

ORDINANCE NO. 351

AN ORDINANCE AMENDING THE CITY OF SISTERS MUNICIPAL CODE SECTIONS 12 AND 13, PUBLIC WORKS CONSTRUCTION STANDARDS FOR STREETS, SIDEWALKS, WATER, SEWER, DRAINAGE AND OTHER APPURTENANT FACILITIES, REPEALING ORDINANCES 298 AND 325, AND DECLARING AN EMERGENCY.

WHEREAS, the City of Sisters does hereby determine that the City has a need for established construction standards for construction of streets, sidewalks, water, sewer, drainage and appurtenant facilities to provide for uniform construction standards and quality.

WHEREAS, the City adopted new construction standards November 11, 1999 and modified them on September 13, 2001, and

WHEREAS, the standards needed amending in numerous areas to provide for the development of public infrastructure that will meet the health, safety, welfare and livability needs of city residents;

NOW, THEREFORE, the Sisters Common Council ordains as follows:

Section 1. The City of Sisters hereby amends Sections 12 and 13 of the Sisters Municipal Code of the City of Sisters as designated in the publication entitled "Public Works Construction Standards for the City of Sisters" dated June, 2004, and as may be amended hereafter from time to time. Public works standards may be obtained from City Hall upon request for a fee established by the City of Sisters.

Section 2. Passage of this Ordinance shall repeal any portion of the Sisters Municipal Code in conflict herewith.

IT IS HEREBY ADJUDGED AND DECLARED that existing conditions are such that this Ordinance is necessary for the immediate preservation of the peace, general welfare, health and safety of the City of Sisters, and an emergency is hereby declared to exist and this Ordinance shall take effect and be in full force and effect from and after its passage by the Common Council of the City of Sisters and its signing by the Mayor.

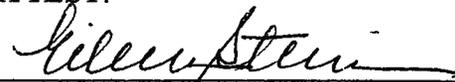
PASSED by the City Council this 10th day of June, 2004.

APPROVED by the Mayor this 10th day of June, 2004.



M. David Elliott, Mayor

ATTEST:



Eileen Stein, City Manager/Recorder

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SECTION I
PUBLIC WORKS CONSTRUCTION STANDARDS
for the
CITY OF SISTERS, OREGON
SPECIAL CONDITIONS AND REQUIREMENTS

A. INTENT

These Public Works Construction Standards for the City of Sisters are intended to:

1. Set forth uniform material and workmanship standards under which all public works facilities shall be constructed or reconstructed within the City, or which shall eventually be owned, maintained or operated by the City.
2. Supplement and complete the requirements of the City's subdivision Land and Participating Ordinance, and other prevailing ordinances as they relate to the physical construction of public works facilities within the City, or which shall eventually be owned, maintained or operated by the City.
3. Provide complete details of construction and comply with provisions of Chapters 3.1, 3.2, and 3.4 of the City of Sisters Development Code. If conflicts exist between the Development Code and this document, the Public Works Construction Standards shall govern.
4. Streamline the administration and construction of public works facilities within the City.

B. SCOPE

1. These Public Works Construction Standards for the City of Sisters shall be applicable to all public streets, drainage, water, sewer, and appurtenant facilities within the corporate limits of Sisters, whether constructed by the City, or constructed privately and turned over to the City for maintenance and operation.
2. These standard specifications shall relate only to public works construction in the City and are not to be identified with building codes, zoning ordinances and other regulations for which procedures and standards have been established. Planning, zoning and related matters shall be satisfied prior to referral of a project to the City Public Works Department for review of proposed facilities.
3. These standard specifications may be amended from time to time upon recommendation by the Public Works Department and appropriate action to do so by the City Council.
4. Nothing contained in these standards or in any extension of facilities pursuant to these standards shall be construed in any way as a guarantee or obligation by City that the facilities, as defined herein, will be altered, enlarged, or expanded in response to increased user demand.

5. By acceptance of the service provided by the City, each user shall be deemed to have agreed to fully comply with and be bound by the rules, regulations, policies, and procedures set forth in these Construction Standards.
6. City retains the right to terminate City utility or public works service or connections to such service, at any time Developer or Developer's contractor or agent, fails to comply with any of the conditions of these standards or associated permits and approvals.

C. DEFINITIONS

The following definitions shall apply throughout these standards:

1. City – The City of Sisters, Oregon, or its representatives.
2. Council – The City Council of the City of Sisters, Oregon.
3. Commission – The Planning Commission of the City of Sisters, Oregon.
4. Contractor – A licensed, bonded, and insured Contractor with a City of Sisters current business license on file at the City, and employed by the Developer.
5. Representative – A City representative appointed by the Council as follows:
 - a. Superintendent - Superintendent of Public Works
 - b. Technician – A City staff technician.
 - c. City Engineer – A registered professional Engineer or consulting engineering firm employed by the City. In the case of projects undertaken by the City with no outside engineering involvement, the term City Engineer may appear in the standards in the abbreviated form of "Engineer".
6. Developer – A person who undertakes construction or reconstruction of a public works facility within the city limits of the City.
7. Developer's Engineer – A registered professional Engineer, licensed in the State of Oregon, and retained by a Developer.
8. Public Works Facility – Any facility constructed upon public right-of-way or public easement which is immediately or eventually to be taken over by the City for maintenance and operation. These facilities include, but are not limited to, streets, sidewalks, curbs, parking lots, driveways, drainage facilities, water system, and sanitary sewer systems.
9. Public Works Construction Permit – A permit issued by City allowing construction of Public Works Facilities, and specifying applicable fees and procedures.
10. Standards – These Public Works Construction Standards as adopted for use in the City of Sisters, Oregon.
11. User – A "user" includes any person, firm, or corporation owning or leasing property within the City and accepting public works services.

D. AVAILABILITY OF USE OF STANDARDS

1. Copies of these Standards shall be available at City Hall upon reasonable notice and payment of \$25.00 for a complete set.
2. A Developer's Engineer may utilize the standards by direct reference thereto in the contract documents prepared for construction of street, drainage, water, and sewer facilities within the City. If such election is made by the Developer's Engineer, contract documents shall contain the following statements:

"Materials and workmanship shall be in strict accordance with the Public Works Construction Standards of the City of Sisters. No changes from the approved project plans and specifications shall be made without prior written approval from the City of Sisters."
3. The Standards are in outline form only, and shall not relieve a Developer's Engineer from his/her professional responsibilities during project design and construction. Any additional project requirements shall be set forth in the documents a Developer's Engineer prepares for the work. The City provides these Standards only as a convenience to facilitate development within Sisters.

E. FORM OF STANDARD SPECIFICATIONS

The accepted abbreviations for various societies, associations and organizations are also used for the sake of brevity. Some of these are presented below.

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AGC	Associated General Contractor of America
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
API	American Petroleum Institute
APWA	American Public Works Association
ASTM	American Society for Testing Materials
AWPA	American Wood Preserver's Association
AWS	American Welding Society
AWWA	American Water Works Association
CRSI	Concrete Reinforcing Steel Institute
CSI	Construction Specifications Institute
DEQ	Department of Environmental Quality
EPA	Environmental Protection Agency

FHWA	Federal Highway Administration
IEEE	Institute of Electrical and Electronics Engineers
NBFU	National Bureau of Fire Underwriters
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
ORS	Oregon Revised Statutes
OSHA	Occupational Safety and Health Administration
OSHD	Oregon State Highway Division
ODOT	Oregon Department of Transportation
PCA	Portland Cement Association
SAE	Society of Automotive Engineers
SSPC	Steel Structures Painting Contractors
UBC	Uniform Building Code
WWPA	Western Wood Products Association

Unless otherwise specifically noted in these Specifications, references to various standard specifications shall mean the current revisions of the same at the time of adoption or amendment of this Ordinance.

F. CONTROL OF PUBLIC WORKS PROJECTS

1. All public works facilities, or facilities to become public shall be designed and periodically inspected under the direction of a Professional Engineer registered in the State of Oregon. Inspections shall be performed on a regular basis. At the completion of the construction, this Engineer shall submit a completion certificate to the City stating that all work has been completed in accordance with the approved project plans and specifications.
2. The City of Sisters will provide a inspector to provide daily inspections of all public works, and the Developer/Owner will be billed for all costs of the inspection. Inspection will be provided for a minimum of 2 hours per working day. Developer/Owner will also be billed for all City expenses related to the work. This shall include all City manpower and expenses, and will include expenses of the City Engineer and all staff members involved in plan reviews and approvals, contracts, pre-construction meetings, etc. Payment for all City expenses must be made before the final plat will be signed for approval.
3. A deposit for City expenses will be provided in accordance with I F.2 before any approvals are granted for the project. Deposit for City expenses will be established by resolution for all subdivisions. Deposit shall be replenished if required by the City, to assure that funds are available at all times for covering City expenses. If funds remain in the deposit at the conclusion of construction and after all approvals are made, funds shall be promptly returned for the balance remaining.

4. Costs for overtime City expenses, and for weekend work will be billed at 50% in excess of normal billing ratios. This shall include both City forces and the costs for City expenses of a consultant.
5. Construction plans for all utilities will be provided to the City of Sisters prior to approval for any construction on new developments.
6. Plan review for new developments will require a minimum time frame of 2 weeks and up to 60 days for each plan submittal. All plan reviews and revisions will be complete before construction will be permitted. The mandatory pre-construction conference will not be held until all construction plans are approved.
7. All easements and right of way dedications will be completed prior to connection of developer's utilities to public infrastructure. No utilities will be extended across proposed developments or properties until utility easements are dedicated and in place.
8. Advance notice for all infrastructure testing will be made to City personnel not less than 24 hours prior to initiation of testing. A minimum manpower assessment of 2 hours work will be charged for all requests for testing after normal working hours and on weekends.
9. Plan approval from the Sisters Rural Fire Protection District must be obtained before the City will approve final construction plans. No exceptions will be permitted.
10. All fire lines shall be dedicated to the City of Sisters from the main water line to approved backflow prevention devices. Easements for the waterlines must be dedicated to the City, and all construction will be in accordance with Public Works Construction Standards of the City of Sisters.
11. Public Works Construction Standards of the City of Sisters will govern over all other conflicting documents of the City. This applies in particular to street standards and required street and alley widths.
12. All surveys for public works facilities shall be performed under the direction of a Professional Engineer or Professional Land Surveyor registered in the State of Oregon. All elevations shall be referenced to USGS datum.
13. Materials and workmanship shall meet or exceed the adopted Standards and at all times they shall be subject to the approval of the City.
14. Approval by the City of the plans and specifications for water and sewerage facilities will be contingent upon necessary approvals for same being attained from the State Health Division, and the Department of Environmental Quality, delegated through the City of Sisters, as appropriate.
15. Prior to acceptance of any development, the City of Sisters will install stop signs, street signs, and any needed traffic control signing. All signing costs will be at Developer's expense.
16. Upon completion of projects to become public works, a Developer or the Developer's Engineer shall submit accurate as-built plans. Two complete blue-line

print sets, one complete set of reproducible Mylar "as-built" drawings, and a digital copy of the final as-builts shall be provided to the City. Such "as-builts" shall show deviations from the original construction drawings and shall include sufficient information to accurately locate water and sewer service extensions, valves, man holes, appurtenances, reports on water and sewer line leakage tests, etc.

17. Upon acceptance of the construction by the City, the public facilities shall be presented to the City Council for acceptance of the improvements for ownership and maintenance. Once accepted by the City Council, a one (1) year warranty bond on materials and workmanship or a cash deposit of 10% of the construction cost shall be negotiated between the City and the Developer to provide assurances that warranty issues will be corrected.

The warranty shall be comprised of a bond or a cash deposit submitted as retainage, and to assure that warrantee issues will be corrected, or that the City has sufficient revenues to make any needed corrective efforts that are not provided by the Developer.

18. To maintain current water, sewer, traffic, and parks master planning, and to provide for updates of comprehensive planning needed to assure that good public infrastructure is available for Sisters residents, each development will pay a fee, established by resolution, to maintain current planning documents.

G. PROCEDURES FOR CONSTRUCTION OF PUBLIC WORKS

1. Before construction of a Public Works project commences, the Contractor or Developer shall meet the following:
 - a. Prior satisfaction of all planning and zoning requirements.
 - b. Submission and approval of detailed construction plans and specifications as prepared by a registered Professional Engineer. Three sets of blueline plans shall be submitted. If acceptable, one set of plans and specifications shall be marked "approved", and shall be returned to the applicant. If not acceptable, any deficiencies shall be noted when these documents are returned to the applicant; the applicant shall then make the necessary corrections and resubmit the documents for approval prior to construction activity. Requirements for plans prepared by a professional engineer may be waived for relatively minor projects, at the discretion of the City.
 - c. Guarantees
 - (1) Person(s) proposing construction, repair or excavation in the public right of way or easements of the City of Sisters shall provide a 120% **guarantee** for the completion of the proposed construction, repair or excavation.

The guarantee may be in the form of assignment of funds, cash deposit, surety bond, letter of credit or other form approved by the City's attorney and in an amount deemed adequate for the completion of the project. Guarantee will be provided whenever

connection is made to existing water, sewer and street infrastructure of the City, and amount of guarantee shall include all construction including construction to point where connections to existing facilities are made. Guarantee shall be posted before construction is permitted, and shall be continued until all proposed construction is complete. Amount of guarantee may be reduced as construction is completed, in an amount approved by the City Engineer.

- (2) Developer/s subdividers shall provide a 120% **guarantee** for meeting the “to and through” policy of the City to provide for the orderly extension of services provided by the City to adjacent properties. Said **guarantee** shall be accompanied by the unrestricted dedication of easements and/or right of way through which the services are to be extended and provided to adjacent properties.

The guarantee may be in the form of assignment of funds, cash deposit, surety bond, letter of credit of other form approved by the City’s attorney and in an amount deemed adequate for the completion of the project.

- (3) In the event that a developer/subdivider seeks final plat approval prior to the City accepted completion of all City service extensions proposed by the developer/subdivider, a **guarantee** for the completion of the proposed extensions will be provided by the developer.

The guarantee may be in the form of assignment of funds, cash deposit, surety bond, letter of credit of other form approved by the City’s attorney and in an amount deemed adequate for the completion of the project.

Determination of Guarantee - The developer/subdivider or their agent shall provide certified-engineered drawings of all work to be done in a format acceptable to the City. Along with the drawings the developer/shall provide a cost estimate of the work to be done. The City of Sisters Superintendent of Public Works and City Engineer shall each review the drawings and estimates, determine adequacy and establish an amount of guarantee set at 120% of the accepted estimate.

- d. Submission of a copy of an insurance certificate indicating that the applicant or each of his/her contractors is covered by public liability and property damage insurance in amounts of not less than \$1,000,000.00/\$1,000,000.00 Property Damage/Bodily Injury Liability, property damage.
- e. Submission of letters from applicable state agencies approving the plans and specifications.

- f. Work in the public right-of-way shall be completed only by a licensed, insured and bonded contractor with a current City of Sisters business license on file at the City.
 - g. Payment to City for applicable fees and procurement of all Public Works construction permits.
2. Daily inspection of construction by City representatives shall be required. No concrete shall be poured or ditch backfilled without such inspections being made and approvals given. A tentative schedule for inspection shall be established when the permit is issued. The permit holder shall give the City a minimum of 24 hours advance notice before inspections fall due. It shall be the permit holder's responsibility to obtain City inspections and approvals before installing the work. Developer's engineer shall provide the City with daily inspection reports of construction progress, reports shall be turned into the City at the end of each week.
3. ACCESS TO PREMISES

The Superintendent of Public Works or his agents or employees shall have access, at proper hours of the day, to all parts of the user's buildings and premises in which public service may be delivered, for the purposes of inspecting the condition of public facilities.
4. The City shall provide the permit holder with a letter formally accepting the improvements for City ownership, operation and maintenance subject to the usual exception as to the one-year guarantee on materials and workmanship, when the following conditions are met:
 - a. Construction is complete.
 - b. The City has inspected the finished work and found it acceptable.
 - c. The permit holder's Engineer submits a certificate of completion and reproducible "as-built" plans to the City as required under item F-5 of these special conditions. Copies of satisfactory passage of water and sewer line leakage tests shall also be furnished to the City.
 - d. The permit holder furnishes the City with a copy of recorded plats and/or easements to ensure the City's access to the public works facility for purposes of operation and maintenance.
 - e. Satisfactory provisions have been made in the form of recorded plats, rights-of-way or easements to ensure the City's access to the public works facility for purposes of operation and maintenance. Developer's Engineer shall demonstrate the proper location of public facilities with rights-of-way or easements by recovering or establishing appropriate property corner monuments. This shall apply both to existing easements and potential rights-of-way ownership.
 - f. Follow all guidelines set forth in the acceptance policies for water, sanitary sewer streets, and storm drainage as set forth in Section V herein.

- g. The contractor shall furnish all labor, materials and equipment necessary and required to complete the work in all respects as shown on the plans, as hereinafter specified, or both.
- h. All work shall conform to the latest City standards which include, but are not limited to, zoning ordinances, subdivision ordinance, Oregon APWA standards, this document and versions thereof. Any work not meeting these standards is subject to removal and replacement at the contractor's expense.
- i. **PLAN SUBMISSION**
Utility plans (plan and profile sheets) shall be submitted individually for each utility. The combining of more than one utility on the same plan sheet will not be permitted.

H. PROGRESS OF CONSTRUCTION

1. It is the intention of these contract documents that the progress of work shall proceed in a systematic manner so that a minimum of inconvenience will result to the public in the course of construction. It is, therefore, necessary that the contractor confine his operations to as small a length of work area per crew as is feasible.
2. Cleanup of all existing debris, construction debris, excess excavation, excess materials, and complete restoration of all ditches, culverts, signposts, and similar items shall be completed immediately following the completion of the project or of any portion of the project.
3. It is the intent of these specifications that the contractor shall provide all labor and equipment necessary to grade and maintain, in a reasonable condition, all streets, roadways, and construction sites on which construction has been accomplished until final acceptance of the entire project by the City.

I. DUST CONTROL

The contractor shall maintain all excavations, embankments, stockpiles, haul roads, access roads, plant sites, waste areas, borrow areas, and other work areas free from dust which would cause a hazard or nuisance. Approved temporary methods of stabilization such as sprinkling, chemical treatment, light bituminous treatment or similar methods shall be used to control dust. Sprinkling, to be approved as the accepted dust control means, must be repeated at such intervals as to keep all parts of the disturbed area damp at all times, and the contractor must have sufficient equipment on the job to accomplish this. Dust control shall be performed as the work proceeds, wherever and whenever a dust nuisance or hazard occurs. Water from the City water system is available upon approval by the City. All water shall be purchased at rates established by the City.

J. COMPLIANCE WITH LAWS AND REGULATIONS

The required provisions of all applicable laws, regulations, and codes shall be deemed incorporated in all public works construction documents and they shall have equal force and effect as though written out fully therein.

K. WORK ON CITY RIGHT-OF-WAY

Work on City right-of-ways shall require the following:

1. Compliance with City approved construction documents, public works construction permit, and these construction standards. Fees for all construction within City right-of-way shall be paid in advance.
2. All construction within existing improved streets shall be provided by the City of Sisters and charged to developer desiring service. This construction shall include hot taps for water mains and services, sewer service tees and laterals, water service laterals, water mains, sewer mains, etc.
3. All water and sewer construction within improved rights-of-way shall utilize Class IV Backfill, and paving shall be replaced with patchless technology, such that no evidence of patch exits after construction.
4. The minimum possible interruption to pedestrian and vehicular traffic flow.

L. PROTECTION OF EXISTING FACILITIES

1. The approximate location of underground City water, sewer, and drainage facilities may be available at the office of the superintendent of Public Works. The approximate locations of underground power, gas, telephone and cable facilities shall be available from the serving utility companies. The locations of existing facilities shall be shown on the construction drawings for public works projects.

In the event of incomplete records on public facilities, the Public Works Superintendent will assist Developer's Engineer with field location of existing facilities. Developer's Engineer shall conduct appropriate location surveys to accurately reflect the location of existing facilities on construction drawings.

2. The exact location of underground facilities shall be verified in advance of public works construction, in cooperation with the public or private utilities involved, or for any other affected parties. This includes water right holders.
3. The contractor shall exercise all possible caution to prevent damage to existing structures and utilities whether above the ground or underground. An attempt has been made to show these structures and utilities on the plans. While the information has been compiled from the best available sources, its completeness and accuracy cannot be guaranteed, and it is presented simply as a guide to prevent possible difficulties. The contractor shall notify all utility offices concerned at least 48 hours in advance of construction operations in which a utility's facilities may be involved. This shall include but not be limited to water, sewer, telephone, electric, gas, and television services.
4. It shall be the responsibility of the contractor to locate and expose all existing structures and utilities in advance of the excavation. Any structures or utilities damaged by the work shall be repaired or replaced in the condition equal to or better than the conditions prior to the damage in accordance with the requirement of the affected utility. Such repair or replacement shall be accomplished at the contractor's expense. The contractor shall notify the owner of the damaged

underground structure or utility, and repairs or replacements shall be made before backfilling takes place. Utility companies must be notified if damage occurs to their facilities.

5. If interfering power poles, telephone poles, guy wires, or anchors are encountered, the contractor shall notify the affected utility at least seven (7) days in advance of construction to permit arrangements for protection or relocation of the structure. However, failure of utility to respond shall create no obligation on City, and contractor shall protect all utilities against damage, or shall stand all costs involved thereof.

If the contractor encounters existing structures that will prevent the construction of any portion of the project and which are not properly shown on the plans, he shall notify the engineer before continuing with the construction. If the contractor shall fail to so notify the City when an existing structure is encountered, but shall proceed with the construction despite this interference, he shall do so at his own risk. In particular, when the location of the new construction, as shown on the plans, prohibits the restoration of existing structures to their original conditions, the contractor shall notify the City so that field relocation may be made to avoid the conflict.

5. Suitable notice shall be given to all public and private utility companies in advance of construction for the purpose of protecting or relocating existing facilities.

M. CITY ORDINANCES AFFECTING PUBLIC WORKS CONSTRUCTION

1. New subdivisions and land partitions under the jurisdiction of the City of Sisters shall comply with the requirements of the City's Subdivision and Partitioning Ordinance as adopted by the City Council, or as it may be hereafter amended or superseded.
2. The physical requirements for all public works construction within the City shall comply with these Standards.
3. Section II through V of these Public Works Standards set forth requirements to be followed in the design of public works facilities in the City. Variances to these design standards may be considered by City staff upon adequate showing that a special case exists. City staff shall file a decision granting or denying such variance with the City Manager. Such decision may be appealed to the City Council under the procedures for the appeal of a zone change.

N. IMPROVEMENT AGREEMENT

If a developer desires to defer construction of a portion of the public works improvements to be constructed, and if such deferral is determined by the City Engineer or City Council to have no adverse effect on the City's interests, the Developer shall enter into an improvement agreement with the City. Said improvement agreement shall set forth completion dates for the items of work to be deferred, and it shall constitute assurance that all improvements will be made in a timely manner, the City Council may impose conditions of approval for such deferments, including bonding of planned facilities.

O. TEMPORARY TRAFFIC CONTROL

1. The contractors of public works projects shall, at his expense, provide and maintain such signs, barricades and warning lights as are necessary to warn and protect the public at all times on highways, roads or streets affected by work operations. In addition, the contractor shall also provide all necessary flagging, barricades, signs and traffic control devices necessary to warn and protect the public, all in conformance with the manual on Uniform Traffic Control Devices, published by the U.S. Department of Transportation.
2. The contractor shall patrol the traffic-control area and reset all disturbed signs and traffic-control devices immediately, and shall remove or cover all non-applicable signs during periods not needed. Patrols shall be conducted regularly, including week-ends and down time during bad weather and contractor shut-downs.
3. He shall further use every reasonable precaution to safeguard the persons and property of the traveling public. Failure of the City to notify the contractor to maintain barricades, barriers, lights, flares, danger signals, or watchmen shall not relieve the contractor from his responsibility. All barricades and obstructions shall be protected at night by signal lights which shall be suitably distributed and kept burning from sunset to sunrise. Barricades shall conform to the standard specifications for highway construction of the State Highway Department affecting the location of construction.

Barricades shall be of substantial construction and shall be suitably painted to increase their visibility at night.
4. Whenever the contractor's operations create a hazardous condition, he shall furnish flagmen and guards as necessary or as ordered by the engineer to give adequate warning to the public of any dangerous conditions to be encountered. He shall furnish, erect, and maintain approved fences, barricades, lights, signs, and any other devices that may be necessary to prevent accidents and to avoid damage and injury to the public. Flagmen and guards, while on duty and assigned to give warning to the public, shall be equipped with approved red wearing apparel and a red flag which shall be kept clean and in good repair. Signs, flags, lights, and other warning and safety devices shall meet the requirements of the current safety manual of the State Highway Department affecting the location of construction.
5. The contractor will be required to confine construction operations within the public rights-of-way or in City ownership unless he has made special arrangements with other affected property owners in advance. The contractor will be required to protect stored materials, and other items located adjacent to the construction. Property owners affected by the construction shall be notified by the contractor at least 48 hours in advance of the time construction begins.
6. When necessary, public traffic shall be permitted to pass through the work with as little inconvenience and delay as possible.

7. The contractor shall provide access to private properties at all times, except during urgent stages of construction when it is impractical to carry on the construction and maintain traffic simultaneously.
8. Under no circumstances shall any public way be closed without the prior approval of City.
9. The contractor shall give occupants of property fronting a street at least 24 hours notice before more than half the street is closed to vehicular traffic.
10. When, in the judgment of the City, vehicular parking is a hazard to through traffic or to the work, the contractor shall furnish and place no parking signs on any street which is directly involved in the construction work.
11. The contractor shall construct and maintain approved temporary detours for the protection of the work and the safe passage of traffic through the work area.
12. When detours are not available, the contractor shall confine operations to a width which provides for safe passage of traffic. If, in the judgment of the City, one-way traffic is necessary, the contractor shall provide at least two (2) flaggers to control traffic, one flagger being stationed at each end of the roadway being limited to restricted use. At the end of each day, the contractor shall leave work in such condition that it can be traveled without damage to the work and without danger to the public.
13. The contractor shall comply with the requirements of the Oregon Department of Transportation, Highway Division and Deschutes County Road Department for work affecting roadways under their respective jurisdictions.

P. GENERAL REQUIREMENTS FOR UTILITY TRENCHING AND CONDUITS

1. Contractors constructing public work projects which include trenching for underground power, telephone and cable television shall coordinate all work with the respective utility company representative; and conform to utility company requirements for trench depth, width, and bedding.
2. Furnish and install Schedule 40 polyvinyl chloride (PVC) conduit or conduit acceptable to utility companies and governing jurisdictions at all street and highway crossings. One additional conduit of similar size to utility specified shall be furnished for future usage. Cap each end.
3. Restore ground surface to match pre-existing conditions, or as otherwise approved by the City or the agency representative having jurisdiction over the road right-of-way. This shall include patchless technology to restore asphalt in all paved, improved streets.

Q. CONTRACTOR'S RESPONSIBILITY FOR UTILITY PROPERTIES AND SERVICE

1. At points where the contractor's operations are adjacent to or cross properties of railway, telegraph, telephone, power, oil, and water companies or are adjacent to other property (damage to which might result in considerable expense, loss, and

inconvenience) no work shall be started until all arrangements necessary for protection thereof have been made, and approved by the City.

2. The contractor shall be solely and directly responsible to the owners and operators of such properties for any damage, injury, expense, loss, inconvenience, delay, suits, actions, or claims of any character brought because of any injuries or damage which may result from the carrying out of the work to be done under the contract.
3. In the event of interruption of domestic water or to other utility services as a result of accidental breakage, or as a result of being exposed or unsupported the contractor shall promptly notify the proper authority. He shall cooperate with the said authority in restoration of service as promptly as possible and shall bear all costs of repair. In no case shall interruption of any water or utility service be allowed to exist outside working hours unless prior approval is received.
4. Neither the City nor its officers or agents shall be responsible to the contractor for damages resulting from the location of underground utilities being other than that shown on the plans or for the existence of underground utilities not shown on the plans.
5. In the event the contractor encounters water service lines that interfere with trenching, he may, by obtaining prior written approval of the City, cut the service, dig through and restore the service with similar and equal materials at the contractor's expense.
6. The contractor shall replace at his own expense any and all other existing utilities or structures removed or damaged during construction, unless otherwise provided for in these specifications or ordered by the City.

R. PUBLIC SAFETY AND CONVENIENCE

The contractor shall comply with all rules and regulations of the city, state and federal authorities regarding the closing of public streets or highways to use of public traffic. No road shall be closed by the contractor to the public except by express written permission of the City engineer. Traffic must be kept open on all roads and streets where no detour is possible. The contractor shall, at all times, conduct his work so as to assure the least possible obstruction to traffic and normal commercial pursuits. The convenience of the general public and residents, and the protection of property, is of prime importance and shall be provided for by the contractor in an adequate and satisfactory manner.

S. EXPLOSIVES

1. In the use and storage of explosives, the contractor shall use every precaution to prevent injury to persons and damage to property. Secure storage places shall be provided and all such places shall be clearly marked with warning signs. Only state licensed persons experienced in the handling of explosives shall be allowed to use explosives on the work, and no explosion shall be detonated until warning has been sounded and all persons within the radius of danger removed.
2. In the handling and storage of explosives, the contractor must comply with all federal, state and local laws, the City and City engineer will not be responsible for

any noncompliance therewith or for damages to property or injury to persons resulting from accidental or premature explosions.

3. When explosives are used, particularly in proximity to buildings or other structures, care shall be taken to protect the surroundings from injury by the explosion, the resultant concussion or by flying rocks or debris. The quantities of explosives and the manner of their use shall be such that adjacent property will not be damaged. In case the vicinity of the work is accessible to the general public, the contractor shall, before any explosives are permitted, post employees about the work in various directions to warn all persons of the danger existing and to prevent them from approaching closer than safety will permit. The City or City engineer shall not be responsible for damage from explosives.

T. PERMITS AND APPROVALS

Developer or engineer shall obtain and pay for all approvals, permits, and/or inspections required by regulatory agencies. Agencies shall include but not necessarily be limited to Oregon Department of Environmental Quality, Water Resources Division, Department of Commerce, Building Codes Division, Department of Transportation, Highway Division, U.S. Army Corps of Engineers, Division of State Lands, and Deschutes County.

For final acceptance of project, City must receive final written acceptance of all approval entities, as-built drawings, and a letter from Developer's Engineer stating all work has been completed as per the City of Sisters Public Works Construction Standards, plans and specifications approved by the City. In addition, all rights-of-way and easements must be recorded, with copies of recording instruments provided to City before acceptance of project will be permitted.

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ORDINANCE 351
SPECIAL CONDITIONS
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SECTION II
STANDARD SPECIFICATIONS AND DETAILS
ENGINEERING REQUIREMENTS FOR CONSTRUCTION
PLANS

A. GENERAL

1. No work shall be commenced until construction plans have been reviewed for adequacy and approved by the City. All plans shall be prepared in accordance with requirements of the city and shall be prepared by or under the direction of an engineer registered as a professional engineer in the state of Oregon.
2. All plans shall be prepared in a manner which is acceptable to the Oregon State Health Division, the Oregon Department of Environmental Quality, or other applicable state and federal regulatory agencies. All approvals required by state or federal authorities shall also be obtained and submitted to the City of Sisters prior to commencing construction of improvements.
3. The City of Sisters has obtained authority for plan review on water systems by the Oregon Health Division, which will permit local review of planned water improvements by the City Engineer. A fee for plan review will be made for each project.
4. The intent of these standard specifications is to establish minimum standards that all development projects will conform to. However, all design must follow standards of excellence which should be expected from quality engineering of city improvements. All work must be provided in accordance with the recommendations of the design engineer with the minimum level of standards provided in these standard specifications. The City of Sisters does not assume responsibility or liability for developers' recommendations or engineering design.
5. Alternatives to standard specifications:
 - a. Alternatives to standard specifications for materials will be considered upon written request by the developer or his engineer. Approvals or variance to standard specifications will be considered and, if appropriate, approved by the city administrator, the public works superintendent, or their appointed designees.
 - b. The minimum sizing for recommended utilities and street standards will be to provide conformance with existing comprehensive plans and/or standards adopted by the city council of the City of Sisters.
6. Drawings. Street utility construction plans shall be drawn on 24 inch by 36 inch standard plan-profile sheets. Minimum horizontal scale is 1 inch equals 50 feet and minimum vertical scale is 1 inch equals 1 foot.
7. General Information. All construction plans shall contain the following information:
 - a. A vicinity map and a general layout map of the proposal showing the location of existing facilities and the proposed improvements.
 - b. North point and scale.
 - c. A suitable title block shall be used showing name and address of the

- subdivider, title of sheet, date, drawing number, and name, address and registration stamp of the engineer.
- d. Location of existing topography, including culverts, streams, pavement, surface obstructions and all aboveground and underground utilities.
 - e. Adjacent streets and right-of-way lines, easements, centerlines, street widths, adjacent utility lines and drainage ways.
 - f. A cross section trench detail showing underground utility line placement with respect to all other buried utility lines.
 - g. Street plans should be separate from utility plans, but all plans should retain the same plan and profile configuration for ease of comparison. Utility profiles should show finished street centerline elevations, or other finished elevation profiles where utilities may be located out of the street curb lines.
8. Specific Information.
- a. Street, alley, and drainage plans shall be based on the following guidelines.
 - (01) 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.
 - (02) 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.
 - (03) 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. 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. Intersections shall have a minimum corner radius of 12' in curbed areas and 15' in noncurbed areas.
 - (04) Half streets, while generally not acceptable, may be approved by the City Council if the Developer provides a right-of-way width of at least 30-40 feet (Depending on street type), where essential to the reasonable development of the property, when in conformity with the other requirements of these regulations, and when the Planning Commission finds it will be practical to require the dedication of the other half when the adjoining property is developed. Whenever a half street is adjacent to the tract to be developed, the other half of the street shall be platted within such tract. Reserve strips and street plugs may be required to

preserve the objectives of half streets.

- (05) Cul-de-sacs shall be as short as possible and no more than 600 feet long and serve no more than 10 dwelling units. Each cul-de-sac shall have a circular end with a minimum diameter of right-of-way width and paving as shown in Table 1 of the sub-chapter.
- (06) Grades and Curves. Grades shall not exceed six (6) percent on arterials, eight (8) percent on collector streets or ten (10) percent on any other street. Centerline radii of curves shall not be less than 300 feet on major arterials, 200 feet on collectors and continuing residential streets, and 100 feet on other streets and alleys. Where existing conditions, particularly topography, make it otherwise impractical to provide buildable lots, the Planning Commission may accept steeper grades and sharper curves. In flat areas, allowance shall be made for finished street grades having a minimum slope, preferably of at least 1.00 percent.
- (07) Alleys shall be provided in commercial and may be required in industrial and residential districts, unless other permanent provisions for access to off-street parking and loading facilities are approved by the Planning Commission. The corners of alley intersections shall have a radius of not less than 12 feet.
 - (a) Dedication - The Planning Commission or City Council may require adequate and proper alleys to be dedicated to the public by the land divider of such design and in such location as necessary to provide for the access needs of the subdivision or partition.
 - (b) Width - Width of right-of-way and paving design for alleys shall be not less than 20 feet. Slope easements shall be dedicated as required by the City Council.
 - (c) Corner Cut-offs - Where two alleys intersect, 10 feet corner cut-offs shall be provided.
 - (d) Grades and Curves - Grades shall not exceed 10 percent (10%) on alleys and centerline radii on curves shall be not less than 100 feet.
 - (e) Other Requirements - All provisions and requirements with respect to streets in this subchapter shall apply to alleys the same in all respects as if the work "street" or "streets" therein appeared as the work "alley" or "alleys" respectively.

b. Streets

- (01) Symmetrical street cross sections are preferred in flat terrain, with opposite curbs or edges of pavement at approximately the same grade.
- (02) Tilted and warped street cross sections shall be utilized in sidehill terrain and to match existing facilities.
- (03) The maximum difference in opposing curb grade elevations shall be

two feet for tilted and warped sections. The street section in warped sections shall be identical to a symmetrical section when measured from curb to curb.

- (04) The finished pavement grades at intersection and cul-de-sac turn-arounds shall be designated and detailed to demonstrate adequate drainage. Edge of pavement profiles or spot elevations will be required.
- (05) Improvement widths shall conform to tables provided in standard details.
 - (a) Streets with parallel parking shall have a minimum Right-of-Way width of 60 feet.
 - (b) Streets with Diagonal Parking shall have a minimum Right-of-Way width of 80 feet.
- (06) Design of Roadway Section
 - (a) Standard roadway design can be used for residential streets and collector streets up to an including the 40 foot wide improvement shown in standard details. Standard sections are to be considered minimum designs and actual soil conditions shall be evaluated by the Project Engineer and may require thicker base rock or pavement installations.
 - (b) For roadways greater than 40 feet curb to curb or with design capacities over 10,000 vehicles per day, street designs shall be submitted to the City with appropriate soils bearing test results and design calculations.

c. Curbs

- (01) Curbs will typically be required in commercial, industrial, institutional, multifamily and similar areas.
- (02) Curbs shall conform to Standard Details.
- (03) Curb tops shall be set level or below adjacent ground levels to provide surface drainage.
- (04) Curb shape to conform to Standard Details. No "glue down" extruded curb shall be permitted in public rights-of-way.
- (05) Monolithic curb and gutter sections will be required where curb grades are below 0.5 percent minimum recommended slope.
- (06) Machine extruded curbs, as well as formed and poured curbs, shall require two inches of 3/4" minus crushed rock base.
- (07) Maximum tolerance for finished curbs shall be 1/2" on alignment, and 1/4" on grade at any point, providing that a drainage pocket does not occur.
- (08) Provide drop curbs for driveways, curbs radius' and ambulatory ramps with original curb pour when locations can be determined in advance. All work shall be in accordance with the latest ADA requirements.

- d. Sidewalks
 - (01) Sidewalks shall conform to Standard Details provided.
 - (02) Sidewalks shall maintain 1/4" per foot cross slope for drainage to curbs.
 - (03) Sidewalk locations shall be determined by the Planning Commission, City Council, or these construction standards.
- e. Driveways
 - (01) Driveways shall conform to Standard Details provided.
 - (02) Maximum driveway ramp slope shall not exceed 15 percent (15%).
- f. General Design
 - (01) Street plan/profile shall show at least the following information:
 - (a) Location of proposed street rights-of-ways with respect to lot property lines, subdivision boundaries and existing streets.
 - (b) Street right-of-way widths, centerline (including bearings) with stationing, all horizontal and vertical curve data, street names, and curb locations.
 - (c) Profile of finished street centerline, with existing ground elevations. Both right and left top-of-curb profiles with top-of-curb elevations. Both right and left top-of-curb profiles with top-of-curb elevations and existing ground elevations.
 - (d) Stationing for beginning and end of curb points on street centerlines and on face of curbs.
 - (e) Required paving and/or repairs. Notes and details.
 - (f) A street cross-section detail showing proposed improvements.
 - (g) Cross sections at maximum intervals of 50 feet, where a cross slope of more than 1 foot exists in the street topography.
- g. Storm Drains.
 - (01) Where storm drains are provided, sizing shall be designed on the basis of a flood frequency of 10 years.
 - (02) Minimum diameter pipe for underground storm drains and storm drainage culverts shall be 12 inches.
 - (03) Storm drain installation shall comply with the provisions of Sisters Ordinance No. 231.
 - (04) Storm drain velocities shall be no less than 3 feet per second no more than 10 feet per second, flowing full.
 - (05) A drop of 0.25 feet will normally be provided through every manhole invert.
 - (06) Manholes shall be provided at the following locations:
 - (a) Every change in pipe grade or manhole.

- (b) Every point of change in pipe size or elevation.
 - (c) Every intersection or junction of storm drains.
 - (d) The upper end of all lateral storm drains.
 - (e) Maximum distance between manholes shall be 500 feet.
- (07) Storm drain plan/profile shall show at least the following information:
- (a) Profile or proposed storm drain lines and manholes including diameter, slope, horizontal length or type of pipe between consecutive manholes.
 - (b) Elevation of finished grade and inverts of each storm drain manhole.
- (08) Storm dry wells and appurtenances shall be provided for new subdivisions and land partitions; and industrial and commercial lots as determined by the City.
- (09) Low corners at street intersections shall be drained through storm dry well systems, or through storm drains.
- (10) Surface water shall be contained and disposed into detention facilities on each lot or ownership within the City, or carried through storm drainage facilities to a permanent drainage course. Surface water will not be allowed to flow to public ways or adjacent properties.
- (11) Curb Inlets.
- (a) Curb inlets shall be used to collect storm water from curb gutters. Connections to the storm drain shall be of 12 inch pipe, and may be made by a tee fitting.
 - (b) The quantity of water received at the inlet shall not exceed the capacity of the inlet.
 - (c) Maximum height of curb inlet opening shall be six inches.
- h. Sanitary sewer:
- (01) Sizing and slope shall be based on minimum standards of the Oregon Department of Environmental Quality and on detailed calculations by the Project Engineer for the specific installation, taking into account all proposed loadings.
 - (02) All pump stations shall be negotiated separately with the City to utilize current acceptability criteria within the City, and designed to meet all standards of the Oregon Department of Environmental Quality.
 - (03) Sanitary sewerline plan/profile shall include diameter, size, slope, horizontal length and type of pipe.
 - (04) Plans shall include the elevation of finished sewer and surface grade and inverts at changes of directions, manholes, cleanouts and connections. All manhole and cleanout locations shall be stationed.

- (05) A drop of 0.10 plus the normal pipe slope will be provided through every manhole invert.
 - (06) Manholes shall be provided at the following locations.
 - (a) Every change in pipe grade or direction.
 - (b) Every point of change in pipe size or elevation
 - (c) Every intersection or junction.
 - (d) The upper end of all lateral sanitary sewers.
 - (e) Maximum distance between manholes shall be 500 feet.
 - (07) Cleanouts may be utilized for the upper end of laterals not exceeding 250 feet in length, if the potential does not exist for future line extensions.
 - (08) Location, elevation and details of all appurtenances and special equipment, such as lift stations and wetwells shall be provided.
 - (09) Details of protective, heated buildings for housing any required electrical controls and/or standby generating facilities shall be detailed.
 - (10) Service or house lateral plan locations and stationing, plus a typical installation detail including depth and length of finished lateral from mainline shall be indicated.
 - (11) The Developer's Engineer shall submit a summary of his design criteria to the City with construction plans, before construction starts. Design criteria shall be subject to review and approval of the City.
 - (12) Minimum cover for all new sewerlines and service lines shall be 36 inches below finish grade. In addition, separation between water and sewerlines, including service lines, shall be in compliance with regulations of the Oregon Health Division and the Department of Environmental Quality.
 - (13) Plans shall include a description of all materials and workmanship to be provided.
 - (14) All main lines shall be extended through the property to be served and extending to neighboring property lines on all sides of the property planned for development.
 - (15) The ends of all unused main and service lines shall be marked by a wooden 2 x 4, painted green, extending 12" above grade.
- i. Waterline plans shall show at least the following information:
- (01) Location of all proposed waterlines, air-release valves, blow-offs, valves and other appurtenances. Detailed drawings of pipe, valve, service connection, hydrant, and any special installations shall be provided.
 - (02) Profile of proposed waterlines including diameter, size, slope, horizontal length and type of pipe.

- (03) Elevation of finished grade and inverts at vertical changes of direction, appurtenances and connections. Appurtenance installation locations shall be stationed.
- (04) House service and water meter plan locations and stationing.
- (05) System design shall conform to applicable state and federal regulations, and specific requirements of the City.
- (06) A typical design domestic water consumption for a single residential home is 15 gallons per minute.
- (07) A typical fire hydrant flow rate of 1000 gallons per minute with a residual pressure of 20 psi should be available in residential areas. Higher flow rates may be required in commercial, industrial, or institutional areas.
- (08) The Developer's Engineer shall submit a summary of his design criteria to City with construction plans. Design criteria shall be subject to review and approval of the City before consideration will be granted for approval.
- (09) Minimum Sizing shall be 6 inch pipe. Runs exceeding 400 feet shall be 8 inch minimum.
- (10) Minimum pressure at the curb 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. (This is minimum pressure acceptable under ORS statutes.
- (11) Lines shall be looped in general, and where the City so specifies. With the exception of cul-de-sacs, all lines shall typically be looped. All cul-de-sacs shall have hydrants placed at the ends of the line, with provisions for possible future extensions. All lines shall be capped at exposed ends for future extensions.
- (12) Hydrants shall be provided at all dead end main lines, including cul-de-sacs.
- (13) All valves shall be the same size as the associated pipeline.
- (14) A maximum distance of two blocks shall be allowed between valves, but at no instance shall the distance between valves exceed 1000 feet.
- (15) Unless otherwise approved by the City, a three-way interconnection shall be valved two ways.
- (16) Unless otherwise approved by the City, a four-way interconnection shall be valved three ways.
- (17) Spacing of fire hydrants shall incorporate all proposed buildings and structures within a 400' radius of a fire hydrant, and/or a fire hydrant shall be provided for each 160,000 square feet of developed areas, unless approved otherwise by the City. The City of Sisters reserves the

- right to increase fire hydrant requirements on a case by case basis.
- (18) Minimum cover for all new distribution pipes and service connections shall be 36 inches below finish grade.
 - (19) All new services shall be individually metered. Hot taps, lateral installation and meters shall be provided and installed by City at developer's expense. Payment for services shall be made in advance.
 - (20) All services shall have a corporation stop, two angle meter stops, meter, meter box, 6" extension with meter reader lid.
 - (21) The minimum service line shall be 3/4" diameter for one house.
 - (22) A single service shall be provided for each home or home site.
 - (23) Commercial and industrial users shall be determined on a case by case basis for service line sizing, in accordance with the Uniform Code.
 - (24) Service meters shall be located in a public right-of-way or easement adjacent to the property line of the property served.
 - (25) Location and sizing of all service connections, valves, hydrants, and appurtenances.
 - (26) Description of all materials and workmanship shall be provided.
 - (27) Specific procedures and schedule to minimize disruption of service to existing users during connections, pressure testing, chlorination, and bacteriological testing. Typically, service to existing customers or users shall not be disrupted during normal operating hours. After hours construction shall be coordinated with affected property owners.
 - (28) All main lines shall be extended through the property to be served.
 - (29) The ends of all unused main and service lines shall be marked by a wooden 2 x 4, painted blue, extending 12" above grade. When service lines are to be unused for a time, minimum requirements for acceptance shall include meter box, extension and lid.
- j. Electrical plan shall show at least the following information:
- (01) 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.
 - (02) Location in trench section detail (including proposed telephone and/or television transmission lines).
- k. Signing
- (01) All newly platted streets shall be signed with names approved by the City of Sisters and Deschutes County.
 - (02) Signs shall be constructed and installed by the City of Sisters at the Developer's expense.
 - (03) Signs along County or State right-of-way shall be approved by the Deschutes County Road Department or the Oregon Department of

Transportation as appropriate.

- l. Permanent Barricades and Guard Rails
 - (01) All permanent barricades and guard rails along City right-of-way shall conform to Standard Details.
 - (02) Permanent barricades and guard rails along County or State right-of-way shall be approved by the Deschutes County Road Department or the Oregon Department of Transportation as appropriate.
 - m. Grading, clearing and excavation of street right-of-ways, lot areas, and real estate parcels, when required by the planning commission or the city council shall be under the supervision of an engineer or geologist who is knowledgeable and skilled in the treatment of soils, soil stabilization and soil erosion. Due consideration shall be given to the existing terrain, cross-slope and vegetation. Approval of the grading, clearing and excavation plan by the city engineer and the city is required prior to any construction or work upon the premises.
 - n. Service meters shall be located in a public right-of-way or easement adjacent to the property line of the property served.
9. Start of Construction. Work shall not be commenced until the city has been notified, in writing, at least 48 hours in advance and until written notice to proceed is issued by the City of Sisters. If work has been discontinued for any reason, it shall not be resumed until the city has been notified in writing.
 10. Inspection. Required improvements shall be inspected under the direction of the Developer's Engineer, and constructed to the satisfaction of the city. The city may require changes in typical sections and details if unusual conditions arising during construction warrant such changes in the public interest. Sewer and water systems must be approved by the City prior to final hookup.
 11. House Services. Underground utilities, sanitary sewers, and storm drains installed in streets by the subdivider shall be constructed prior to the surfacing of the streets. Stubs for service connections for underground utilities and sanitary sewers shall be placed to street or easement right-of-way lines, and to lengths that will avoid the need to disturb street improvements when service connections are made. Secondary power lines, telephone and TV cables shall be constructed to each lot.
 12. As-built Plans. As-built plans of subdivisions, tracts of land and all land developments where public utilities including water and sewer facilities, streets, curbs and sidewalks are built within the said project shall be furnished by the Developer's Engineer to the city. The as-built plans shall contain three sets of plans, one being a reproducible copy and two being blueprint copies of the total project. The as-built plans shall be furnished to the City as soon as possible after completion of the construction, but not later than 60 days from completion of the project. The City will not allow hook-ups to the water or sewer system, or an occupancy permit for completed development until as-built plans are furnished to the City.
 13. In the commercial district, the City has developed standards for old fashioned street lighting. Lighting in accordance with the standards shall be provided on each block corner. Developer shall be responsible for all costs of street lighting to achieve

compliance with developed standards.

14. Any proposed development with significant impact on City services must provide updates and modifications to the City's water management/conservation plan. This is required by the Oregon State Water Resources Department. Modifications to this plan must show that no adverse effects to the water management/conservation program will be created by the proposed development. If adverse effects are created by the anticipated development, a plan and program to correct the problems created will be provided to achieve acceptance of the project.
15. All plans for new infrastructure will be submitted to the City for review. The City will forward plans to the City Engineer, who will endeavor to provide plan review within two (2) weeks after receipt. All plan reviews will be returned to the City Public Works Department, where additional requirements may be imposed for project development. All costs of plan review will be the responsibility of the Developer. Good construction plans verified to be in compliance with Standard Specifications will incur the least costs for plan review. All developers should carefully review submitted plans to minimize their charges for plan review.

A minimum deposit of \$250 will be applied to all projects for plan review. City staff will estimate deposit costs in excess of the minimum for major developments. Any costs in excess of the deposited amounts must be paid to the City before completed projects will be accepted. Any balances remaining in deposits will be returned to the Developer upon project acceptance by the City.

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ENGINEERING REQUIREMENTS FOR CONSTRUCTION PLANS
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**SECTION III
STANDARD SPECIFICATIONS AND DETAILS
CONSTRUCTION STAKING**

1. SCOPE

- a. The intent of this section is to define the staking services to be provided by the Developer's Engineer and to set forth the responsibilities of the Developer's Contractor respecting the use and maintenance of said stakes. All staking and surveying whether or not specifically listed in this section will be the responsibility of the Developer. All grade checking and transferring of lines and grades from the construction stakes will be the Developer's or his contractor's responsibility.

2. SCHEDULING

- a. Construction staking shall be scheduled to assure appropriate reference stakes are set by the Developer's Engineer in advance of any construction. Reference stakes typically shall include property corner monuments clearly defining the public right-of-way.

3. PRESERVATION OF PROPERTY CORNER MONUMENTS AND CONTROL STAKES

- a. Construction activities shall be performed to assure protection and prevent disruption of any property corner monument or control stakes. Any such monuments or stakes, damaged by construction activities, shall be restored in accordance with Oregon statutes, and/or the Developer or his agents or contractor shall be subject to the penalties established in Oregon statutes.

4. RESTAKING

- a. Restaking as required by the City to assure conformance with approved plans, shall be provided by Developer's Engineer, at the expense of the Developer or his contractor
- b. Curblines shall be staked by means of an offset line no more than 6' offset, showing the cut to the elevation. Said stakes shall be protected and saved for a period of two (2) working days after construction to enable the Inspector to approve the alignment and grade.
- c. Base rock shall be staked by painting an appropriate target on the curb if applicable, and/or providing construction stakes (blue tops) on centerline and each edge.

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SECTION IV
STANDARD SPECIFICATIONS AND DETAILS
GENERAL CONSTRUCTION STANDARDS

A. GENERAL

1. Carefully maintain bench marks, monuments, and other reference points. If disturbed or destroyed, notify engineer.
2. All construction within Oregon State Highway right-of-ways shall be in conjunction with the "General Provisions of the Oregon Department of Transportation."
3. All construction within Deschutes County right-of-ways shall be in conjunction with Deschutes County Standards.
4. All sanitary sewer design and construction shall be in accordance with the Department of Environmental Quality, "Sewer Design Criteria" as supplemented herein.
5. All domestic water system design and construction shall be in accordance with the Oregon Human Resources, Health Division, "Administrative Rules" and as supplemented by the engineer.
6. Acceptance of the completed right-of-way improvements will not be given until reproducible "as built" drawings have been submitted to and approved by the City.
7. Conditional Approval. Approval of construction materials other than what is specified herein will be on a job to job basis.
8. A minimum 10' separation between waterlines and sewerlines shall be maintained. On all new subdivision installations, the sewerline shall be installed at the centerline of each proposed right-of-way. A minimum 5' separation shall be provided between power and telephone utilities and public water and sewer utilities.
9. The developer's engineer shall be present for all testing of water and sewer facilities, including air testing, TV testing, flushing, vacuum testing, disinfection, and water testing.
10. City water can normally be made available for construction. Arrangements must be made in advance to purchase water from the City.

B. COORDINATION

1. This item concerns parties involved with public utilities and personal property adjacent to proposed construction. Contractor shall coordinate his work with that of:
 - a. City of Sisters
 - b. Central Electric Cooperative, Inc.

- c. Bend Cable Communications
 - d. U. S. West Telephone Co..
 - e. Private property owners.
 - f. Other affected utilities or public agencies.
2. Maintain at least one-way traffic on all streets unless authorized in writing by City.
 3. The contractor shall coordinate with the City, public utilities and/or agencies during construction work to avoid damage to utilities and improvements. If there is any doubt as to the disposition of existing utilities or improvements, the contractor shall notify the City, who will instruct the contractor as to the disposition of said improvements or utilities.
 4. The city's public work superintendent shall be notified 24 hours prior to the different phases of construction for scheduling inspections.
 5. The contractor shall further cooperate with the city and schedule his work to insure non-interrupted supply of water or availability of sanitary sewer facilities to city residences.
 6. The location of existing improvements and related facilities shown on the plans may deviate from the actual location and may necessitate minor design revisions during the course of the project. In order to insure the protection of existing facilities the contractor shall verify their location.
 7. A complete set of Public Works Construction Standards, latest edition, shall be present on the construction site at all times construction is ongoing. Standards shall be in possession of Contractor.

C. PROTECTION

1. All existing improvements, utilities and properties whether inside or outside the street right-of-way shall be protected against damage by the contractor. The contractor shall be responsible for the safety and stability of the existing structures and building in or adjacent to the work, where affected by his operations, and shall repair or make good any damage caused by his operations to mutual satisfaction of the city, public utilities and/or agencies.
2. All construction work shall be performed with the minimum disturbance to and interference with normal functioning of adjoining properties.

Where necessary, the contractor shall provide barricades for the protection of property and persons from damage and injury due to the execution of the work. The contractor shall, for the purpose of alleviation or prevention of dust nuisance originating within the construction site, apply water in locations designated by the engineer with pressure type water distribution trucks equipped with a spray system. The exact rate and number of applications will be determined by the local public agency or the engineer.

3. Job Conditions.
 - a. Environmental Requirements. If unfavorable weather conditions necessitate interrupting filling and grading operations, prepare areas of compaction of surface and grading to avoid collection of water. Provide adequate temporary drainage.
 - b. Protection. Conduct earthwork operations so as to prevent wind blown dust and dirt from interfering with the owner's and adjacent property. Assure liability for all claims related to wind blown dust and dirt.

D. CLEARING AND GRUBBING

1. General. This item shall include clearing and grubbing of all the right-of-way as necessary to complete the construction of the project. It shall include, but not be limited to, the following:
 - a. Removal of all trees, stumps, debris, and specified plant materials.
 - b. Disposal of all cleared materials by burning or hauling from site at contractor's expense. Contractor shall observe all city, county, state and federal laws pertaining to fire permits and burning.
 - c. All stumps, roots, and other embedded wood shall be completely removed to a depth of not less than one foot below limit lines of clearing. This may require grubbing, blasting, or the use of a stump removing machine.
 - d. All holes resulting from grubbing shall be filled with suitable material and compacted.
 - e. No excavated materials shall be permitted to cover brush or trees following clearing and disposal.
 - f. Removal and replacement of all improvements and/or other structures required to be removed and/or damaged during construction operations.

E. MISCELLANEOUS SITEWORK

1. Scope. This work shall include all labor, materials, and equipment required for ditching, backfilling, grading, leveling, excavating, embankment construction and other earth moving work required in the construction of the project, excepting those items as covered and included under other sections of these specifications.
2. Materials.
 - a. Clearing and grubbing, as specified.
 - b. Unclassified excavation shall include excavationable excavated materials shall be utilized for embankment in conjunction with grading as required. Borrow materials utilized for general embankment construction shall be earth, sand or gravel or combination thereof, which shall be free of peat, humus, muck, vegetative matter, organic matter or other characteristics detrimental to the construction of firm, dense and sound embankments.

3. Workmanship.
 - a. Excavation shall be carried to lines and grades in accordance with approved plans. Special care shall be taken not to excavate below subgrade. Subgrade shall be finished within a tolerance of 1/10 of a foot of grades indicated on plans.
 - b. All embankment shall be placed in twelve inch layers, before compaction. Each layer shall be separately compacted by means of approved equipment, type subject to approval of the engineer. Finish grades shall be within tolerance of 1/10 of a foot of line, cross sections and grades shown on approved plans or approved by the local public agency. Compactive equipment must provide a density of not less than 95% of "maximum density" when tested according to AASHTO Standard Method T-180 Method A, in areas of embankment. The City shall have the right to request compaction tests to assure compliance. The developer shall be responsible for compaction testing costs.
 - c. Moisture Content. Subgrade materials shall contain an optimum amount of moisture during compaction to stabilize and bind materials to produce densities specified. If sufficient moisture is not present, additional water shall be added by sprinkling.
 - d. The contractor shall:
 - (01) Furnish access to site and facilities for inspection.
 - (02) Notify the local public agency 48 hours prior to any fill or backfill operations.

Pay costs for additional inspections and tests due to noncompliance with standard specifications.

F. TRENCH EXCAVATION AND BACKFILL

1. General. Unclassified excavation shall include all materials encountered, complete, including but not limited to the following:
 - a. Protection of private property.
 - b. Locating and protecting existing utilities.
 - c. Maintenance of adequate barricades, lights and warning signs for protection of the public.
 - d. Removal of all obstructions, including stumps, logs and rubbish.
 - e. Pavement removal in improved streets. Pavement shall be sawn to a uniform line, a maximum of six inches on each side of excavated trench.
 - f. Disposal of cleared trees.
 - g. Foundation stabilization.
 - h. Curb removal wherever required for construction.
 - i. Clearing and shaping required for excavation.

- j. Excavation of trench for pipe and appurtenances.
 - k. Shoring, cribbing, bracing, dewatering and sheet piling, if required.
 - l. Hauling and disposal of excavated materials.
 - m. Repair of public and private property damaged.
 - n. All miscellaneous items of work to complete construction specified.
 - o. Final cleanup and continuous cleanup during construction.
 - p. Repair of damage to utilities.
2. Rock excavation shall infer solid rock which cannot be excavated with a "Caterpillar 235" or equivalent power shovel and requiring blasting for removal.
- a. Solid rock as defined as follows:

Solid rock, as referred to herein in connection with the classifying of excavation, shall comprise and include (1) boulders measuring 1 cubic yard or more in volume, (2) all rock material which is in ledges, bedded deposits and unstratified masses and which cannot be removed without drilling and blasting, and (3) conglomerate deposits which are so firmly cemented as to present all the characteristics of solid rock and which cannot be removed without drilling and blasting.

When solid rock layers have an overburden of material of common classification which cannot practically be stripped and handled separately from the solid rock and/or are interspersed with a material of common classification, the entire mass will be classified as solid rock if the solid rock constitutes noteline or conduit which crosses under the surfaced portion of the highway or street, installation shall be either tunneled, jacked, driven or bored under the surface.
 - b. The contractor shall make arrangements with applicable public agency and/or public utilities agencies before starting construction.
 - c. Casing shall be one quarter inch steel pipe, asphalt dipped.
 - d. Contractor shall sand slurry pack voids around the pipe and casing for the full length of the casing prior to backfilling the access pits. Ends to be watertight.
4. Trench Backfill and Bedding.
- a. General. No rock will be used on any project until a test report on the material is approved by City staff.
 - b. Foundation Stabilization. Stabilization material shall be utilized from approved sources as directed by the engineer, where it is necessary to stabilize the trench bottom.

Materials shall be one and one half inch minus gravel or crushed rock, reasonably evenly graded from coarse to fine, free from friable and organic matter. City must approve material prior to use.

- c. Pipe Bedding. Granular material for pipe bedding shall be clean, hard, sound, durable, $\frac{3}{4}$ " minus crushed rock conforming to Section 02630 Oregon Department of Transportation (ODOT) Standard Specifications, latest edition. Materials shall be free of organic matter.
- d. Pipe Zone . Pipe zone material shall be as specified above for "Pipe Bedding" material when Class I, III, or IV backfill is required; or with other classes of backfill shall be approved suitable trench side material which is free of organic matter, contains no frozen soil, contains no clay soil, contains no rock or other masses larger than $\frac{3}{4}$ - inch, and which will compact to specified density. City must approve material prior to use.
- e. Gravel base under improved streets, surfaced roadways and driveways, shall be $1\frac{1}{2}$ " minus crushed quarry rock conforming to Section 02630 ODOT Standard Specifications, latest edition..
- f. Gravel leveling course under improved streets shall be $\frac{3}{4}$ " minus crushed quarry rock conforming to Section 02630 ODOT Standard Specifications, latest edition.
- g. Drain rock shall be 1-1/2" uniform, round, washed drain rock or concrete gravel.
- h. Trench Backfill Methods. Under all improved streets, or planned improved streets, trench will be class III or IV backfill.
 - (01) Class I Backfill: Shall be backfilled with the excavated materials in layers not thicker than one foot layers. Excavated materials to be utilized for backfill shall be screened on a 2-inch screen. No rock greater than 2 inches shall be permitted for backfill and not more than 25 per cent of the material, by weight, shall exceed $1\frac{1}{2}$ inches in one direction. Each layer shall be thoroughly tamped by means of hand or mechanically operated tampers. Fill shall be compacted to 95 percent density when tested in accordance with AASHTO modified standards, and such that no settlement will occur under normal traffic loading.
 - (02) Class II Backfill: Following backfill in the pipe zone, the excavated material as specified for Class I backfill may be pushed back into the trench by mechanical means. Where this method of backfill is allowed the earth shall be pushed first onto the slope of the backfill previously placed and allowed to roll down into the trench. The contractor will not be allowed to push the backfill material into the open trench. A windrow of excavated material shall be placed over the trench to allow for settlement. The contractor shall make his own estimate of the amount of settlement that will occur and will stockpile enough material to compensate for settlement. After the backfill has been completed, the entire working area, including the trench, shall be graded with a motor grader.

(03) Class III Backfill: Minimum standards under new or existing asphalt. Following backfill in the pipe zone, the trench shall be backfilled with $\frac{3}{4}$ - inch minus clean, hard, sound, durable, angular, well-graded crushed rock/gravel, free from organic matter, and in accordance with ODOT standards. Installation and compaction shall be as specified for Class I backfill. City must approve material prior to use. Trench above the pipe zone shall be backfilled to within twelve inches of finished surface for pavement areas and nine inches for gravel improved roadways. Trench shall then be filled with base course, leveling course, and asphaltic concrete, as appropriate.

(04) Class IV Backfill: Required under ODOT and Deschutes County roadways, and for specific other cases designated by City. Following backfill in the pipe zone, the trench shall be backfilled with a sand-slurry mixture with 1 sack Portland Cement (per cubic yd) of sand or pea gravel. Slump of mixture shall be 6 to 8 inches.

City must approve material prior to use. Trench above the pipe zone shall be backfilled to within four inches of finished surface for pavement areas and eight inches for gravel improved roadways. Trench shall then be finished with asphaltic concrete, or minimum eight inches of base and leveling course, as specified and appropriate.

In general, all construction of water and sewer services and mains for improved streets will be provided by the City of Sisters and paid for by the developer. All asphalt reconstruction in improved streets shall utilize infrared patchless technology.

- i. Any area requiring rock excavation shall be bedded with materials specified for granular pipe bedding. Gravel shall extend six inches above and below the installed pipe and run the full width of the trench. If class I or II backfill is utilized, rock excavated may not be utilized for backfill material and must be disposed of by the contractor.

5. Workmanship.

- a. Grade. The flow line of pipe shall be to line and grade shown or established by the engineer.
- b. Shoring, sheeting, and bracing shall be used to prevent caving. All sheeting, shoring and bracing to conform to requirements of OSHA. Remove after completion.
- c. Locate all excavated materials so as to allow pedestrian and automotive travel.
- d. All streets and roadways shall be kept open to at least one-way traffic unless authorized by the City in writing.

- c. Locate all excavated materials so as to allow pedestrian and automotive travel.
- d. All streets and roadways shall be kept open to at least one-way traffic unless authorized by the City in writing.
- e. Maintain means of removing and disposing of all water. No damage to adjacent property shall result. No water allowed shall be allowed through the pipe until authorization received from City. Adequate screening shall prevent objectionable objects from entering at all times. For public safety, all lines shall be plugged and backfilled to prevent unauthorized entry after working hours.
- f. All excess excavated materials shall be hauled and legally disposed of by the contractor and the contractor shall bear all costs and retain any profit incidental to such disposal.
- g. **Blasting Procedures.** Blasting for excavation will be permitted only after securing approval of City and only when proper precautions are taken for the protection of persons and property. The hours of blasting will be fixed by the City. Any damage caused by blasting shall be repaired by the contractor at his expense. The contractor's procedures and methods of blasting shall conform to state and local laws and to municipal ordinances, and shall be performed by competent, licensed personnel.

G. STORM DRAIN

- 1. **General.**
 - a. This item shall include furnishing and installing all pipe specified herein for all storm drain mains and catch basin laterals.
 - b. Pipeline fittings proposed for placement under City streets shall be watertight.
 - c. All pipe installed to manufacturer's recommendations.
 - d. All pipeline materials shall be American made.
- 2. **Pipe Materials.**
 - a. **Concrete Pipe.**
 - (01) Concrete pipe with nominal inside diameters of 18" or smaller shall be class III non-reinforced pipe, minimum, and shall conform to ASTM C 14-74, or latest revision.
 - (02) Concrete with nominal inside diameters of 21" or larger, shall be class III reinforced pipe, minimum, and shall conform to ASTM C 76-74 or latest revision.
 - (03) All concrete pipe shall have rubber ring joints, Rev-O-Lok C 443-74, or latest revision, "Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets."

- (04) Pipe materials under this item shall be as manufactured by members of the Pacific Northwest Concrete Pipe Association, or approved by the engineer.
- (05) Pipe sizing not normally manufactured may be increased one size to utilize standard manufacture.
- b. Polyvinyl Chloride (PVC) Pipe.
 - (01) PVC pipe with nominal inside diameters between 4 and 15 inches shall meet the requirements of ASTM D 3034, SDR 35, type PSM polyvinyl chloride sewer pipe.
 - (02) Pipe shall be furnished with an integral bell gasketed joint conforming to ASTM D3034. An integral bell shall be furnished with each length of pipe.
 - (03) Rubber rings shall conform to the requirements of ASTM D1869.
 - (04) Pipe shall be as manufactured by J-M Manufacturing Company, Inc., or approved equal.
- c. Large Diameter Polyvinyl Chloride (PVC) Pipe.
 - (01) PVC pipe with 18 and 27 inch nominal inside diameters shall meet the requirements of ASTM F679, SDR 35, T-1 wall thickness, type PS 46 PVC sewer pipe.
 - (02) Pipe shall be furnished with an integral bell gasketed joint conforming to ASTM D3212. An integral bell shall be furnished with each length of pipe.
 - (03) Rubber rings shall conform to the requirements of ASTM F477.
 - (04) Pipe shall be as manufactured by J-M Manufacturing Company, Inc., or approved equal.
- d. Polyvinyl Chloride (PVC) Ribbed Pipe.
 - (01) PVC pipe with 18 and 48 inch nominal inside diameters shall meet the requirements of ASTM F794, type PS 10 PVC storm drain pipe.
 - (02) Pipe shall be furnished with an integral bell gasketed joint. An integral bell shall be furnished with each length of pipe.
 - (03) Rubber rings shall conform to the requirements of ASTM F477.
 - (04) Pipe shall be Perma-Loc as manufactured by J-M Manufacturing Company, Inc., or approved equal.
- e. High Density Polyethylene Gravity Pipe (large diameter).
 - (01) Pipe and fittings in size range 18 through 120" nominal inside diameters with integral bell joints, per ASTM F894 shall be made of high density, high molecular weight polyethylene pipe material meeting the requirements of type III, class C, category 5, grade P34, as defined in ASTM D1248.

- (02) Gaskets. Rubber gaskets shall comply in all respects with the physical requirements in the non-pressure requirements of ASTM specification F477. They shall be molded or produced from an extruded shape approved by the manufacturer and spliced into circular form.
 - (03) Lubricant. The lubricant used for assembly shall have no detrimental effect on the gasket or on the pipe.
 - (04) Pipe shall be Spirolite HDPE as manufactured by Chevron Chemical Company or approved equal.
- f. High Density Polyethylene Gravity Pipe (small diameter).
- (01) Pipe fittings in size range 12 through 24 inch nominal inside diameters shall be permitted of high density, high molecular weight polyethylene pipe material meeting the requirements of AASHTO M-294. Smooth interior corrugated pipe required.
 - (02) Couplings shall be corrugated to match the pipe corrugations, and the width shall be not less than $\frac{1}{2}$ the nominal diameter of the pipe and shall engage an equal number of corrugations on each side of the pipe joint.
 - (03) Rubber gasket joints will be required.
 - (04) Pipe shall be ADS N-12 HDPE as manufactured by Advanced Drainage Systems, Inc., or approved equal.
3. Workmanship.
- a. All pipe installation shall include but not be limited to the following:
 - (01) Materials shall not be distributed on the job faster than can be used to good advantage.
 - (02) All pipe shall be inspected prior to installation. No cracked, broken, or defective pipe or fittings will be allowed. All pipes shall be cleaned before installation.
 - (03) Proper implements, tools, and construction operations will be maintained by the contractor for the safe and proper protection of the work.
 - (04) Maximum deviation from line and grade shall not exceed $\frac{1}{2}$ " for line and $\frac{1}{4}$ " for grade. Batterboards required, if the contractor grade establishment is judged insufficient by the City.
 - (05) Pipe base, if utilized, shall be placed and compacted in trench pipe installation.
 - (06) All pipe shall be carefully lowered into the trench to prevent damage to the pipe. Contractor will be responsible for inspecting the pipe before installation and for the proper laying of materials to manufacturer's recommendations. He shall be responsible for all

damage to the pipe before final acceptance by the local public agency or the engineer, and shall reinstall pipe that does not meet specifications or was damaged during installation.

- (07) No debris, tools, or other materials allowed in pipe.
- (08) All pipe sealed at night to provide public safety and provide foreign materials from entering pipe.
- (09) Gravel Pipe Base.
 - (a) Gravel pipe bedding shall be placed under all pipelines wherever ground conditions of existing materials may prove harmful to pipeline installation.
 - (b) Gravel bedding shall be provided to a depth of 6" below the outside of the pipe. The top of the base shall terminate 6" above the outside of the pipe and the pipe base shall be placed for the full width of the trench.
- (10) Foundation stabilization materials shall be placed under all pipelines wherever soft ground conditions are encountered that are not beneficial to proper installation, and in such quantity as is required to stabilize the trench bottom.

Bell holes shall be dug at each joint to permit the joint to be properly made; to permit easy inspection of the joint, and to provide uniform bearing for the entire pipe length.

All testing, disinfection, flushing, mandrel, TV inspection, and miscellaneous testing shall be performed by a licensed, bonded and insured contractor with a business license for the City of Sisters.

b. Storm Drain and Catch Basin Installation.

- (01) End caps and pipe appurtenances shall be furnished by the pipe manufacturer and shall be the same class as main line to which they are installed. Watertight connections are required under all City streets.
- (02) Catch basin laterals shall be of 12" diameter of concrete, PVC or high density polyethylene pipe under all City streets.
- (03) All polyethylene or PVC storm drain pipes shall be installed with class III backfill as specified. In addition, a deflection test shall be conducted as provided under testing of sanitary sewer pipes.
- (04) All drainage pipe terminating at a dry well shall have screens installed at the outlet of catch basins or other appurtenances to prevent leaves, pine needles and other debris from entering the dry well.

H. CULVERTS

1. General.

- a. This item shall include furnishing and installing all pipe for driveway approaches where curb and gutters are not required along with appropriate drainage swales, draws, creeks and constructing required wing walls.
 - b. All pipe shall be installed to manufacturer's recommendations.
 - c. All pipeline materials shall be American made.
2. Materials.
- a. Corrugated Metal Pipe.
 - (01) Corrugated metal pipe shall be helical corrugated, Armco "Hel-Cor" aluminized steel, type 2", or approved equal, conforming to AASHTO M36, type 2 and M-190 specifications.
 - (02) Aluminum pipe is an approved equal. Kaiser "Corlix" storm sewer pipe, conforming to AASHTO M 196, current edition.
 - (03) Corrugated metal pipe shall be nominal inside diameters of 12" minimum. Pipe shall be 14 gauge minimum.
 - (04) Joints shall be made with connecting bands fabricated from same material and gauge as pipe. Connecting bands shall be 12" wide for steel, 12" wide for aluminum. Minimum pipe length 20' long except for end runs. Joints proposed for placement under City streets shall be watertight.
3. Workmanship.
- a. Materials shall not be distributed on the job faster than can be used to good advantage.
 - b. All pipe shall be inspected prior to installation. No cracked, broken, or defective pipe or fittings will be allowed. All pipes shall be cleaned before installation.
 - c. Proper implements, tools, and construction operation shall not exceed ½" for line and ¼" for grade. Batterboards required, if the contractor grade establishment is judged insufficient by the City.
 - e. Pipe base shall be placed and compacted in trench pipe installation.
 - f. All pipe shall be carefully lowered into the trench to prevent damage to the pipe. Contractor will be responsible for inspecting the pipe before installation and for the proper laying of materials to manufacturer's recommendations. He shall be responsible for all damage to the pipe before final acceptance by the local public agency or the engineer, and shall reinstall pipe that does not meet specifications or was damaged during installation.
 - g. No debris, tools, or other materials shall be allowed in pipe.
 - h. Gravel Pipe Base.

- (01) Gravel pipe bedding shall be placed under all pipelines wherever ground conditions or existing materials may prove harmful to pipeline installation.
 - (02) Gravel bedding shall be provided to a depth of 6" below the outside of the pipe. The top of the base shall terminate 6" above the outside of the pipe and the pipe base shall be placed for the full width of the trench.
 - i. Foundation stabilization materials shall be placed under all pipelines wherever soft ground conditions are encountered that are not beneficial to proper installation, and in such quantity as is required to stabilize the trench bottom.
 - j. Bell holes shall be dug at each joint to permit the joint to be properly made; to permit easy inspection of the joint, and to provide uniform bearing for the entire pipe length.
- Watertight joints are required under all City streets.

I. SANITARY SEWERS

- 1. General.
 - a. This item shall include furnishing and installing all pipe specified herein for all sanitary sewer main, laterals and house service laterals.
 - b. All pipe shall be installed to manufacturer's recommendations.
 - c. All pipeline materials shall be American made.
 - d. STE refers to Septic Tank Effluent Sewer Systems.
 - e. STEP refers to Septic Tank Effluent Pressure Systems.
 - f. STEG refers to Septic Tank Gravity Installations.
 - g. Grinder Pumps and Pressurized Conventional Sewer Installations will not be permitted.
 - h. All gravity pipelines 4" and larger will be "TV'd" after installation, except for private service laterals, with a copy of the tapes placed on file with the City.
 - i. Sanitary House Laterals. A minimum 4 inch lateral shall be installed for each building, except that STEP house laterals shall be a minimum of 1 inch, and STEG laterals shall be 1-1/4 inch.
 - j. Service laterals from main line to right-of-way shall be minimum 4 inches, for conventional sewers, and 1-1/4 inch for STE installations.
 - k. STE type systems will only be permitted in specific, individual, approved locations and where shown to be cost effective, including operation and maintenance costs. Each installation must be separately evaluated by City Staff prior to installation. No maintenance of STE systems, or cleaning of septic tanks will be provided by the City.

2. Pipe Materials (Conventional Systems).
 - a. Gravity Mains.
 - (01) Polyvinyl Chloride (PVC) Sewer Pipe.
 - (a) PVC pipe with nominal inside diameters between 4 and 15 inches shall meet the requirements of ASTM D 3034, SDR 35, Type PSM Polyvinyl Chloride Sewer Pipe.
 - (b) Pipe shall be furnished with an integral bell gasketed joint conforming to ASTM D 3034. An integral bell shall be furnished with each length of pipe.
 - (c) Rubber rings shall conform to the requirements of ASTM D 1869.
 - (d) Pipe shall be as manufactured by Manville Manufacturing Company, Inc., or approved equal.
 - (02) Large Diameter Polyvinyl Chloride (PVC) Sewer Pipe.
 - (a) PVC pipe with 18 and 27 inch nominal inside diameters shall meet the requirements of ASTM F 679, SDR 35, T-1 wall thickness, Type PS 46 PVC Sewer Pipe.
 - (b) Pipe shall be furnished with an integral bell gasketed joint conforming to ASTM D 3212. An integral bell shall be furnished with each length of pipe.
 - (c) Rubber rings shall conform to the requirements of ASTM F 477.
 - (d) Pipe shall be manufactured by Manville Manufacturing Company, Inc., or approved equal.
 - b. Pressure Mains.
 - (01) Polyvinyl Chloride Sewer Pipe.
 - (a) PVC pipe shall be Class 150 and meet the requirements of SDR 18. Pipe shall meet the requirements of AWWA C 900, latest revision with the exception that PVC pipe shall be made to cast iron outside diameters. The pipe shall further meet Uni-Bell Standard Uni-B-2-72 or latest revision.
 - (b) Pipe lengths furnished shall be in standard lengths for twenty (20) feet, with sufficient amounts of short lengths for making connections to fittings, curves and other closures. Short lengths will be permitted only as required to make necessary connections.
 - (c) The integral socket bell shall be rubber ring type "Ring Tite" or approved by the City and shall meet the same strength requirements as that of the pipe. An integral socket bell shall be furnished with each length of pipe.

- (d) Rubber rings shall conform to the requirements of ASTM D 1869.
 - (e) Pipe shall be "Blue Brute" as manufactured by Manville Manufacturing Company, Inc., or approved equal.
- (02) Ductile Iron Pipe.
- (a) Ductile iron pipe shall be Class 51, minimum, and meet the requirements of AWWA C 151, latest revision.
 - (b) Pipe shall be made with nominal inside diameters as shown on the plans.
 - (c) Pipe shall have 150 psi working pressure designed for five (5) foot depth of cover, lay condition Type 5.
 - (d) Joints shall be mechanical joint or push on joint.
- (001) Mechanical Joints.
- (1) A bell, cast integrally with the pipe or fitting and provided with an exterior flange having bolt holes or slots, and a socket with annular recesses for the sealing gasket and the plain end of the pipe or fitting.
 - (2) A pipe or fitting plain end.
 - (3) A sealing gasket.
 - (4) A follower gland with bolt holes.
 - (5) Black iron tee-head bolts and hexagonal nuts.
 - (6) Shall meet the requirements of AWWA C111, latest revision.
- (002) Push On Joints.
- (1) The integral socket bell shall be rubber ring type "Tyton Joint" or approved, and shall meet the same strength requirements as that of the pipe. An integral socket bell shall be furnished with each length of pipe.
 - (2) Rubber rings shall conform to the requirements of AWWA C111 latest revision.
- (e) Ductile Iron Pipe shall be cement lined on the inside conforming to AWWA C104, latest revision, outside coating shall be a bituminous coat one (1) mil thick, conforming to AWWA C151, or latest revision.
 - (f) Pipe shall be manufactured by U.S. Pipe and Foundry or approved by the City.

- c. Pressure Mains-STE Systems. This type of system will only be permitted for isolated installations where gravity type sewers cannot be made to function, and where grinder type pumps cannot be made to function.
 - (01) Polyvinyl Chloride Pressure Pipe
 - (a) PVC pipe for mainline installations shall be Class 200. Materials shall conform to ASTM 2241 SDR 21.
 - (b) All fittings required shall be of same class of material. Rubber gasket joints required, conforming to ASTM F477.
 - (c) Pipe shall be made with nominal inside diameters as specified and as shown on the plans, and shall meet Uni-Bell Standards, latest revision.
 - (d) Pipe lengths shall be standard lengths with short lengths permitted only as required to make necessary connections.
 - d. STE Service Laterals. PVC for service laterals shall be minimum 1 inch, Class 200, and shall conform to ASTM D-2241.
 - e. Galvanized Steel Pipe. Pipe for combination air/vacuum release and blow-off valve assemblies shall be Schedule 40, hot-dipped galvanized, seamless or electric resistance welded type, standard weight, conforming to ASTM A 53-90b. Furnish sizes as indicated.
- 3. Fittings.
 - a. General. All fittings shall be of sufficient strength to withstand all handling and load stresses encountered. All fittings shall be of the same material as the pipe unless otherwise specified. Material joining the fittings to the pipe shall be free from cracks and shall adhere tightly to each joining surface. Use the sewer main for service lateral connection. Tee-wye shall not be closer than 12 inches to any joint or bell of main line sewer main which is 12 inches or less in diameter.
 - b. Gravity Mains.
 - (01) Tee-Wyes.
 - (a) Provide tee-wye in the sewer main for service lateral connection. Tee-wye shall not be closer than 12 inches to any joint or bell of main line sewer main which is 12 inches or less in diameter.
 - (b) Use push-on type fittings for joints conforming to same standards as the pipe.
 - (c) Push-on type tee-wye fittings shall be as manufactured by GPK Industries, or approved equal, and be fabricated by the manufacturer before delivery to the site.
 - (02) Wyes.

- (a) Provide wye in the sewer main for cleanout construction. Wye shall not be closer than 12 inches to any joint or bell of main line sewer main which is 12 inches or less in diameter.
 - (b) Use push-on type fittings for joints conforming to same standards as the pipe.
 - (c) Push-on type wye fittings shall be as manufactured by GPK Industries, or approved equal, and be fabricated by the manufacturer before delivery to site.
- (03) Elbows.
- (a) Use push-on type fittings for joints conforming to same standards as the pipe.
 - (b) Elbows shall be as manufactured by GPK Industries or approved equal.
- (04) End Plugs.
- (a) Provide ends of all service laterals and fittings with approved watertight plug. Such plugs shall be removable and their removal shall provide a socket suitable for making a flexible joint lateral connection or extension. See Detail 25 for required property owner cleanout.
 - (b) End plugs shall be as manufactured by GPK Industries or approved equal.
- (05) Sand Collars.
- (a) Provide sand collars at all manhole connections to form a watertight seal at the manhole, using non-shrink grout and concrete bonding agent for poured in place manholes and Kor-N-Seal boots and stainless bands for precast manholes.
 - (b) Sand collars shall be furnished by the pipe manufacturer. Field-fabricated collars or waterstops will not be allowed.
- c. Pressure Mains for Conventional Systems.
- (01) Fittings shall meet the requirements for Class 250 cast iron pipe, Federal Specifications WW-P-421 or for Class D cast iron pipe and fittings conforming to ANSI Specifications A21.10 (AWWA C110).
 - (02) Mechanical joint. Cast iron fittings for use with AWWA C900 or ductile iron pipe shall be of the short body dimension type, (1) bell construction with an exterior flange having bolt holes or slots, and a socket with annular recesses for sealing gasket and the plain end; (2) plain end; (3) sealing gasket; (4) follower gland; and (5) tee head bolts and hexagonal nuts, conforming to ANSI Specifications A21.11 (AWWA C111).
 - (03) Fittings shall be as manufactured by Tifco, Tyler, or approved equal.

- d. Pressure Mains for STE Systems.
 - (01) Fittings shall be of same class of material as pipe. Rubber gaskets shall conform to ASTM F 477.
3. Workmanship.
 - a. All pipe installation shall include, but not be limited to the following:
 - (01) Materials shall not be distributed on the job faster than can be used to good advantage.
 - (02) All pipe shall be inspected prior to installation. No cracked, broken, or defective pipe or fittings will be allowed. All pipes shall be cleaned before installation.
 - (03) Proper implements, tools, and construction operations will be maintained by the contractor for the safe and proper protection of the work.
 - (04) Maximum deviation from line and grade shall not exceed ½" for line and 1/4" for grade. Batterboards required, if the contractor grade establishment is judged insufficient by City staff.
 - (05) Gravel pipe base shall be placed and compacted in trench before pipe installation.
 - (06) Bell holes shall be dug at each joint to permit the joint to be properly made, to permit easy inspection of the joint, and to provide uniform bearing for the entire pipe length.
 - (07) All pipe shall be carefully lowered into the trench to prevent damage to the pipe. The contractor will be responsible for inspecting the pipe before installation and for the proper laying of materials to manufacturer's recommendations. He shall be responsible for all damage to the pipe before final acceptance by the City, and shall reinstall pipe that does not meet specifications or was damaged during installation.
 - (08) Gravel Pipe Base.
 - (a) Gravel pipe base shall be provided to a depth of 6" below the outside of the pipe. The top of the base shall terminate 12" above the outside of the pipe, and shall be placed for the full width of the trench.
 - (09) Foundation stabilization materials shall be placed under pipe lines wherever soft ground conditions are encountered that are not beneficial to proper installation, and in such quantity as is required to stabilize the trench bottom.
 - (10) Lettering for all pipe shall be installed facing up for inspection purposes.
 - (11) No debris, tools, or other materials shall be allowed in pipe.

- (12) All pipe must be sealed and covered at night to provide public safety and prevent foreign materials from entering pipe. Cover shall be a minimum of 12" before Contractor leaves jobsite. Failure to comply with this requirement will be cause for non-renewal of Contractor's business license.
- b. Sewer Pipe Installation.
- (01) Furnishing and installing pipe specified herein for all trunk lines and laterals.
- (02) Pipe installation to manufacturer's recommendations.
- (03) Service tees, end plugs and appurtenances for all pipe installed shall be installed as specified herein and to manufacturer's recommendations.
- c. Pressure Main Installation.
- (01) Furnishing and installing pressure main and fittings shall be completed as specified herein.
- (02) Laying and Jointing the Pipe.
- (a) Maximum deflection at any joint shall not exceed 3 degrees.
- (b) Maximum deviation from established line and grade, 1/2".
- (c) Concrete thrust blocking shall be installed at all fittings, required by the City, or established by standard construction procedures to prevent movement. All blocking shall be of 2,500 psi concrete. Concrete shall be poured as stiff as possible and shall be covered after pouring. The block sizes for various fittings shall conform to the standard details.
- All necessary precautions to prevent uplift shall be taken by the contractor.
- Lettering for all pipe shall be installed facing up for inspection purposes.
- d. Sanitary House Laterals.
- (01) Furnishing and installing 4" service laterals of pipe specified herein.
- (02) All highway crossings shall be maintained to satisfaction of City staff.
- (03) Appurtenances include but are not limited to: Stainless Steel couplings, 11-1/4" degree, 22-1/2 degree, 45 degree elbows, and reducing fittings to form water tight connections between private service laterals. Grouted joints and flexible plastic pipe shall not be utilized to make permanent connections. No 90 degree elbows shall be utilized between the building and the septic tank.

- (04) Cleanouts shall be installed every 100 feet and/or every 135 degrees in accumulated bending between the house and the public service lateral, in accordance with the National Plumbing Code.
- (05) Calder type couplings are only permissible for the connection at the house.
- e. The following table shall be utilized for gravity sewer installation as a minimum acceptable slope.

<u>Inside Pipe Diameter</u>	<u>Grade</u>
(inches)	(feet per 100 feet)
6.....	0.60
8.....	0.40
10.....	0.28
12.....	0.22
15.....	0.15
18.....	0.12
21.....	0.10

4. Testing of Sewer Pipe.

- a. Testing of sewer installations shall not occur until all utilities and excavation is complete, or new testing will be required.
- b. Testing for gravity sewers. All pipe shall be thoroughly flushed and cleaned prior to testing, including pulling of a test ball to insure cleanliness. A test shall then be conducted on the first section of pipe laid to establish that the pipe line material is capable of preventing infiltration and that the lines are being installed to insure that infiltration of ground water will not be greater than amount set forth herein. Section of pipe lines tested shall be at least 300 feet in length. If test indicates infiltration exceeding amount hereinafter set forth, defective material of workmanship shall be corrected and test rerun until leakage is within tests shall be made as often as City staff deems necessary to insure leakage is being held within limits specified.
- c. Low Pressure Air Testing of Gravity Sewers.
 - (01) Contractor shall furnish all facilities and personnel for conducting test under observation of the Developer's Engineer and City staff. Testing shall not be conducted in the absence of the Developer's Engineer.
 - (02) Contractor may desire to make air test prior to backfilling for his own purposes. However, acceptance air test shall be made until all

excavation is completed, and until backfilling has been completed and compacted.

- (03) The first section of pipe not less than 300 feet in length installed shall be tested in order to qualify.
- (04) Immediately following pipe cleaning, the pipe installation shall be tested with low pressure air. Air shall be slowly supplied to the plugged pipe installation until internal air pressure reaches 4.00 pounds per square inch greater than the pipe. At least two minutes shall be allowed for temperature stabilization before proceeding.
- (05) The pipeline shall be considered satisfactory if the time required in seconds for pressure to decrease from 4.0 to 3.5 pounds per square inch greater than the average back pressure of any ground water that may submerge pipe is not less than that computed according to Uni Bell Standards, latest edition, and to the following table entitled "Duration for Air Test Pressure Drop." Duration of test shall be as computed from the table, using length "L" in feet, but not less than "minimum time" listed in the table.
- (06) If installation fails requirements, contractor shall determine source or sources of leakage, and he shall repair or replace all defective materials or workmanship. Completed pipe installation shall meet requirements of test, before being considered acceptable.

Duration for Air Test Pressure Drop

Pipe Size (Inches)	Pipe Size (mm.)	Duration (seconds)	Minimum Time (minutes)
4	100	0.190 L	2
6	150	0.427 L	3
8	200	0.760 L	4
10	225	1.187 L	5
12	305	1.709 L	6
15	380	2.671 L	7

Larger diameters- see latest Uni-Bell Standards.

- d. Television Inspection. Contractor shall conduct an internal television inspection of all installed mainline sewers and service laterals to the property line, with a movable eye internal camera that permits investigation of each lateral connection to the main line. Lines shall be evaluated for compliance with Standard Specifications, and provide a copy of complete color video tape in VCR compatible format for review by City. Inspection shall be conducted by a City approved, licensed and bonded technical service with a City business license, which is equipped to make an audio-visual record on the tape. A voice accounting of

suspected deficiencies shall be made on the sound track. Inspection firm shall provide City with written record of any problems noted, on a form approved by City staff, with stationing, and any noted concerns for needed corrective action. Video report and written report shall be submitted to the City, and will become property of the City. If defects are noted in the television inspection, repairs shall be conducted to eliminate defects, and lines shall have a new television inspection provided under identical circumstances until all noted deficiencies are corrected. Following eleven (11) months of successful operation, the contractor shall complete a second internal television inspection of all installed mainline sewers and service laterals to the property line, with similar equipment and procedures to the original testing. If defects are observed, repairs shall be conducted to eliminate defects. All costs shall be at developer's expense.

- e. Deflection Test for PVC. In addition to air and television testing, contractor shall perform a deflection test to all sanitary sewers, storm drains and culverts constructed of PVC pipe after the ariable deflection measuring gauge through the completed pipeline. The diameter of the mandrel shall be 95 percent of the pipe diameter unless otherwise specified by the City. Testing shall be conducted on a manhole-to-manhole basis, after the line has been completely flushed out with water. Contractor shall locate and repair any sections failing to pass the test and to retest the section, at no expense to City.
- f. Testing of Pressure Main.
 - (01) General. A test shall be conducted on the first section of pipe laid to establish that the pipe materials are capable of meeting design requirements. Section of test line shall be at least 200 feet in length. If test indicates materials or workmanship that does not meet design requirements, defective material or workmanship shall be corrected and test rerun until specifications are fulfilled.
 - (02) Pressure. After each section of pipe has been laid and partially backfilled, it shall be subjected to a hydro-static pressure of 50% in excess of specified pipe strength. After the entire pipeline is completed, a final test shall be under taken under the same conditions and utilized to guarantee the performance of the completed system.
 - (03) Duration. The duration of each pressure test shall be at least one hour at 150 psi to determine leakage by formulas contained herein.
 - (a) Procedure. Each valved section of pipe shall be slowly filled with water and the specified test pressure, measured at the point of lowest elevation, shall be applied by means of a pump connected to the pipe connection, means of measuring the water necessary to maintain the test pressure, gauges and all necessary apparatus shall be furnished by the contractor. The

contractor shall furnish all necessary assistance for conducting the test.

- (b) Expelling Air. Before applying the specified test pressure, all air should be expelled from the pipe.
- (c) Examination During Test. All exposed pipe, fittings, and valves, and all joints shall be carefully examined during tests. Any visible leaks shall be repaired until tight. Any cracked, broken, or defective pipe, couplings, fittings, or valves shall be replaced at the contractor's expense. All exposed pipe, fittings, and valves, and all joints shall be carefully examined during tests. Any visible leaks shall be repaired until tight. Any cracked, broken, or defective pipe, couplings, fittings, or valves shall be replaced at the contractor's expense.
- (d) Leakage. Leakage shall be defined as the quantity of water supplies into the pipe, or any valved section of it, necessary to maintain the specified test pressure after the pipe has been filled with water and the air expelled. City staff and Developer's engineer must be present to observe leakage testing, and City staff will make final decision regarding acceptance of installation. Testing shall not be conducted in the absence of the Developer's Engineer.

No pipe installation will be accepted until the leakage is less than the number of gallons per hour as determined by the formula in which:

$$L = \frac{ND\sqrt{p}}{7400}$$

L= Allowable leakage in gph.
 N= No. of joints in length of pipe tested.
 D= Nominal diameter of pipe in inches.
 p= Average test pressure during leakage test, in pounds per square inch.

Correction of Excessive Leakage. Should any test of pipe laid disclose leakage greater than that allowed under section above, the contractor shall, at his own expense, locate and repair the defective joints of pipe until the leakage is within the specified allowance.

J. MANHOLES, CLEANOUTS AND ACCESS PORTS FOR STE SYSTEMS

1. General. This section shall include the construction of new manholes and stubs.
2. Manhole Materials.
 - a. Frames and grates for standard, drop and special manholes shall be Silvertown Foundry, Pattern No. 107, Inland Foundry, IFCO 802, or approved equal, two hole style, or approved equal.

- b. Precast sections shall be a minimum of 48 inches in diameter, reinforced concrete pipe conforming to ASTM C 478 latest revision, with eccentric cones. In shallow manhole sections less than 4'-0 deep, flat top manhole covers with an eccentric ring location may be provided in lieu of normal cone sections. Flat top manhole covers shall comply with Oregon APWA standards. To allow for settlement, precast manholes shall be provided with Kor-N-Seal boots and stainless steel bands for all pipe connections, or approved equal.
 - c. Poured-in-place manholes may be substituted.
 - d. Reinforcement shall be circular.
 - e. Minimum wall thickness- 5 inches.
 - f. Manhole taps shall be pipe tap plus 2 inches minimum.
 - g. Manhole grout for concreting around pipes entering manholes shall be one part cement to two parts sand. Sand must pass 1/8" inch screen. Grout shall be provided for precast and conventional manhole bases. Consistency must be such that it adheres readily to the pipe.
 - h. Manhole extension rings shall be two or four inches in thickness and of material equal to manhole sections. Mortar shall provide water-tight seal between; (1) eccentric cone and ring, (2) ring and ring.
 - i. Concrete bases shall provide uniform bearing through full circumference of manhole wall. Mortar shall provide water-tight seal between base and manhole wall.
 - j. Ram-Nek, or approved equal, preformed flexible plastic joint compound shall be utilized for joints in manhole sections. Ram-Nek primer required on manholes prior to applying joint compound. Ram-Nek shall be heated prior to installation, and manhole rings compressed together to avoid later settlement and leaks.
 - k. Manhole sections utilizing confined "O" ring joints are an approved alternate.
3. Cleanout Materials.
- a. Frames and grates shall be Silverton Foundry Number 201 or equal.
 - b. Cleanouts in unimproved areas shall have frame and lid installed in 24 inch square concrete pad 12 inches thick.
 - c. Piping fittings, reducers, water tight plugs and other appurtenances to be of equal or greater classification shall be used as the main piping.
 - d. A concrete encasement shall be installed on the bottom side of the cleanout through the section where the transition is made from horizontal piping to vertical piping.
4. Access Port Materials for STE Systems.

- a. Access ports shall be installed at all changes in main line pressure pipe size changes, and at locations sufficient to permit ready cleaning of the main lines.
 - b. A concrete encasement shall be installed on the bottom side of the access port for support purposes.
5. Cleanouts for STE Systems.
- a. Cleanouts shall be installed at all intersections of main pressure lines, and at the terminal points for all STE pressure mains.
 - b. All cleanouts shall be watertight.
 - c. All cleanouts shall have cast iron frame and cover.
 - d. Concrete encasement shall be installed on the bottom side of the cleanout for support purposes.
6. Workmanship.
- a. Manhole rings and covers in roadways shall be set flush with the surface when the manhole is located at a roadway crown, at other locations in roadways shall be installed one-half inch above road surface to prevent infiltration of surface water. Manhole rings and covers in easements shall be installed two inches above finish ground grade. Manholes shall have a maximum of eight (8) inches of extension rings.
 - b. Concrete manhole bases shall be hand troweled to provide a smooth surface for wash down.
 - c. Provide foundation stabilization material where necessary to ensure an adequate foundation for the manhole.
 - d. Manholes shall be located as follows:
 - (01) Every change in grade or alignment of sewer.
 - (02) Every point of change in size or elevation of sewer.
 - (03) Each intersection or junction of sewer.
 - (04) Upper end of all lateral sewers.
 - (05) At intervals of 500 feet or less.
 - e. Cleanouts will not be approved as substitutes for manholes, except at the upper end of lateral sewers 250 feet or less in length.
 - f. Access ports shall be located at all changes in pipeline sizing for STE systems.
 - g. Pump Stations. At all entrances of STE systems into pump stations, Contractor shall provide a means of extracting main line cleaning devices.
 - h. Cleanouts for STE Systems shall be installed at all intersections of main pressure line and at the terminal points for all STE pressure mains. A 24"

square concrete encasement 6" deep shall be provided for support of the cover, and to provide ease of location.

- i. 3000 psi concrete bed utilized on section of cleanout transitioning from horizontal to vertical shall encase only lower one-half of the pipe and shall extend from 1/8" bend to 1/8" bend.
- j. Where two feet or less change-in-flow line elevation occurs at a manhole, the elevation change will be made inside the manhole by forming the base to accommodate it. Where more than two feet elevation change occurs at a manhole, an outside drop assembly is required.
- l. Taps. Grout taps into manholes for full wall thickness. Allow adequate curing time so that backfill and compaction operations do not disturb the grout.

7. Testing

- a. Finished manhole shall be watertight. All manholes shall be vacuum tested in accordance with Oregon A.P.W.A. and DEQ standards.
- b. General. All manholes and wetwells shall be tested after completion of all surface restoration, including final adjustment to grade.
- c. Vacuum Testing. The test shall consist of plugging all inlets, outlets and manhole entrances and applying a 5 psi or 10" Hg vacuum to the manhole. The allowable air loss (vacuum pressure loss) shall not exceed 1 psi or 2" Hg for the time period stated in the table below.

Depth of Manhole (Ft)	Time (sec) for Manhole Diameters	
	48"	60"
8	20	26
10	25	33
12	30	39
14	35	46
16	40	52

Repair all manholes that do not meet the vacuum test, or are unsatisfactory from visual inspection, to conform to the requirements herein.

K. CATCH BASINS AND DRYWELLS

- 1. General. This section shall include the construction of new catch basins.
- 2. Materials.
 - a. Frame and Grate. Shall be fabricated from structural steel conforming to the requirements of ASTM A36, dimensions shall conform to standard detail.
 - b. Concrete. See Division V.

- c. Grout. Epoxy grout shall be one part cement to two parts sand. Sand must pass 1/8" screen. Consistency must be such that it adheres readily to the pipe and catch basin well.
 - d. Precast units may be used in lieu of cast-in-place units when approved by the City. Details of proposed units shall be submitted for approval.
 - e. Drywells shall be in accordance with standard details.
3. Workmanship.
- a. Set frame and grate at slope of batter apron, recessed 1/2" at sides for positive entrance flow of storm water.
 - b. Adequate foundation for all catch basins shall be obtained by removal and replacement of unsuitable material with well graded granular material.

L. WATER MAINS

1. General.
- a. This item shall include furnishing and installing all pipe specified herein for all waterlines.
 - b. All pipe shall be installed to manufacturer's recommendations and to:
 - (01) AWWA standards C-600 for ductile iron pipe.
 - (02) PVC water pipe should be installed in accordance with the Uni-Bell Plastic Pipe Association guide for installation of polyvinyl chloride plastic pressure pipe for municipal water main distribution systems.
 - c. All pipeline materials shall be American made.
 - d. No existing City water improvements shall be exposed without a City representative on site.
2. Pipe Materials.
- a. Ductile Iron Pipe.
 - (01) Ductile iron pipe shall be class 150, minimum, and meet the requirements of AWWA standards C151 and C150.
 - (02) Pipe shall be made with nominal inside diameters as shown on the plans.
 - (03) Pipe shall have 150 psi working pressure designed for 5' minimum depth of cover, lay condition type 5.
 - (04) Joints shall be mechanical joint or push on joint.
 - (a) Mechanical Joints shall include the following:
 - (aa) A bell, cast integrally with the pipe or fitting and provided with an exterior flange having bolt holes or slots, and a socket with annular recesses for the sealing gasket and the plain end of the pipe or fitting.

- (bb) A pipe or fitting plain end.
 - (cc) A sealing gasket.
 - (dd) A follower gland with bolt holes.
 - (ee) Tee-head bolts and hexagonal nuts.
 - (ff) Shall meet the requirements of AWWA Standards C111.
- (b) Push On Joints.
- (aa) The integral socket bell shall be rubber ring type “tyton joint” or approved, and shall meet the same strength requirements as that of the pipe. An integral socket bell shall be furnished with each length of pipe.
 - (bb) Rubber rings shall conform to the requirements of AWWA standard C111.
- (05) Ductile iron pipe shall be cement lined on the inside conforming to AWWA standards C-104, outside coating shall be a bituminous coat 1 mil thick, conforming to AWWA standard C151.
- (06) Pipe shall be manufactured by U.S. Pipe and Foundry, or approved equal.
- b. PVC Pipe.
- (01) PVC pipe shall be class 150, minimum, and meet the requirements of SDR 18. Pipe shall meet the requirement of AWWA C-900, manufactured to cast iron outside diameters. The pipe shall further meet Uni-Bell standard Uni-B-2.
 - (02) Pipe shall be made with nominal inside diameters as specified herein or shown on plans and shall meet the standard dimension rations (SDRs) as set forth in Uni-B-2.
 - (03) The integral socket bill shall be rubber ring type “ring tite” or approved, and shall meet the same strength requirements as that of the pipe. An integral socket bell shall be furnished with each length of pipe.
 - (04) Rubber rings shall conform to the requirements of ASTM F-477.
 - (05) Pipe shall be “blue brute” as manufactured by Mansville Corp. or approved equal.
- c. Galvanized Steel Pipe.
- (01) Galvanized steel pipe as specified hereafter shall be utilized for galvanized, combination air vacuum relief and blow-off valve piping per standard detail.
 - (02) Galvanized steel pipe shall be the screwed fitting type and shall conform to the requirements of ASTM A-120.

3. Workmanship.
 - a. Materials shall not be distributed on the job faster than can be used to good advantage.
 - b. All pipe shall be inspected prior to installation. No cracked, broken, or defective pipe or fittings will be allowed. All pipes cleaned before installation.
 - c. Proper implements, tools, and construction operations will be maintained by the contractor for the safe and proper protection of the work.
 - d. Pipe base, if utilized, shall be placed and compacted in trench before pipe installation.
 - e. All pipe shall be carefully lowered into the trench to prevent damage to the pipe. contractor will be responsible for inspecting the pipe before installation and for the proper laying of materials to manufacturer's recommendations. He shall be responsible for all damage to the pipe before final acceptance by the local public agency or the engineer, and shall reinstall pipe that does not meet specifications or was damaged during installation.
 - f. No debris, tools, or other materials shall be allowed in pipe.
 - g. Minimum pipe cover shall be 36".
 - h. All pipe shall be sealed at night to provide public safety and provide foreign materials from entering pipe. In addition, since the City often has extreme temperature variations, pipe shall be backfilled at night to prevent expansion and contraction.
 - i. Gravel Pipe Base.
 - (01) Gravel pipe bedding shall be placed under waterlines wherever ground conditions or existing materials may prove harmful to waterline installation. See specifications for gravel bedding.
 - j. Foundation stabilization materials shall be placed under waterlines wherever soft ground conditions are encountered that hinder proper installation, and in such quantity as is required to stabilize the trench bottom.
 - k. Bell holes shall be dug at each joint to permit the joint to be properly made; to permit easy inspection of the joint, and to provide uniform bearing for the entire pipe length.
 - l. Laying and Jointing the Pipe.
 - (01) Maximum deflection at any joint shall not exceed three degrees.
 - (02) Maximum deviation from established line and grade; 1/2".
 - (03) Concrete thrust blocking shall be installed at all fittings as specified herein, required by engineer, or established by standard construction procedures.

- (04) All necessary precautions to prevent uplift shall be taken by contractor.
 - (06) Lay pipe on uniform grade without high spots or dips, bell ends upgrade.
 - (07) Lettering for all pipe shall be installed facing up for inspection purposes.
- m. Testing of Completed Waterline
- (01) Testing of water installations shall not occur until all utilities and excavation is complete, or new testing will be required.
 - (02) General. A test shall conducted on the first section of pipe laid to establish that the pipe materials are capable of meeting design requirements. Section of test line shall be at least 200 feet in length, or at the discretion of the engineer. If test indicates materials or workmanship that does not meet design requirements, defective material or workmanship, the situation shall be corrected and the test rerun until specifications are fulfilled.
 - (03) Pressure. After each section of pipe has been laid and backfilled, it shall be subjected to hydrostatic pressure of 50% in excess of specified pipe strength. After the entire pipeline is completed, a final test shall be undertaken under the same conditions and utilized to guarantee the performance of the completed system.
 - (04) Duration. The duration of each pressure test shall be at least one hour at 150 psi to determine leakage by formulas contained herein. For acceptance of installation, all testing must be conducted under observation of City staff.
 - (a) Contractor shall furnish all facilities and personnel for conducting tests, under observation of Developer's Engineer and City staff.
 - (b) Procedure: Each valved section of pipe shall be slowly filled with water and the specified test pressure, measured at the point of lowest elevation shall be applied by means of a pump connected to the pipe connection. The means of measuring the water necessary to maintain test pressure, gauges and all necessary apparatus shall be furnished by the contractor. The contractor shall furnish all necessary assistance for conducting the test.
 - (c) Expelling Air: Before applying the specified test pressure, all air shall be expelled from the pipe.
 - (d) Examination During Test: All exposed pipe, fittings, and valves, and all joints shall be carefully examined during the tests. Any visible leaks shall be repaired until tight. Any

cracked, broken, or defective pie, couplings, fittings or valves shall be replaced at the contractor's expense.

- (e) Leakage: Leakage shall be defined as the quantity of water supplied into the pipe, or any valved section of it, necessary to maintain the specified test pressure after the pipe has been filled with water and the air expelled. City staff and Developer's Engineer must be present to observe leakage testing, and City staff will make final decision regarding acceptance of installation. No pipe installation will be accepted until the leakage is less than the number of gallons per hour as determined by the formula in which:

$$L = \frac{ND\sqrt{p}}{7400}$$

L= allowable leakage in gph
 N= no. joints in length of pipe tested
 D= nominal diameter of pipe in inches
 p= average test pressure during leakage test, in pounds per square inch.

- (f) Correction of Excessive Leakage: Should any test of pipe laid disclose leakage greater than that allowed under section above, the contractor shall, at his own expense, locate and repair the defective joints or pipe until the leakage is within the specified allowance.

- (05) All disinfection, flushing, and testing shall be performed by a licensed, bonded and insured contractor with a business license for the City of Sisters.

n. Sterilization.

- (01) All lines will be sterilized prior to connection to the existing lines.
- (02) Prior to commencing disinfection procedures, all lines shall be flushed thoroughly to remove dirt, construction debris, and other potential contaminants.
- (03) Initial amounts of chlorine shall be injected into the line to provide a dosage of at least 25 ppm. Treated water shall be retained in the pipe for at least 24 hours. A free chlorine residual of not less than ten ppm shall be maintained in all parts of the line after the 24 hour period has elapsed.
- (04) Chlorinating agent shall be either a liquid chlorine gas-water mixture, direct fed chlorine gas, or a calcium hypochlorite and water mixture at the contractor's option.
- (05) Prior to the sterilization process, all valves in the main line shall be operated, and all blow offs, hydrants and services shall be flushed until a strong residual is found. Flushing shall be provided in accordance with AWWA C651-99.

- (06) After chlorination, the water shall be flushed from the line until the water tests are equal chemically and bacteriologically to those of the present system. After flushing water from the City system, water shall be maintained in the line for at least 24 hours before final testing. Final sampling shall be tested, and results obtained before approval is granted to supply residents from line. Bacteriological test results must be tested by a recognized testing laboratory, in accordance with AWWA Manual M12, with negative results, before consumer usage is allowed.
- (07) Sterilization shall be conducted in the presence of the City. Samples shall be taken at various points along the line to be certain all portions of the system have been sterilized.
- (08) A neutralizing chemical shall be introduced to thoroughly neutralize the residual chlorine before the water is wasted.
- (09) All testing, flushing, and disinfection, shall be performed by a licensed, bonded and insured contractor with a business license for the City of Sisters.

M. WATERLINE APPURTENANCES

1. General.
 - a. This item shall include installing all pipe appurtenances required for each type of pipe, including thrust blocking to prevent pipe movement after installation. Materials may include, but are not limited to, cast iron bends, valves, valve boxes, hydrants, and service laterals.
 - b. Trench excavation and pipe base preparation are provided in previous sections, and special care shall be taken to provide proper bedding around fittings, adequate bell clearance, and reaction or thrust blocking required for installation.
 - c. Submittal material for all valves to be installed shall be provided to the City prior to installation.
 - d. All appurtenances must be American made.
2. Materials.
 - a. Fittings.
 - (01) Fittings shall consist of all bends, and other appurtenances required for the project.
 - (02) Cast or Ductile Iron Fittings.
 - (a) Fittings shall meet the requirements of ANSI specification 21.10 (AWWA C-110) for 250 psi working pressure. Fittings shall be the short body dimension type.

- (b) Flanges shall conform to ANSI specification B16.1, class 125 unless otherwise specified and shall be faced and drilled in accordance with ANSI specifications B16.1, class 125.
 - (c) Gasket material for flanged joints shall be a sheet rubber conforming to federal specifications HH-G-156, class A or B, 1/8" thick, and as approved. The gasket shall be full cut with hole to pass bolts.
 - (d) Bolts and nuts for use with flanged joints shall be cadmium plated.
 - (e) Mechanical joints shall conform to the requirements of ANSI specification A21.11 (AWWA C-111).
 - (f) Push on joint fittings shall not be approved.
 - (g) Rubber rings for mechanical joints shall conform to the requirements of ANSI specification A21.11 (AWWA C-111).
 - (h) Bolts and nuts for use with mechanical joints shall be galvanized tee-head bolts and hexagonal nuts.
 - (i) Fittings shall be manufactured by Tifco, Tyler, Clow, or approved equal.
- (03) Flanged coupling adaptors shall be Rockwell #912 or approved equal. Bolts and hardware shall be stainless steel.
- (04) Flanged reducing coupling adaptors shall be Rockwell #914 or approved equal. Bolts and hardware shall be stainless steel.
- (05) Reducing couplings shall be Rockwell #415 or approved equal. Bolts and hardware shall be stainless steel.
- (06) Compression couplings for service connections shall be Rockwell #411 or approved equal. Bolts and hardware shall be stainless steel.
- (07) Transition couplings shall be Rockwell #433, Dressed Style 153 or approved equal. Bolts and hardware shall be stainless steel.
- (08) Tapping sleeves shall be Clow No. F-5205 or approved equal.
- b. Cast Iron Valves.
- (01) Resilient Wedge Valves.
- (a) Resilient wedge valves shall be brass mounted, non-rising stem conforming to AWWA C-509. All valves shall be 200 psi, minimum, working pressure, and hydrostatic shell test and furnished with "O-Ring" stem seals.
 - (b) Valves shall have flange to flange ends, mechanical joint ends, or mechanical joint to flange ends.
 - (c) All valves shall have a 2" square wrench nut.

- (d) Valves greater than 8" shall be butterfly valves.
 - (e) All gate valves shall be furnished with a cast iron valve box.
 - (f) Valves shall be as manufactured by M&H, Mueller, Clow, or approved equal.
 - (g) Valves shall be American made.
- (02) Butterfly Valves.
- (a) Butterfly valves shall be rubber seated, tight closing type conforming to AWWA C-504, class "150B" butterfly valves. All valves shall be 150 psi, minimum, working pressure, 300 psi test pressure.
 - (b) Valves shall have flange to flange ends, mechanical joint ends or mechanical joint to flange ends.
 - (c) All valves shall have a 2" square wrench nut.
 - (d) All butterfly valves shall be furnished with a cast iron valve box.
 - (e) Valves shall be Dresser 450, or equal by Pratt Groundhog, or Kennedy, Figure 40 or approved equal.
 - (f) Valves shall be American made.
- c. Tapping Valves.
- (01) Tapping valves shall meet or exceed AWWA C-500, except that the seat rings shall be of larger diameter to permit entry of the tapping machine cutters.
 - (02) Tapping valves shall be Clow No. 5093 or approved equal.
- d. Valve Boxes.
- (01) Cast iron valve boxes shall be furnished and installed with all valves.
 - (02) Boxes shall be adjustable length, two piece, for varying installation conditions, and shall have a slip means of adjustment.
 - (03) Shaft shall be 5¼" diameter, and cover shall be lettered WATER.
 - (04) Boxes shall be Rich "926" or approved equal.
- e. Thrust and Resistance Blocking.
- (01) All blocking shall be of 2,500 psi concrete. They shall be poured at all fittings where required to prevent movements. Concrete shall be poured as stiff as possible and shall be covered after pouring. The block sizes for various fittings shall conform to the standard details. Blocking must be allowed to set for 72 hours prior to pressure testing.

- (02) Blocking shall be placed between undisturbed earth and the fitting to be anchored.
- (03) All blocking shall be placed so that the pipe and fitting joints will be accessible for repair.
- f. Air Vacuum Release Valves. Combination air vacuum relief valves shall be iron bodied, bronze mounted combination air and vacuum relief valves, designed for normal usage of 150 psi, APCO, McCracken, Golden Anderson, or approved. One 2" gate valve, as specified, shall allow removal and reconditioning of vacuum relief valve. Connection to main pipe shall be made through the use of double strap service clamps, Smith Blair, as specified, or approved equal. Required piping shall be galvanized iron. Install at all points or summits of any given line.
- g. Blow Off Valves. Blow off valves shall be constructed per standard details, with a 2" gate valve installed for manual operation, as specified. Miscellaneous piping shall be galvanized iron. One 4" x 4" painted cedar post shall be furnished for ready field location, and to secure outfall piping. Connection to main line shall be made through use of double strap service clamps, Smith Blair, as specified, or approved equal.
- h. Service Laterals.
 - (01) Service Saddles.
 - (a) Brass saddles $\frac{3}{4}$ through 2" IP tap, utilized with C-900 PVC pipe, shall be Ford Meter Box Company, style S90, or approved equal.
 - (b) Brass saddles $\frac{3}{4}$ through 2" IP tap, utilized with ductile iron pipe shall be Ford Meter Box Company, solid bronze, double strap with I.P. taps, style S90, or approved equal.
 - (02) Corporation Stops. Corporation stops used with $\frac{3}{4}$ and 1 inch tap shall be Ford Meter Box Company, type F1101 or approved equal. Stop shall be furnished with iron pipe threads and copper tube pack joint.
 - (03) Gate Valves. Gate valves used with $1\frac{1}{2}$ and 2 inch tap shall be bronze, non-rising stem and shall have pressure containing parts of material having at least the physical properties of ASTM B-62. Gate valves shall be of the solid wedge type. Stem shall be of cast silicon brass or rolled silicon brass. Valves shall be furnished with bronze tee handle and cast iron valve box as specified.
 - (04) Meter Stops. (2 required per meter)
 - (a) Angle meter stops used with $\frac{3}{4}$ and 1 inch copper pipe shall be catalog no. KV43-332W and KV43-444W, respectively, as manufactured by Ford Meter Box Company, or approved equal.

- (b) Angle meter stops using 1½ and 2 inch copper pipe shall be catalog no. FV43-777W, respectively, as manufactured by Ford Meter Box Company or approved equal. Reinforced rubber gaskets required.

(05) Piping.

- (a) All ¾ through 2 inch water service laterals shall be seamless copper water tubing conforming to ASTM B-88, Type K. Joints to be silver soldered. Copper pipe fittings shall be solder pattern, seamless cast copper to bronze.

(06) Meter Boxes.

- (a) Service boxes for ¾ and 1 inch service laterals in traffic areas shall be Brooks No. 37 for a 5/8" x ¾" meter and Brooks No. 38 for a 1" meter, or approved equal. Double meter installation in one service box shall be Brooks No. 11-2 (C.I.). If double service box is utilized, installation shall use a bronze manifold for meters.
- (b) Meter boxes for 1½ and 2 inch service laterals in traffic areas shall be Brooks No. 66 or approved equal.
- (c) Meter boxes outside of traffic areas shall be Ametek 12" standard meter box or equal with a hinged ductile iron metal meter reader lid. The words "water meter" shall be cast into the top of the lid.
- (d) Meter box extensions shall be the same material as the meter boxes, and shall have appropriate joints for extending the meter boxes.

- (07) Pressure reducing valves. Bronze body, screwed threads, with a pressure range of 50-100 psi. Wilkins series 600 or approved equal.

i. Hydrants.

- (01) Fire hydrants shall be a AWWA compression type, traffic model, with main valve to remain closed if barrel should be accidentally broken. Length of barrel shall be sufficient for 36" pipe cover. Hydrant shall be installed to finish grade, with base flange 6" above adjacent ground.
- (02) Hydrants shall be "O" rings seals, rugged main valve, positive drain valve, bronze weather cap, and non-kinking chains. Hydrants shall have bronze seat right and bronze cap nut. Entire valve mechanism, including drain valves, must be easily removed without digging. Hydrant shall be capable of 360 degree rotation on stem. Mueller Super Centurion, Clow Medallion, or approved equal. Operating nut shall be 1½" pentagon, national standard, counter-clockwise opening and color shall be fire hydrant red.

- (03) Each hydrant shall be equipped with two 2-1/2" hose nozzles and one 4-1/2" threaded pumper nozzle. Size of hydrant valve opening shall be 5 -1/4". Hydrant inlet shall be mechanical joint. Must meet AWWA specification C-502 and national standard specifications.
 - (04) Provide barrel extensions as required.
3. Workmanship.
- a. Fittings.
 - (01) Install to manufacturer's recommendations.
 - (02) Dropping of fittings into trench is prohibited. Care should be taken in handling at all times.
 - (03) Before lowering cast iron fittings and while suspended, each fitting shall be inspected and lightly tapped with a hammer to detect flaws. All defective fittings shall be rejected.
 - b. Valves and Valve Boxes.
 - (01) Install to manufacturer's recommendations.
 - (02) Provide valve boxes to grade, for each valve.
 - (03) Valve box shall not rest on valve and shall be centered and plumb over valve nut.
 - c. Fire Hydrants.
 - (01) Set where approved by City.
 - (02) Install to manufacturer's recommendations and Standard Detail. Hydrant tee and valve must be installed on the main waterline. Joints must be flanged to provide anchoring.
 - (03) Hydrants shall be plumbed vertically.
 - (04) Hydrant base shall be set on firm and solid foundation.
 - (05) Concrete blocking shall be provided as per standard drawing in the specifications.
 - (06) Flush hydrant thoroughly after installation to remove foreign matter.
 - (07) Provide proper bury.
 - d. Service Laterals.
 - (01) Service laterals shall be installed as per standard details to property line. Minimum depth 12", maximum depth 18".
 - (02) Angle meter stops shall be provided with a minimum depth of 12", maximum depth 18".
 - (03) Service laterals shall include all required pipe and fittings from the main line to the meter boxes including meter boxes, with hinged lids

and 6" extensions, and 2 angle meter stops, complete and connected to provide service to properties.

- (04) Service laterals shall not be permitted in hydrant trenches.
- (05) Flush, test, and disinfect water main and service lines prior to connecting meter to residential services.
- (06) Set meter boxes to grades at designated locations, square and true with the street and main.

N. TONING WIRE AND UNDERGROUND WARNING TAPE

- 1. Scope. The work to be done under this section consists of furnishing all labor, material, equipment and performing all work specified herein for the burying of an insulated copper wire and an underground warning tape in close proximity to installed non-ferrous pipelines.
- 2. Materials.
 - a. Copper wire shall be number 16.
 - b. Underground warning tape shall be 6 inches wide, metallic type, color per APWA standards, with words "caution, waterline (sewerline)(stormline) buried below.
- 3. Workmanship.
 - a. Wire and tape shall be buried the entire length of trench and shall be placed per the standard detail drawing.
 - b. Wire shall be brought to the surface and connected to ground rods, valve boxes, cleanouts and manholes.
 - c. Tape shall be placed over the pipe zone material, approximately 12" above top of installed pipe.
 - d. Wire shall be duct taped to top of pipe at maximum 8' centers.

O. COMMON EXCAVATION FOR STREET CONSTRUCTION

- 1. Scope. This item covers the excavation of any material encountered irrespective of nature, character, or conditions, complete, including but not limited to:
 - a. Protection of private property.
 - b. Disposal of cleared items.
 - c. All excavation and embankment.
 - d. Removal of existing asphaltic pavement.
 - e. Removal of existing sidewalks.
 - f. Removal of existing curbs and curb returns.
 - g. Locating and protecting existing utilities.
 - h. Repair of damage to existing utilities.

- i. Maintenance of adequate barricades, lights, and warning signs for protection of public.
 - j. Hauling of and disposal of excavated materials.
 - k. Repair of private and public property damaged.
 - l. Sawing of all concrete and asphalt concrete pavement to neat, straight edges where existing surfaces are to remain.
 - m. Final backfill and cleanup.
 - n. All miscellaneous items of work to complete construction specified.
 - o. Re-shaping of the grade.
 - p. Preparation of subgrade.
 - q. Grading of existing driveways which are specified for restoration.
2. Materials, as specified under Miscellaneous Sitework.
 3. Workmanship, as specified under Miscellaneous Sitework.

P. PREPARATION OF SUBGRADE

1. Scope. This item covers the shaping, trimming, and finishing of the graded roadbed, slopes and surfaces of roadway earthwork to bring them in reasonably close conformity to the lines, grades and cross sections established by the engineer.
2. Stabilization Material. Stabilization material shall be as specified.
3. Sterilization. All subgrade shall have ground sterilant applied prior to base rock placement.
4. Workmanship.
 - a. Subgrade shall be made free of ruts, depressions and irregularities.
 - b. Water is required for compaction.
 - c. Compaction shall be done as specified under Miscellaneous Sitework.
 - d. Soft or unstable subgrade materials shall be excavated and replaced, with compacted foundation stabilization material as specified, under trench excavation and backfill, as directed by City staff.

Q. BASE AND LEVELING COURSES

1. General. This item includes furnishing all materials, labor and equipment for construction of base and leveling courses, complete.
2. Materials.
 - a. Base course material shall be 1½"-0 crushed rock.
 - b. Leveling course material shall be ¾"-0 crushed rock.
 - c. A combination base and leveling course material is approved for 1"-0 crushed rock.

- d. Base and leveling course material shall conform to the requirements of Section 02630 of the Oregon Department of Transportation, Highway Division, standard specifications, except 70 percent of the particles by weight shall have at least one mechanically fractured face based on grading requirements of the section. Furthermore, the fracture requirements shall be applicable uniformly throughout the grading of the materials involved. (All gravel sizing shall have fractured faces applicable by screen sizes to the 70% level.) The material shall be tested and tests shall be furnished to the City of Sisters showing conformance thereto on each of the gradations to which the materials are divided in determining conformance to the requirement for grading of the materials. Testing for each proposed pit shall be furnished to the City on an annual basis, and at more frequent intervals at the discretion of the City Engineer if there is any question regarding the quality of rock being furnished for City purposes.
 - e. A complete test report on base and leveling course material to be used shall be submitted with the proposal. The report shall be by a recognized independent testing agency and date not earlier than six months prior to construction start. No rock will be used on any project until test report is approved by City staff.
3. Workmanship.
 - a. Sequencing and Scheduling. Notify City 48 hours prior to placement of base and leveling courses to permit inspection.
 - b. Placement. Rock shall be spread to such depth that when thoroughly compacted it will conform to grades and dimensions on plans. Segregation shall be avoided.
 - c. Compaction. Base and leveling course shall be compacted to achieve 95% density when tested in accordance with AASHTO standard method T-180, method A. Water shall be added as required.

R. ASPHALTIC CONCRETE PAVEMENT

1. Scope. This item includes furnishing all materials, labor and equipment necessary to laying asphaltic concrete pavement, complete, as shown on plans and specified herein.
2. Materials for Asphaltic Concrete.
 - a. Composition. Asphaltic concrete shall be composed of asphaltic cement, mineral filler, sand and gravel, or crushed rock mixed together in the proportions hereinafter specified.
 - b. Asphaltic Cement. Shall be paving asphalt conforming to AASHTO standard specification for asphaltic cement. The penetrations shall be 60-70.

- c. Proportion of materials. Shall be of such size and gradings that when proportioned and mixed together from two or more stockpiles (3/4-1/4 and 1/4-0) they will produce a uniform mixture which will conform with the requirements as follows.

Sieve Size Passing	Percentages of Total	
	Class "B"	Class "C"
1"	100	
3/4"	95-100	100
1/2"	81-93	95-100
3/8"	73-80	81-94
1/4"	52-72	60-80
No. 10	21-41	26-46
No. 40	8-24	9-25
No. 200	2-7	3-8
Asphaltic Cement	4-8*	4-8*

*Percent of total mix (by weight)

Exact proportions of several constituents used in production of bituminous mixture shall be within the limits above specified, be fixed by engineer, and proportions so established shall be changed only upon his order.

3. Workmanship.

- a. Mixing Plant. Asphaltic concrete shall be proportioned and mixed to produce a mixture within the job mix formula. The plant shall be equipped with suitable storage bins for aggregates, weighing devices, heating and mixing equipment. Plant facilities shall be open to City at all times during operation for checking temperatures being maintained in preparation of mixture.
- b. Preparation of Mixture.
- (01) Size of batch shall be determined by engineer based on manufacturer's capacity rating or net cubic content of mixer below center of mixer shafts.
 - (02) Combined mineral aggregate shall be thoroughly mixed dry, after which proper amount of bituminous cement shall be distributed over aggregate and the whole thoroughly mixed for such period as is necessary to produce homogeneous mixture of unchanging appearances in which all particles of mineral aggregate are uniformly coated with bituminous cement.
 - (03) For batching plants, mixing time after introduction of bituminous cement shall be not less than 30 seconds and as much longer as is necessary to obtain specified results. For continuous mix plants, the mixing time in seconds shall be as determined by dividing the pugmill dead capacity in pounds by the pugmill output, in pounds

per second, and shall be regulated by fixing a minimum gauge in the mixing unit or by other satisfactory mixing unit adjustments.

(04) The ingredients of the mixture shall be heated, combined and mixed in such a manner as to produce a mixture of such temperature that when deposited on the road it will be within the temperature range set forth hereinafter.

- c. Temperature Limits. The temperature to which the aggregates and bituminous cement are to be heated and at which the asphaltic concrete is to be deposited on the road shall be in accordance with the following:

Degrees Fahrenheit to which aggregates are to be heated before mixing	250-325
Degrees Fahrenheit to which bituminous cement is to be heated before mixing	250-300
Degrees Fahrenheit at which asphaltic concrete is to be deposited on road	250-300

- e. Hauling, spreading, and Finishing.

(01) Mixture shall be transported from mixing plant to point of use in dump trucks having tight, clean, smooth, metal beds, which have been sprayed with a minimum amount of fuel oil, paraffin oil and lime solution to prevent mixture from adhering to beds.

(02) No loads shall be sent out so late in the day as to prevent completion of spreading and compacting during daylight unless artificial light satisfactory to engineer is provided. Trucks shall be furnished with suitable canvas or burlap covers to prevent loss of heat, if required to meet established temperature standards.

(03) Contact surfaces of curbs, gutters, catch basins, manholes, cleanouts, edges and surfaces of existing pavements and other structures within the pavement areas shall be treated with a thin uniform coating of asphalt cement of type designated and applied as directed by City.

(04) Mixture shall be laid on leveling course hereinbefore specified. Leveling course shall be shaped and rolled as necessary to repair any areas disturbed by trucking. Placing of this mixture will be permitted only during dry weather and when the ambient temperature is above 40EF.

(05) Mixture shall be delivered to and spread by an asphaltic concrete paver of standard all edges adjacent asphaltic paving will be sawcut to provide uniform edge for new pavement.

(06) Mixture shall be delivered to and spread by an asphaltic concrete paver of standard self-propelled type which meets the approval of City, and shall be thereby struck off and finished to specified grade and cross section. Mixture shall be laid in strips of such width as to

hold to a practical minimum the number of longitudinal joints required.

- (07) Length of strips and time of placing adjoining strips shall be such that the edge of any strip along a longitudinal joint shall have the adjoining strip constructed against it within 24 hours. City may authorize special circumstances for weekend construction, etc.
- (08) No asphaltic concrete material shall be placed against the edge of a strip course of layer of similar material that has been rolled and has cooled unless said edge has been prepared in the same manner as hereinafter set forth for transverse joints.
- (09) On areas of irregular shape, limited area, or where unavoidable obstacles make use of specified spreading and finishing equipment impracticable, in the judgement of the City, mixture may be spread and finished by hand methods which shall be performed in a skillful manner, without segregation of materials, and to specified grade, cross section and smoothness.
- (10) Care shall be taken at all times to prevent segregation in the mixture as evidenced by areas of fine and course materials, and any portions where such segregation occurs shall be corrected with fresh mixture either spread and worked into the surface, or by complete removal and replacement of aggregated mixture as directed by City.
- (11) On full depth asphalt, contractor shall lay blacktop in a minimum of two lifts. Width of spread shall be varied so that longitudinal joints on succeeding lifts do not fall over joints in the lower lifts.

e. Compacting.

- (01) After spreading, striking off and finishing have been performed and while mixture is still hot, the course of asphaltic concrete shall be compacted thoroughly and uniformly by rolling. Rolling shall be done with self propelled three wheeled or tandem roller weighing not less than six tons and at least one of which shall weigh not less than ten tons. In general, one roller shall be provided for each 75 tons of mixture placed per hour or each 600 square yards of mixture placed per hour when the depth of course is such that 75 tons spread over an areas exceeds 600 square yards.
- (02) Rolling shall be continued until asphaltic concrete has been compacted to such extent that its specific gravity expressed in percentage of the specific gravity of the combined aggregates is not below 92%.
- (03) Along beams, curbs, headers and walls, around manholes and catch basins, and at other places not accessible to the roller mixture shall be thoroughly compacted with hand tampers, smoothing irons or mechanical tampers. On depressed areas, a trench roller may be

employed, or compression strips may be used under the roller to transmit compression to the depressed area.

- (04) Surface of the asphaltic concrete after compaction shall be smooth and true to established cross section and grade. Any mixture that becomes loose or broken, mixed with dirt, or is in any way defective shall be removed and replaced with fresh hot mixture, which shall be immediately compacted to conform with surrounding area. Any areas showing excess of bituminous cement due to improper rolling procedure shall be removed and replaced.
- f. **Tranverse Joints.** Placing of a course or strip of asphaltic concrete shall be as nearly continuous as practicable and the roller shall pass over an unprotected end of freshly laid mixture only when the laying of the course or strip is to be discontinued long enough to permit the mixture to become chilled. In all cases, when work is resumed the material previously laid and permitted to become chilled shall be cut back or removed along the end so as to produce a slightly beveled edge for the full thickness of the course and the old cut away material shall be removed from the work. The new mixture shall be placed or raked against the fresh cut, thoroughly tamped, and rolled to provide a smooth joint exactly meeting the line, grade and cross section of adjoining asphalt concrete after thorough compaction. When end of a course of strip of asphaltic concrete is to be temporarily subjected to traffic, end shall be left on a bevel of approximately 1:1 to provide a fresh edge against which subsequently placed asphaltic concrete is to abut.
- g. **Surface Smoothness.** The surface of the top or wearing surface course, when finished, shall be of uniform texture, smooth, true to crown and grade, and free from defects of all kinds. The smoothness shall be such that when tested with a ten foot straight edge placed on the surface with its centerline of the highway, the maximum deviations of the surface from the edge of the straight edge will nowhere exceed ½". If surface is not acceptable to City staff, work shall be replaced until an acceptable finish is provided.
- h. **Control traffic.** No traffic shall come in contact with any course or lift of pavement until course of lift has cooled and set sufficiently to prevent marking. Those edges which are to be along longitudinal joints shall be protected from traffic to the extent that no breaking down of the edge shall occur.
- i. **Patching.** All patching of improved City streets will be provided by the City of Sisters at the property developers expense. All patching shall utilize infrared patchless technology to eliminate appearance of patching within improved City streets, and payment for work will be paid in advance.
- (01) Omissions or damage to wearing surface shall be immediately corrected by hand patching. Defects such as raveling, low centers,

lack of uniformity, or other imperfections caused by faulty workmanship shall be corrected as directed by City.

(02) All costs incurred in correcting omissions and in patching shall be borne by contractor.

j. Cleanup. After the pavement has been completed, the contractor shall collect and remove from the site all debris resulting from his operations. Graded areas along the streets or drive ways that have been disturbed by the paving operations shall be regraded to the satisfaction of the City.

S. PORTLAND CEMENT CONCRETE PAVEMENT

1. Quality Assurance. Requirements of ACI 301 shall govern work, materials and equipment related to this section unless noted otherwise.
2. Submittals. Manufacturer is responsible for the design of the concrete mix which shall conform to ASTM C94 requirements for ready mix concrete. Prior to delivery of concrete, manufacturer shall furnish to the City of Sisters a written statement giving the design mix and properties by weight and aggregate plus amount of water in gallons per bay proposed for use in each class or type of concrete specification. Furnish evidence of testing or proposed design mix which assures design strength as specified, statement in writing on letterhead of manufacturer, identified to the specific project, addressed to the City of Sisters.
3. Products.
 - a. Concrete Mix.
 - (01) Strength. 4000 psi minimum compressive strength after 28 days when tested in accordance with ASTM C39.
 - (02) Aggregate. 1 ½" maximum size.
 - (03) Slump. 4" minimum and maximum when tested in accordance with ASTM C143.
 - (04) Cement. 6.30 sacks per cubic yard of concrete, minimum.
 - b. Cement Type. ASTM C150 type I for all concrete.
 - c. Admixtures. ASTM C494 only as approved by City.
 - d. Hardener and Sealer. Horm clear seal as manufactured by Grace Construction Materials, or approved equal.
4. Mixing and Delivery. (Attention is directed to Section 26.1511 UBC standard, 1979.) Certification is required. Under "Additional information": Show water added in addition to design mix, who added it and who authorized it. Note: engineer/architect or testing laboratory may authorize additional water. If slump test indicates slump when tested I within specified limit, no problem; if slump is in excess of specified limit, concrete is rejected and cannot be used on project. The concrete shall be placed in a maximum elapsed time of 1½ hours after the mixing water and cement has entered the drum until completion of discharge.
5. Thickness Requirements.

- a. Minimum total thickness of the Portland cement concrete for each type of street constructed area as follows:

(01) Minor residential (non-through street)	5"
(02) Residential	5½"
(03) Collector	6½"
(04) Arterial	8"
(05) Bicycle Path	4"
6. Preparation.
 - a. Subgrade under curbs and street shall be excavated and filled with 2" of clean sand to provide uniform bearing surface.
 - b. Construction of Portland cement concrete pavement shall not be in progress or continued when a descending air temperature in the shade and away from artificial heat falls below 40°F.
 - c. Streets may be constructed in half sections using wooden forms as a guide. All forms must be set and maintained true to the line and grade until the concrete has sufficiently hardened.
 - d. Curb and gutter section must be integrally poured as a unit.
7. Placing.
 - a. Place concrete as near as possible to the final location. Movement by vibrator not permitted.
 - b. The contractor shall place the concrete uniformly in its final position by the slip form or other approved method in one complete pass in such a manner that a minimum of finishing will be necessary to provide a dense and homogeneous pavement in conformance to true grade and cross section. The machine shall vibrate the concrete for the full width and depth of the pavement being placed. Such vibrations shall be accomplished with the vibrating tubes or arms working in the concrete.
 - c. The contractor shall compact the concrete by means of vibrating screeds, mechanical tampers, tamping templates and such other implements as approved. A vibrating screed or an automatic screening and tamping machine may be substituted for a tamping template, subject to approval. The contractor shall operate the equipment in such a manner that a satisfactory compaction of the concrete is produced and the surface of the pavement is uniform, true to grade and cross section. Immediately after placing concrete upon the subgrade and before initial set has occurred, the contractor shall strike off the concrete and tamp by means of a tamping template, used at right angles to the center line of the street, until the concrete is thoroughly consolidated to specified grade and crown section and sufficient mortar is brought to the surface for finishing purposes.

8. Joints. The joint pattern layout should be planned prior to construction. Although the end of the day header construction joint cannot generally be planned, the overall joint spacing can be anticipated. The joint pattern of any project should consider the width of the concrete placement planned by the contractor. For pavement less than 6" thick, the maximum joint spacing should be 21 to 15 feet. For the plain jointed pavement 6" or greater, the maximum joint spacing should be 15 and 18 feet. In order to establish a good plane of weakness for stress relief, joints should have a depth of one quarter the thickness of the slab in inches. This depth will allow the pavements to crack at the joint and provide an aggregate interlock. The joint pattern relationship of length to width should not exceed a ratio of 1 to 1 ½; i.e., a pavement ten feet wide should not be jointed longer than 12 to 15 feet.
 - a. Transverse contraction joints shall be constructed by sawing to the depths and widths and locations called for in the standard plans shown as detail. Alternate method of joint construction is the placement of a narrow straight edge into partially set concrete, then carefully removing without creating a hump.
 - b. Construction joints shall be constructed where there is an interruption of more than 30 minutes in the concreting operation. For streets constructed in half sections, a longitudinal keyway joint shall be used.
 - c. Expansion joints using ½" premolded material shall be provided around catch basins and manholes to isolate the structures. The top of the materials shall be ¼" below finish concrete grade.
9. Finishing. After the concrete is placed and compacted, the contractor shall strike a true to line, grade and cross section as shown and float to a smooth, even texture with an approved long handled wood float having a trowelling or smoothing surface from 6 to 12 inches wide, or other approved floating device. The contractor shall apply the float to the surface of the concrete with its length parallel to the centerline of the street and operate it from bridges, planing off the high places and filling the low places. Preceding applications of the float shall be lapped by at least ½ its length. If, after such planing, low places are discovered in the surface of the concrete, the contractor shall add additional concrete to fill in and bring such low places to grade, as approved. Floating shall leave the surface finish at specified grade, cross section and surface tolerance with a surface free from laitance, soupy mortar, marks or irregularities. Following the float refinish and at the proper set, the surface shall be broom finished. The contractor shall draw the broom transversely across the pavement with not more than one stroke per width of broom. Any areas of minor honeycomb or other minor defect in composition of the concrete shall be filled along the exposed edges with a stiff mortar or cement and fine aggregate applied to the moistened concrete in a professional manner. Areas showing serious defects in composition shall be cause of removal of the affected pavement and replacement with pavement of specified quality for the full width of strip between longitudinal joints or edges and for a length not less than 10 feet. The contractor shall tool the free edges of new pavement and joints with previously placed Portland cement concrete with an

approved edging tool, to remove laitance and mortar resulting from finishing operations and to provide a clean rounded edge to the new pavement. Tooling shall not form ridges on the surface of the concrete. Tooling of edges at transverse joints shall be performed as directed.

10. Tolerances. At the conclusion of the finishing operation the surface of the pavement shall not vary from a true surface when tested with a 10 foot testing straightedge, more than .01 foot in 10 feet. The finished surface shall not vary more than 0.03 foot from the plan elevations at any point.
11. Curing. Immediately after the final floating, surface finishing and edging has been completed and while the concrete surface is still moist, the entire exposed surface of the newly laid concrete shall be covered and cured in accordance with one or another of the following provisions as the contractor may elect:
 - a. Liquid Membrane-Forming Compounds. Membrane-forming compound shall be of the white pigmented type and shall be applied uniformly to damp concrete by pressure-spray methods at a rate which will form an impervious membrane when tested in accordance with AASHTO T-155.
 - b. White Polyethylene Sheeting. The white polyethylene sheeting shall be applied to damp concrete as soon as the sheeting can be placed without marring the surface. The sheeting shall be placed in intimate contact with the surface, shall extend over and beyond the sides or edges of the slabs or forms and shall be weighted as required to hold it in position as a waterproof and moisture proof covering. Laps shall be of dimensions and design in place to maintain tightness equivalent to the sheeting.
 - c. Waterproof Paper. Waterproof paper shall be applied to damp concrete as soon as it can be placed without marring the surface. The paper shall be placed in intimate contact with the surface, shall extend over and beyond the sides or edges of the slabs or forms and shall be weighted as required to hold it in position as a waterproof and moisture proof covering. Transverse laps shall be at least 18" and longitudinal seams shall be cemented.
 - d. Cotton or Jute Mats. Cotton or jute mats shall be applied to damp concrete as soon as the surface has set sufficiently to prevent marring thereof. Just prior to placing, the mats shall be saturated with water and shall be kept fully wetted during the curing period. The mats shall be maintained in intimate contact with the concrete surface and shall be extended over the edges and beyond sufficiently to be well weighted down along side the pavement edges. Regardless of which of the above methods the contractor chooses, the curing medium shall be intact and effective for a period of not less than 72 hours after application.
12. Protection. The contractor shall erect and maintain suitable barriers to protect the concrete from traffic or other detrimental trespass until the pavement is opened to traffic. If necessary, the contractor shall maintain watchmen to insure that barriers are not removed or destroyed and that trespass upon the pavement does not occur.

Wherever it is necessary that traffic, including contractor's vehicle and equipment, be carried from one side of the pavement to the other, the contractor shall construct and maintain suitable bridges over the pavement as directed. The concrete shall have attained the specified compressive strength and shall be free from scarring, abrasion, stones, loose mortar and other matter apt to be deleterious to the concrete prior to allowing equipment or traffic to use the new surface. All equipment shall be operated without damage to the new concrete. The contractor shall repair or replace any part of the pavement, as directed, which has been damaged by traffic or from any other cause prior to its official acceptance, at no expense to the City.

T. COMPACTION TESTING

1. If, in the opinion of the City, the methods utilized by the contractor for placing trench backfill, embankment, base course, leveling course or asphaltic concrete pavement are not achieving the degree of compaction specified for that item, a compaction test or tests will be ordered by the City.
2. Test will be performed by a recognized independent testing points to the monuments and he shall give reasonable notice of the schedule for monument work in order to avoid distribution of the points.
3. If test results reveal that specified compaction was not achieved, contractor will remove and replace that portion of the work found to be defective in a manner that will achieve the required compaction. Additional testing will be performed following replacement of backfill as directed by the City. All testing costs shall be borne by the contractor.

U. STREET MONUMENTATION

1. If this item shall include furnishing all labor, materials, equipment, and services necessary for installation of monument cases as specified herein.
2. Monument Cases.
 - a. Cast iron monument cases shall be installed at monument locations.
 - b. Shaft shall be 6-1/4" inside diameter.
 - c. Monument cases shall be Valley Iron and Steel Company, pattern no. 700, or approved equal.
 - d. All cases shall be American made.
3. Workmanship.
 - a. Before installation of casings and while suspended, each casing shall be inspected and lightly tapped with a hammer to detect flaws. All defective casings shall be rejected.
 - b. Install to manufacturer's recommendations.
 - c. Monument casing shall be centered and plumb over the monument location.
4. Installation.

- a. Contractor shall be responsible for having all monuments referenced in advance of construction, re-established and set to grade at the proper time.
- b. It shall be responsibility of the contractor to install the required monument casings in accordance with the plans, specifications and as directed by the City. The contractor shall carefully protect all reference points to the monuments and he shall give reasonable notice of the schedule for monument work in order to avoid distribution of the points.
- c. Contractor shall maintain and protect monument casings once installed.

V. SIGNS AND POSTS

1. Scope. This item shall consist of the furnishing, fabricating, galvanizing and erecting of sign posts in conformity with the lines, grades, dimensions and locations as directed or provided by the City of Sisters. In general, signs and posts will be furnished and installed by City staff at Developer's expense.
2. Materials.
 - a. Backfill. Backfill materials shall conform to the applicable portions of this Section IV.
 - b. Concrete. Concrete shall conform to the requirements of Section V.
 - c. Posts.
 - (01) Post materials shall conform to the applicable portions of following.
 - (02) Posts shall be 4" x 4" treated, painted posts.
 - (03) Standard sign post is 4" x 4" x 10 feet long.

W. SEEDING AND MULCHING

1. Description.
 - a. Scope. This work shall consist of preparing, fertilizing, seeding and mulching of areas to develop a growth of grass thereon. The areas involved will comprise cut and fill slopes and leveled portions of the roadside areas disturbed by construction; exclusive of rock slopes. The work shall be performed in all areas disturbed by construction operation.
 - b. Construction Seals. Unless otherwise approved, this work is to be performed during either the spring season, generally between February 1 and May 15th, or the fall season, generally between August 1 and September 15th. The work shall be performed only at times when local weather and other conditions affecting the work are favorable to proper prosecution with the specified seasons.

The work under this specification shall not be undertaken when wind velocities would prevent uniform application of materials involved or when winds would drift the materials to areas on which they are not desired.

2. Materials.

a. General. Materials shall meet the requirements specified in the following subsections:

- (01) Seed. All grass seed including legume seed shall be from blue tag stock and from the latest crop available. Each variety shall be from tested seed and shall be delivered in standard sealed containers labeled in accordance with Oregon state laws and U.S. Department of Agriculture rules and regulations under the Federal Seed Act in effect on the date of invitation of bids. The percentage of purity, germination and maximum weed content shall be as set forth in the General Seed Certification Standard by Oregon State University Certification Board or as specified in the special provisions. The seed shall have been tested within nine months of date of delivery and shall not be moldy, or show evidence of being set or otherwise damaged.

Each lot of seed shall be subject to inspection, sampling and testing on delivery to the project. Seed not meeting the requirements of these specifications or the special provisions or not labeled as specified will be rejected and shall be replaced with seed conforming to the specifications. Grass seed may be delivered to the project as a mixture providing each variety of grass seed in the mixture is identified and labeled as specified or a certification from the supplier is attached giving the percentage of each variety of grass seed in the mixture and the percentage of purity, germination and weed content, as well as other pertinent data.

- (02) Fertilizers. Inorganic or organic fertilizers shall be of any standard brand, furnished in moisture proof bags. Each bag shall be marked with the weight and with the manufacturer's analysis of the contents showing the percentage for each ingredient contained therein and shall be certified as to analysis. Fertilizers shall be furnished in a dry condition free of lumps and caking, in granular or pelletized form. Fertilizers shall be standard commercial grade and shall conform to all state and federal regulations, and to the standards of the Association of Official Agricultural Chemists. All fertilizers shall be subject to testing by the State Department of Agriculture.

Organic. Organic fertilizers shall consist of cottonseed meal, blood meal, bone meal, fish meal, tankage, or similar organic substances. Required chemical composition for each specific use will be set forth in the special provisions.

Inorganic.

- a. 22-16-8. This fertilizer shall analyze 22% nitrogen, 16% available phosphoric acid, 8% soluble potash, and include a

minimum of 2% sulfur. The fertilizer shall contain not less than 50% cold water insoluble nitrogen derived by incorporating a minimum of 800 lbs. of urea formaldehyde per ton of fertilizer. The fertilizer shall have a minimum activity index (AI) of 50 as determined by the Association of Official Agricultural Chemists analytical methods.

- b. 7-40-6. This fertilizer shall be a co-granulated magnesium ammonium phosphate and magnesium potassium phosphate, controlled release compound having a minimum analysis expressed as percent of total weight as follows:

Total Nitrogen (N)	7%
2% maximum water soluble ammoniacal nitrogen	
5% maximum water insoluble ammoniacal nitrogen	
Available Phosphoric Acid	40%
Soluble Potash	6%
Total magnesium	12%
Unless otherwise approved, granules shall be of the coarse size.	

- (03) Soil Conditioners. Soil conditioners for changing or modifying the soil structure, as distinguished from plant foods and mulch, shall be spent mushroom growing compost, processed and composted mint plant residue (mint manure), well rotted pea vines or other approved material.
- (04) Mulch Materials. Mulch materials shall meet the following requirements and receive approval by the engineer.

Grass Straw. Straw mulch shall be grass straw consisting of bents, bluegrasses, fescues and rye grasses, singly or in combination. Grass straw mulch shall not be musty, moldy, caked, decayed or of otherwise low quality, and shall be free of noxious weeds or noxious weed seeds.

Peat Moss. Peat moss shall be horticultural grade natural peat moss furnished in bales or bags, in air-dry condition, and free from woody substances. The bales or bags shall carry identification of contents and volume.

Sawdust. Sawdust mulch shall be free of chips, strips and splinters. It shall have no toxic substances injurious to plants.

Bark. Bark mulch shall be ground, shredded or broken particles from the bark of fir, pine or hemlock trees shall be free from weed seeds, harmful bacteria or disease spores and substances toxic to plant growth. The mulch shall be of the size commonly known in the trade as "medium bark mulch." A 15 pound sample shall be submitted to the engineers for visual inspection and approval prior to delivery of the material to the project, and the approved sample will

be used as a reference for acceptability of the material used in the work.

Wood Cellulose Fiber. Wood cellulose fiber mulch shall consist of a specially prepared wood fiber processed to contain no growth or germination inhibiting factors. The fiber mulch shall be manufactured and processed in such manner that the wood cellulose fibers will remain in uniform suspension in water under agitation and will blend with grass seed, fertilizer and other additives to form a homogeneous slurry. The processed mulch material shall have characteristics to form a blotter-like ground cover on application, having moisture absorption and percolation properties and the ability to cover and hold grass seed in contact with soil. The wood cellulose fiber mulch material shall be shipped in packages of uniform weight (plus or minus 5%) and bearing the name of the manufacturer and the air-dry weight content.

3. Construction

a. Preparation of Areas.

- (01) Those areas to be seeded on which earthwork has been performed shall be at established grades, cross sections and finish specified at the time of seeding. All areas to be seeded which are misshapen or eroded shall be restored to specified condition or to cross section, grade or slope as directed just prior to seeding.
- (02) All areas to be seeded shall be made substantially clear and free of weeds, briars, sticks, debris and other matter inimical, detrimental or toxic to the growth of grass.
- (03) Such trees, shrubs and ground covers which are designated by the City or indicated on the plans to be left in place on areas to be seeded or adjacent thereto shall be protected from damage, and the preparation work shall be performed around and between them as directed. Native grasses or turf may be left undisturbed at the discretion of the City.
- (04) The surface soil on all areas to be seeded shall be in a condition favorable for the germination and growth of grass seed. A minimum of ¼" of surface soil shall be in a loose condition.
- (05) Soil preparation operations shall be directional along the contours of the areas involved. On roadbed cut and fill slopes, the operations shall closely parallel the roadbed centerline to form minor ridges and irregularities thereon to retard erosion, retain seed and favor germination.

b. Fertilizing and Seeding.

- (01) General.

- (a) Fertilizer and seed shall be applied uniformly on the prepared areas at rates to insure and favor germination.
 - (b) The several kinds of seed, when more than one kind is to be used may be mixed together in the required proportions and used as a seed mixture. Fertilizer and seed may be combined in water for application by hydraulic means as hereinafter provided. When fertilizer and seed are to be applied separately and successively, they shall be applied in dry condition. If applied from separate compartments, the application may be done in one operation.
 - (c) Fertilizer and seed normally shall be placed prior to the placing of mulch. However, fertilizer and seed maybe applied after mulching under the following conditions: 1) when the mulch is punched into the soil by mechanical means such as modified sheepsfoot rollers or serrated flat blade discs; 2) when it is necessary to hold down the much with wire netting or like material; and 3) on slopes steeper than 1½ horizontal to 1 vertical where a slurry containing seed, fertilizer and water applied directly to the soil would tend to run down the slope.
 - (d) Fertilizer and seed shall not be allowed to fall upon areas where they are not desired. Special care shall be exercised to prevent their falling or drifting upon areas occupied by stone base, stone boulders, planting areas and other areas e equipment and methods used, due care shall be exercised to prevent drift and displacement of fertilizer and seed. If the equipment used and the method of application result in waste of material, other equipment and method shall be substituted therefor and shall meet with approval of the engineer.
- (02) Application of Fertilizer and Seed. Fertilizer and seed may be applied by one of the following kinds of equipment as the contractor may elect.
- (a) By power drawn or self-propelled grass seed drills or seeders with which the fertilizer shall be worked into the soil and the seed shall be placed and covered to a depth of approximately ¼".
 - (b) By hydraulic-type equipment providing continuous mixing and agitating action to a mixture of water, fertilizer, seed, mulch, or combinations thereof, and whereby the mixture will be applied through a pressure-spray distribution system providing a continuous nonfluctuating discharge and delivery of the mixture in prescribed quantities uniformly on specified area. The application of the materials shall be using a sweeping, horizontal motion of the distributing device.

- (c) Blower-type equipment using air pressure and an adjustable disseminating device whereby dry fertilizer and dry seed will be separately and successively applied at constant measured rates in prescribed quantities, uniformly, on specified areas. The application of the materials shall be by using a sweeping, horizontal motion of the distributing device.
 - (d) By hand-operated mechanical spreaders or seeders, whereby dry fertilizer and dry seed will be separately and successively applied in prescribed quantities, uniformly, on specified areas.
 - (03) Limitation on Kind of Equipment.
 - (a) Regardless of the equipment and methods used, due care shall be exercised to prevent drift and displacement of fertilizer and seed. If the equipment used and the method of application result in waste of material, other equipment and method shall be substituted therefor and shall meet with approval of the engineer.
 - (b) The fertilizing and seeding operations shall be conducted to avoid disturbance of areas previously prepared, fertilized, seeded or mulched, and if any such areas do become disturbed they shall be again prepared, fertilized, seeded and mulched as the engineer may direct, without additional compensation.
 - (04) Notice of Procedure. the contractor shall give at least two days notice to the City of the time and place of starting his operations and shall keep the City advised of his schedule of operations.
- c. Mulching.
 - (01) General.
 - (a) Mulch material shall be spread uniformly over designated areas at rates which will insure and favor germination.
 - (b) Mulch material for seeded areas shall be placed after those areas have been fertilized and seeded; except that if fertilizer and seed are combined therewith and applied by hydraulic means, wood cellulose fiber mulch may be combined therewith and applied simultaneously. Mulch materials on seeded areas shall be in place not later than two work days after the seeding has been performed.
 - (c) Mulch material shall be maintained in place by whatever means may be appropriate, subject to the provisions of the following paragraphs. The contractor shall be responsible for the replacement of any materials which becomes displaced prior to acceptance of the work.

(02) Placing of Mulch Material. The placing of the several kinds of mulch materials shall be in conformance to the requirements set forth in the numbered paragraphs which follow, as applicable:

- (a) Grass straw mulch material shall be placed to a reasonably uniform thickness, within the range of 1½ to 2½ inches, and averaging approximately 2" in loose condition. This rate requires approximately 2 tons of dry mulch per acre. The mulch shall be loose enough for sunlight to penetrate and air to circulate; but dense enough to shade the ground, reduce the rate of water evaporation, and prevent or materially reduce erosion of underlying soil. Grass straw mulch shall include, but are not limited to the following; light spraying with a nontoxic bituminous material at a rate of about 100 gallons per acre, disking or punching the straw partially into the soil, covering the straw lightly with soil, covering with open-mesh fabric or wire netting fastened to the soil, or by the prior "pegging" of the slopes with small stakes, pegs, arrow shaft material, etc., set in the ground at about 2' spacings and protruding about 3". The method of placing and retaining grass straw mulch shall be at the option of the contractor.
- (b) Wood cellulose fiber shall be applied either as a water-borne material wherein the fibers are uniformly suspended in water and applied to seeded areas, or as a part of a homogeneous mixture containing fertilizer, seed and the fiber mulch in suspension in water and uniformly applied to prepared areas at the respective specified rates of application. Wood cellulose fiber shall be applied by hydraulic pressure equipment and methods which deliver the water-borne fiber, or homogeneous mixture containing the fiber, in sufficient quantities uniformly on the specified areas.

Unless otherwise approved, the rate at which wood cellulose fiber is applied shall be a minimum of 2,000 pound per acre, which rate shall be based on the dry weight of the fiber.

(03) Protective Measures.

- (a) Care shall be exercised in the mulching operations to prevent displacement of soil, fertilizer and seed in place and to prevent disfigurement or damage to the areas on which the mulching is performed. Mulch material which comes upon adjacent trees and shrubs, roadways, in drain ditches, on structures, upon areas where mulching is not specified, or which collects at the ends of culvert or accumulates to excessive depths on mulched areas shall be removed therefrom and shall be spread lightly on specified areas, restored to thinly mulched areas or wasted as conditions warrant and as the City may approve or direct.

Mulch materials which are deposited in a matted condition or in clumps shall be loosened and spread uniformly over the areas.

- (b) If liquid asphalt is used with grass straw mulch, protective covering shall be used on structures and objects where asphalt stains would be objectionable, as necessary to avoid such discoloration and stain; and care shall be taken to protect the public from damage by drifting spray.
- d. Care of the Work. The contractor shall be responsible for all work performed under and required by this section as said responsibilities are set forth, and the following provisions:
- (01) During construction work of any kind under the contract, the contractor shall take such precautionary measures as are warranted to protect and preserve the seeded areas and mulched areas from damage of any kind and from any cause.
 - (02) Seeded areas and mulched areas which become damaged shall be required, to fertilize, seed and mulch as necessary to restore them to specified condition when so directed and the contractor shall bear all expense involved in such restoration work. The restoration work shall be in accordance with the applicable requirements for the original work.

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ORDINANCE 351
GENERAL CONSTRUCTION STANDARDS
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SECTION V
STANDARD SPECIFICATIONS AND DETAILS
CONCRETE INSTALLATION STANDARDS

A. GENERAL

1. Published specifications, standards, tests or recommended methods of trade, industry or governmental organizations apply to work of this section, where cited by abbreviation noted.
 - a. Uniform Building Codes, 1973 edition (UBC).
 - b. American Society for Testing Materials, 1973 edition (ASTM).
 - c. American Concrete Institute (ACI).
2. Work under this item includes, but is not limited to:
 - a. Furnishing, mixing, forming, placing, finishing and curing all concrete required for construction of curbs and gutters, catch basins and sidewalks.
 - b. Furnishing and installing all required reinforcing steel.

B. FORMWORK

1. General.
 - a. Formwork. Shall conform to ACI 347 unless otherwise noted.
 - (1) Shall prevent leakage or washing out of cement mortar.
 - (2) Shall resist spread, shifting, settling and deflection greater than 1/8 inch between supports after concrete placement
 - b. Shoring.
 - (1) Shall carry vertical and lateral loads to ground either independently or in combination with portions of structure which have attained adequate strength.
 - (2) Shall transmit loads from successive parts directly through falsework without creating ending or shearing stresses in concrete.Shall withstand wind and earthquake forces.
 - c. Safety. Contractor shall be responsible for adequate strength and safety of all form work including falsework and shoring.
2. Materials.
 - a. Plywood Forms. DEPA exterior "plyform," or approved class I or class II thickness required to support concrete at rate poured.
 - b. Steel Forms. As approved by local public agency or the engineer may be used in lieu of wood, at contractor's option.
 - c. Chamfers. Surfaced lumber WCLIB construction grade or better.
 - d. Wood Framing. Shall be WCLIB standard grade or better, Douglas fir.
 - e. Accessory Items.
 - (1) General.

- (a) Including all devices necessary for proper placing, spacing, supporting and reinforcing steel in place.
 - (b) Accessories which will be exposed in the finished concrete surface shall be:
 - (001) Galvanized
 - (002) Stainless Steel
 - (003) Concrete
 - (004) Plastic
 - (005) Aluminum
 - (006) Or approved
 - (2) Form Ties.
 - (a) Richmond "snap ties"
 - (b) Dayton "sure grip"
 - (c) Or approved type recommended by manufacturer for conditions of installation. No metal allowed within 1 inch of surface after tie removal.
 - (3) Reinforcing Bar Supports.
 - (a) Slabs exposed to view- above grade- Dayton "sure grip" stainless steel reinforcing bar supports, or approved.
 - (b) Slab on grade, masonry or concrete supports.
 - (4) Premolded Expansion Joint.
 - (a) Material, bituminous type.
 - (b) Manufacturer. Carey "elastite" ½ inch thick or approved.
 - (5) Sealing Compound. "Careylastic" or approved.
 - (6) Form Coatings. Form sealer, nonstaining, nongrain raising, free of mineral oils or other nondry ingredients and leaving no bond-inhibiting residues on concrete. Grace construction materials "form film," or approved.
3. Construction.
- a. Construction forms must be true to required lines, grades, dimensions and surfaces.
 - b. Arrange forms to permit single pours of exposed surfaces, areas, or panels without occurrence of joinery between adjacent forming materials in same plane.
 - c. Carefully align snap ties horizontally and vertically where concrete is exposed to view.
 - d. Cleanouts and Openings. Provide on interior face of wall forms as required for effective removal of dirt, debris and waste material, for inspection of

reinforcing and for introduction of vibrators.

- e. Apply form sealer to wood forms prior to placing reinforcing steel. Follow approved manufacturer's directions.
- f. Falsework and centering shall be constructed according to ACI 347.
- g. Accessory Items.
 - (1) Contraction Joints.
 - (a) Weakened plane contraction joints for curb and sidewalk shall be constructed at right angles to curb line, with spacing in 5 foot 6 inch multiples, not to exceed 5 foot 6 inches for sidewalk and 11 feet for curb.
 - (b) Contraction joints may be sawed or hand formed with joint depth to be a minimum of $\frac{1}{4}$ the total depth of the section.
 - (2) Expansion Joints - provide in following locations:
 - (a) Wherever walks abut vertical surfaces.
 - (b) Curb. Expansion joints shall be constructed at right angles to the curb line with spacing in 11-foot multiples, not to exceed 33 feet. Expansion joints shall also be placed at interface at straight curb and short radius curved sections, interface of new curb with old curb, and both sides of driveway cuts.
 - (3) Walks.
 - (a) Expansion joints shall be constructed at right angles to the curb line with spacing not to exceed 33 feet.
 - (b) Expansion joints shall also be placed at interface with straight walk and short radius curved sections, interface of new walk with old walk and both sides of driveway approaches.
 - (001) Elsewhere as indicated or necessary to prevent shrinkage from cracking concrete.
 - (4) Expansion Joints.

Bring joint material to within $\frac{1}{2}$ inch of top surface. Fill remainder of joint material with standard sealing compound.

 - (a) Provide where indicated or required by construction plan.
 - (b) Provide key indentations at all joints as shown.
 - (c) Prevent formations of shoulders and ledges.
 - (5) Removal of forms and supports.
 - (a) Do not remove formwork until concrete has hardened and attained sufficient strength to permit safe removal and adequate support of inherent and imposed loads.
 - (b) Minimum setting times shall be as follow:
 - (001) Walls 7 days

- | | |
|-------------------------------|---------|
| (002) Structural Slabs | 21 days |
| (003) Footings and Foundation | 3 days |
| (004) Earth Supported Slabs | 3 days |
- (6) Forms.
- (a) Remove forms carefully to avoid damaging corners and edges of exposed concrete.
 - (b) Reuse. The engineer will approve reuse of forms provided they are in good condition and have been cleaned, repaired and resealed as required to achieve concrete of specified quality.

C. REINFORCING STEEL

1. Submittals.
 - a. Shop Drawings.
 - (1) Bending and placing diagrams prepared by firm supplying reinforcing steel for the project.
 - (2) Bending and placing diagrams prepared in accordance with "Manual of Standard Practice for Detailing Reinforced Concrete Structures," ACI publication 315-65.
 - b. Manufacturer's literature describing products if required by engineer.
 - c. Samples, certificates of compliance, mill test reports.
2. Product delivery, storage and handling.
 - a. Delivery of reinforcing and accessories shall arrive at site not more than 48 hours before placement.
 - b. Store in manner to prevent excessive rusting and fouling with grease, dirt or other bond-weakening coatings.
 - c. Take precautions to maintain identification after bundles are broken.
3. Materials.
 - a. Reinforcing bars shall be new billet steel, ASTM A-615, grade 40.
 - b. Tie wires shall be ASTM A-82.
 - c. Welded wire fabric shall be ASTM A-82
 - d. All steel furnished shall be American made.
4. Fabrication and Installation
 - a. Shop-fabricate and cold-bend as detailed on reviewed shop drawings.
 - b. Conform with requirements of ACI 316 and ACI 301 where specific details are not shown or where drawings and specifications are not more demanding.
5. Placement.
 - a. General.
 - (1) Place bars and welded wire fabric according to tolerances specified in

Sections 504 and 505.

- (2) Ensure placement will permit concrete protection in conformance with ACI 318 or to extent shown.
 - (3) Support and fasten bars securely with concrete blocks, spacers, chairs or ties. Wire-tie bar intersections. Secure bars at intervals not exceeding 80x diameter for horizontal bars and 192 x diameter of bar for vertical bars.
 - (4) Do not bend bars around openings or sleeves. Wherever conduits, piping, inserts, sleeves, etc., interfere with placing or reinforcing, obtain the engineer's approval of placing before pouring concrete.
- b. Splices and laps shall be in conformance with ACI 318.
 - c. Prior to placing, verify reinforcing has been bent, positioned, and secured in accordance with drawings; ensure removal of oil, grease, dirt or other bond-weakening coatings; replace severely rust-pitted reinforcing.

D. CONCRETE CAST IN PLACE

1. Quality Assurance. Requirements of ACI 301 shall govern work, materials and equipment related to this section unless noted otherwise.
2. Submittals. Manufacturer is responsible for the design of the concrete mix shall conform to ASTM C94 requirements for ready mix concrete. Prior to delivery of concrete, manufacturer furnish to owner through engineer a written statement giving the design mix and properties by weight of cement and aggregate plus amount of water in gallons per bag proposed for use in each class or type of concrete specification. Furnish evidence of testing of proposed design mix which assures design strength as specified, statement in writing on letterhead of manufacturer, identified to this specific project, addressed to City.
3. Products.
 - a. Concrete Mix.
 - (1) Strength. 4000 psi minimum compressive strength after 28 days when tested in accordance with ASTM C39 for curb and gutters, catch basins, walks, manhole bases, thrust blocking and sign post bases.
 - (2) Aggregate. 1½ inch maximum size.
 - (3) Slump. 4" minimum and maximum when tested in accordance with ASTM C143.
 - (4) Cement. 6.3 sacks per cubic yard of concrete, minimum.
 - (5) 4% to 6% air entrainment.
 - b. Cement Type. ASTM C150 type I for all concrete.
 - c. Admixtures. ASTM C494 only.
 - d. Non-shrink Grout. Master Builders "Embeco."
 - e. Hardner and Sealer. Horn clear seal as manufactured by Grace Construction materials or approved equal.

4. Mixing and Delivery. (Attention directed to Section 1905. UBC Standard, 1997.) Certification is required. Under "Addition Information": Show water added in addition to design mix, who added it and who authorized it. Note: engineer, architect or testing laboratory may authorize additional water. If slump test indicates slump when tested is within specified limit, no problem, if slump is in excess of specified limit concrete is rejected and cannot be used on project.
5. Preparation.
 - a. Protect finish surfaces adjacent to concrete- receiving places.
 - b. Spray forms with water immediately before casting.
 - c. Notify City, Project Engineer, inspector and testing agency 48 hours before the intended pour.
 - d. Subgrade Preparation.
 - (1) Subgrade under curbs, walks and catch basins shall be excavated or filled with suitable material to required lines and grades.
 - (2) Subgrade shall be mechanically compacted to achieve 95% relative maximum density in upper six inches. Compaction to extend one foot outside form lines.
 - (3) Subgrade shall be moist prior to concrete placement.
6. Placing.
 - a. Achieve proper consolidation and avoid honeycombing by using spading and mechanical high frequency vibrator. Avoid segregation of materials by excessive vibrating.
 - b. Avoid segregation by excessive drops, 6'-0" maximum drop.
 - c. Mechanical compaction shall be done by immersion with high frequency vibrators operating at speeds of not less than 7,000 rpm. Insert vibrator vertically at intervals as required to gain thorough compaction, 18 inches to 30 inches usual. Vibrator tip to extend into previously placed concrete layer. Avoid damage to form faces.
 - d. Place concrete as near as possible to the final location. Movement by vibrator not permitted.
 - e. Hot Weather Concreting. Conform to ACI 605 when mean daily temperature rises above 75 degrees Fahrenheit.
 - f. Cold Weather Concreting. Conform to ACI 306 when mean daily temperature falls below 40 degrees Fahrenheit.
 - g. Construction Joints.
 - (1) Verify location and conformance with typical details; provide only where designated or approved by engineer.
 - (2) Thoroughly clean surfaces and remove laitance prior to placing adjacent concrete.
 - (3) Vertical Joints. Thoroughly wet and slush with coat of neat cement

grout prior to placing adjacent concrete.

- (4) Where construction joint occurs between adjacent slab sections, allow 24 hours to elapse between placing sections.
- h. Scored Joints. Walks, score on five foot 6 inch centers.
 - i. Walls.
 - (1) Distribute concrete in maximum 18 inch high layers unless otherwise approved.
 - (2) Space points of deposit to eliminate need for lateral flows.
 - (3) Level top surface before stopping work.
 - j. Slabs.
 - (1) Complete areas as defined by formwork same day as started.
 - (2) Make surfaces smooth, clean and in plane true to elevations shown whether level or sloped.
 - k. Curbs.
 - (1) Machine curb new or replacement.
 - (a) The slipform-extrusion machine approved shall be so designed as to place, spread, consolidate, screed, and finish the concrete in one complete pass in such a manner that will necessitate a minimum of hand finishing to provide a dense and homogenous section.
 - (b) The machine shall shape, vibrate, and/or extrude the concrete for the fulldepth and width of the concrete section being placed; operated with as nearly a continuous forward movement as possible.
 - (2) Formed method for curb and catch basins.
 - (a) Forms shall be of wood, metal or other suitable material that is straight and free from warp, and has sufficient strength to resist the pressure of the concrete without excessive deflection.
 - (b) Front and back forms shall extend for full depth of concrete being placed.
 - (c) Forms shall be cleaned and coated with approved release agent prior to concrete placement.
 - (d) Concrete shall be deposited in forms without segregation and tamped and spaded or mechanically vibrated for thorough consolidation.
 - l. Curing
 - (1) Comply with UBC.

- (2) Curing process must control moisture and temperature within the curing mix for not less than 14 days for all concrete work.
 - (3) Ideal curing temperature is 70 degrees Fahrenheit. When curing temperature exceeds 80 degrees Fahrenheit or falls below 50 degrees Fahrenheit, special curing procedures must be used. These procedures must meet with the engineer's approval and remain in effect so long as he deems it necessary.
7. Curing Compounds.
 - a. Application in strict compliance with manufacturer's detailed instructions as herein outlined and modified. Spray application, rate not to exceed 250 square feet per gallon. Apply as soon as practical after sheen had disappeared from concrete, no later than one hour after final troweling.
 - b. Location. All slabs, walks and curbs.
8. Protection. Protect all concrete from damage. Special care shall be given to exposed slabs to prevent staining or discoloration.
9. Cleaning, Patching and Defective Work.
 - a. Where concrete is under strength, out of line, level, or plumb, or shows objectionable cracks, honeycombing, rock pockets, voids, spalling, exposed reinforcing or is otherwise defective, and in the engineer's judgment, these defects impair proper strength or appearance of the work, the engineer will require its removal and replacement at the contractor's expense.
 - b. Immediately after stripping and before concrete is thoroughly dry, patch minor defects, form-tie holes, honeycombed areas, etc., with patching mortar. Patch shall match finish of adjacent surface unless noted. No patching is allowed on concrete walls to be sandblast finished.
 - c. Remove ledges and bulges.
 - d. Compact mortar into place and neatly fill defective surfaces to produce level, true planes.
 - (1) Insure removal of bituminous materials, form release agents, bond breakers, curing compounds if permitted or other materials employed in work of concreting which would otherwise prevent proper application of sealants, liquid waterproofing, or other delayed finished or treatments.
 - (2) Where cleaning is required, take care not to damage surrounding surfaces or leave residual from cleaning agents.
 - (a) Stained or discolored concrete shall be cleaned as directed by engineer.
 - (b) Stains or other defects which cannot be removed are subject to correction by removal and replacement.
10. Concrete Surface Finish- flat work.
 - a. Broom Finish.

- (1) Location. Walks and slabs.
 - (2) Trowel to smooth, hard, slick surface, free from trowel marks. Absorption of wet spots with neat cement not allowed.
 - (3) Broom lightly at right angles to slab length. Provide scoring as specified.
 - b. Smooth Trowel Finish.
 - (1) Location. Interior slabs.
 - (2) Trowel to smooth, hard, slick surface, free from trowel marks. Absorption of wet spots with neat cement not allowed.
 - c. Sack Finish Concrete.
 - (1) While concrete is green, apply with rubber float the following mixture: 1 part sand, 1 part cement, mixed as dry as practicable.
 - (2) Fill all voids and rub off excess.
 - (3) Location. All exposed vertical concrete surfaces not otherwise finished including curbs and foundation walls.
 - d. Ramp Texture.
 - (1) Diamond grid shall be 1¼ x ½ grid.
 - (2) Broom area to be textured prior to placing ramp texture.
 - (3) Must conform to American Disabilities Act standards.
11. Concrete Finishes- formed work.
 - a. Curb and Gutter Finish.
 - (1) Edged
 - (2) Troweled
 - (3) Exterior surfaces light broom finish
 - (4) Grinding exposed surfaces not allowed.
 - b. Catch Basin Finish.
 - (1) Formed outside and inside
 - (2) Troweled on top surface
 - (3) Smooth interior surface required.
 - c. As Cast Finish- walls.
 - (1) Location. All vertical surfaces not subject to view.
 - (2) Remove snap ties and fill holes with cement mixed as dry as practicable; pack solid.
 - (3) Correct all aggregate pockets, honeycombing, and other defects as directed by engineer.
 - (4) Grind off fins and projections from all exposed concrete.

(5) Remove stains and foreign materials as directed by City.

E. CONCRETE TESTS AND INSPECTIONS

1. General. Tests and inspections for work provided under the following:
 - a. Reinforcing
 - b. Concrete, cast-in-place
2. Reinforcing. The testing agency will, when required by City:
 - a. Take samples from bundles as delivered to job site from mill.
 - (1) When bundles are identified by heat number and accompanied by mill analysis, two specimens shall be taken from each ten tons, or fraction thereof, of each size and grade.
 - (2) When reinforcing is not positively identified by heat numbers or when random sampling is intended, two specimens shall be taken from each two and on-half tons, or fraction thereof, of each size and grade.
 - b. Test for tensile and bending strength.
3. Concrete Cast-in-Place.
 - a. The testing agency will, when required by the City or the project engineer, review mix designs, certificate of compliance, and samples of materials the contractor proposed to use.
 - (1) The testing agency will, when required by the City or the project engineer:
 - (2) Perform testing in accordance with ACI-318.
 - (3) Test concrete to control slumps according to ASTM C143.
 - (4) Test concrete for required comprehensive strength as follows:
 - (a) Make and cure specimen cylinders according to ASTM C31.
 - (b) Transport specimen cylinders from job to laboratory.
 - (c) Test specimen cylinders at age seven days and age 28 days for specified strength according to ASTM 39.
 - (d) Base strength value on average of three cylinders taken for 28 day test.
4. Testing Agencies. Must be certified private testing laboratory, not a representative of concrete supplier. All testing agencies must have a current City business license on file with the City prior to providing testing services.
5. Cost for testing as outlined herein shall be paid for by contractor.

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**SECTION VI
CITY POLICY FOR ACCEPTING NEW STREETS**

The City may accept new streets, built to City Public Works Construction Standards, after 90 percent of the developed area which the street services has been build upon, or three years after the initial paving has been installed, whichever occurs first. However, the City shall not accept streets sooner than one (1) year after initial paving has been installed. The street pavement, curbs and sidewalks shall be in good condition as determined by a City inspection prior to final inspection.

WATER AND SEWER SYSTEM ACCEPTANCE POLICY

The City may accept new water and sewer system installations built to City Public Works Construction Standards providing the following conditions have been met:

1. After completion of construction of the total project, and after all testing has been satisfactorily completed, a final inspection to prepare a check (punch) list shall be made with representatives present from the City, Developer's engineering firm, and the Contractor. The check list shall include any items either damaged or improperly placed during construction, and any item(s) which, in the opinion of the City, need repair.
2. The final check list shall then be given to the Contractor to make necessary repairs. When all work is complete, the Developer and the Developer's Engineer will provide correspondence stating that all work has been completed in accordance with City Public Works Construction Standards, and requesting acceptance of developed facilities by the City.
3. Once all repairs have been satisfactorily made and inspected by the City, written certifications received by the City, and final approval has been granted by the City Engineer, the one (1) year warranty period will then go into effect upon written notice to the Contractor.
4. If at any time during the course of the one (1) year warranty period, the City has reason to believe the water and/or wastewater facilities have been damaged or are faulty in any way, the Developer or Developer's Contractor will be required, at their own cost, to repair any damage or fault deemed necessary to the water and sewer system.
5. Just prior to expiration of the one (1) year warranty period, the City shall inspect the water and sewer facilities. If satisfactory, the City shall notify the Contractor in writing, of City acceptance of the water and sewer facilities. If the water and sewer facilities are not satisfactory, the City shall notify the Contractor of those deficiencies noted. Upon satisfactory correction of such deficiencies, the City shall again inspect the facilities and will notify the Contractor, in writing, of City's acceptance of the water and sewer facilities. Any delay in correcting deficiencies shall also cause delay of final acceptance.

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