales will not be accepted. All construction drawings submitted shall be 22" by 34" or 24" by 36" overall size.

C. INFORMATION REQUIRED ON PLAN

1. General

a. Vicinity map
b. North arrow, preferably to top or right of each sheet
c. Project title or name
d. Sheet Index
e. Quantities for Engineering Fees
    1) Size and total lineal feet of sewer main
    2) Size and total lineal feet of water main
    3) Size and total lineal feet of fire service lines
    4) Size and total number of water services/sewer services
    5) Size and total number of water meters
    6) Size and total number of manholes
    7) Total number of fire hydrants
    8) Lineal feet of all streets and alleys
f. Approval signature block including Public Works Director, City Engineer, Sisters-Camp Sherman Fire Marshal, and all Utility Providers impacted by project.
g. Owner/Developer name, address, and phone number
h. Consulting Engineer/Surveyor name, address, and phone number
i. Any associated City or County Land Use application number
j. Indicate City benchmark used to establish control
k. Existing topography
l. Location of all utilities and roads, existing and proposed
m. Rights of way, property lines, and any easements
n. Plans shall include standard notes. These notes are updated on a regular basis. The latest version shall be obtained from the Engineering Department prior to plan submittal.

Note: An approved tentative plat may be included in the plan set to fulfill any of the above requirements as appropriate.

2. Streets

a. North arrow, preferably to top or right of page
b. Vertical and horizontal curve data

c. Indicate roadway centerline and stationing along centerline
d. Indicate slopes of centerline, and gutter lines if necessary
e. Indicate curb return radius
f. Indicate grades at the ends and midpoint of the curb returns
g. Detailed design of each curb ramp showing slopes of all ramps and landings with spot elevations as necessary and in conformance with Public Right of Way Accessibility Guidelines.
h. Indicate drainage system and location and size, in square foot, of drainage area served by every dry well
i. Indicate the location of utilities, existing and proposed
j. All relevant street system details
k. Demonstrate that streets may be extended thru adjacent properties if so desired
l. Show location, direction, size, type and of MUTCD number of all permanent street signing
m. Show location and size of any postal delivery boxes to be placed on public right of way
n. Existing street lights within one block radius of project boundary
o. Location of street lights to be installed by local power company

3. Stormwater – See Chapter 3 Central Oregon Stormwater Manual

a. Location of manholes, inlets and storm line
b. Stationing of structures relative to street stationing
c. Invert and rim elevations at junction and sediment manholes and inlets
d. Inlet type, size, rim elevation
e. Swale and pond edge, slope, contours, inlets, outlets, surfacing, overflow, outlet protection
f. All relevant storm system details.
g. A profile demonstrating that sufficient cover will be maintained and showing finished street where applicable.
h. Drainage report including narrative, basin map and other figures, calculations, downstream analysis and other required submittals as appropriate
i. Wellhead protection areas within project.

4. Sanitary Sewer

a. Location of manholes, sewer line
b. Location of gravity grease interceptors and sampling manholes as required
c. Stationing along sewer line
d. Entering and exiting invert elevations at manholes
e. Sewer is designed and extended to provide service to adjacent properties
f. All relevant sewer system details
g. Sewer cleanout locations
h. A profile demonstrating that sufficient cover will be maintained and showing finished street where applicable

5. Water

a. Location of valves, fittings and fire hydrants, and water lines
b. Stationing along waterline
c. Water system is designed to provide service to adjacent properties
d. All relevant water system details.
e. A profile demonstrating that sufficient cover will be maintained and showing finished street grade where applicable.

6. Construction Cost Estimate and Fees

Building square footage and/or number of lots shall be provided to determine plan review and inspection fees. Final plans will not be approved until fees have been paid.