ORDINANCE NO. 434

AN ORDINANCE OF THE CITY OF SISTERS AMENDING THE SISTERS MUNICIPAL CODE SECTIONS 12 AND 13, PUBLIC WORKS CONSTRUCTION STANDARDS FOR STREETS, SIDEWALKS, WATER, SEWER, DRAINAGE AND OTHER APPURTENANT FACILITIES, REPEALING ORDINANCE 349 AND DECLARING AN EMERGENCY

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

WHEREAS, those Construction Standards were last updated by the City on June 10, 2004; and

WHEREAS, the Construction Standards need amending to provide for the development of public infrastructure to meet the health, safety, welfare and livability needs of city residents, visitors, and businesses;

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

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

Section 2. The City of Sisters repeals Ordinance 349 of the Sisters Municipal Code.

Section 3. The City Council finds that it is necessary for the health, protection and safety of the residents of and visitors to the City of Sisters to have this ordinance take effect upon adoption and hereby declares an emergency. This ordinance, therefore, shall become effective on the date of passage.

PASSED by the City Council of the City of Sisters this 12th day of December, 2013 and **APPROVED** by the Mayor this 12th day of December, 2013.

Brad Boyd, Mayor

ATTEST:

Kathy Nelson, City Recorder

2013

PUBLIC WORKS STANDARDS AND SPECIFICATIONS

CITY OF SISTERS

DECEMBER 2013

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101.1.00 DEFINITIONS

Whenever the following terms are used in these Standard Specifications, the Agreement, the Supplemental Specifications, Special Provisions, on the Plans, and in any other Contract Documents or other instruments pertaining to construction where these specifications govern, the intent and meaning shall be interpreted as follows, applicable to both the singular and plural thereof.

Addendum - A written or graphic modification to any of the Contract Documents issued before the opening of bids, which revises, adds to, or deletes information in the Solicitation Documents or previously issued Addenda.
Additional Work – Increased quantities of any Pay Item, within the scope of the Contract, for which a unit price has been established.
Advertisement – The public announcement inviting bids or quotes for work to be performed and materials to be furnished.
Agency – The city, county, state, special district, or political subdivision, as applicable, which has entered into an Agreement with the Contractor.
Aggregate – Rock product of a specified quality and gradation.
Agreement - The written contract between Owner and Contractor, signed and executed by both parties, describing the work to be performed and compensation to be paid and other Contract Documents that are attached to the Agreement.
Attorney in Fact – An Entity, or person, appointed by another to act in its place, either for some particular purpose, or for the transaction of business in general.
As Approved – A phrase understood to mean reviewed and accepted by the City Engineer or his authorized representative.
Base – A course or layer of specified aggregate material of specified thickness placed below the pavement course.
Bid – A competitive offer submitted in response to an Invitation to Bid or solicitation of a price to supply materials or services.
Bid Bond – The Surety bond for a Bid guarantee.
Bid Closing – The date and time, specified in the advertisement or Addenda, after which Bids, Bid modifications, and Bid withdrawals will no longer be accepted.
Bidder – An Entity, person, firm, partnership, or corporation submitting a formal proposal on a project.
Bid Security - A certified check, cashier's check, or surety bond, required to be submitted with the Proposal, to guarantee execution of the Agreement.
Bid Schedule – The list of Pay Items, their units of measurement, and estimated quantities in the Proposal Documents.
Boulders – Particles of rock too large to pass a 12-inch square opening.
Calendar Day – Any day shown on the calendar, beginning and ending at midnight.
Change Order - A written order issued by the Engineer or Owner to the Contractor, and signed by an authorized agent of the City of Sisters, modifying Work required by the

Contract and, if applicable, establishing the basis of payment for the modified work, or an adjustment in the Contract Price or the Contract Time issued after execution of the Agreement.
City - The City of Sisters, including its duly authorized representatives.
City Council - The duly elected City Council of the City of Sisters.
City Engineer - See Engineer.
Contract - See Agreement.
Contract Amount (**Contract Price**)– Total sum of the Contract Pay Items calculated by multiplying the Pay Item quantities by the unit prices in the Schedule of Items, and including all Extra Work authorized by Change Orders.
Contract Documents – Solicitation Documents, Proposal, Agreement, General Conditions, Supplemental Conditions, Specifications, and Drawings, including all modifications thereof incorporated into the Documents before their execution, and including all Change Orders, written orders and authorizations issued by the Agency, Permits, orders, and authorizations obtained by the Contractor applicable to the Project, and all other documents and requirements incorporated by specific reference thereto.
Contract Item (Pay Item) - A specific unit of work for which a price is provided in the proposal.
Contractor - The entity, person or persons, partnership, corporation, or joint venture, who has entered into an agreement with the City as party or parties of the second part, or her/his or their legal representatives. The word "Contractor" shall be taken to mean the Contractor, her/his agents, employees, officials, subcontractors, or anyone connected with the work herein set forth on behalf of the Contractor.
Contract Time - The amount of time allowed to complete the Work under the Contract, counted as the number of calendar or work days stated in the Contract Documents, and including authorized time extensions, starting from the date of the Notice to Proceed. If a calendar date of completion is stated in the proposal, in lieu of a number of calendar days, the contract shall be completed by that date.
Developer - A private entity, person, partnership or corporation, who has expressed the intention of providing, or who has undertaken to provide, a facility, structure, or like public improvement project to be accepted for maintenance and ownership by the City.
Design Engineer - A private engineering firm retained by the City, Developer, or Owner to provide design, construction management, or some other service necessary for the construction of the proposed public facility.
Drawings - See Plans.
Engineer – The term "Engineer" shall signify the "City Engineer or his/her authorized representative".
Entity – A natural person capable of being legally bound, sole proprietorship, limited liability company, corporation, partnership, limited liability partnership, limited partnership, profit or nonprofit unincorporated association, business trust, two or more persons having a joint or common economic interest, or any other person with legal capacity to contract, or a government or governmental subdivision.
Equipment - All machinery, tools, manufactured products, and fabricated items, together with the necessary supplies for upkeep and maintenance, and all apparatus necessary for the proper construction and acceptable completion of the work, or specified for incorporation into the Work.
Establishment Period – The time specified to assure satisfactory establishment and growth of planted materials.
Extra Work – Work not included in the Contract, but deemed by the Engineer to be necessary to complete the Project.

Final Acceptance – Written confirmation by the City that the Project has been completed in accordance with the Contract, with the exception of latent defects and Warranty obligations, if any, and has been accepted for maintenance by the City.
Final Inspection – The inspection conducted by the Engineer to determine that the Project has been completed in accordance with the Contract.
Incidental – A term identifying those acts, services, transactions, property, or other items for which the City will make no separate or additional payment.
Inspector – The representative of the City Engineer authorized to inspect and report on Contract performance, and assigned to witness and verify tests of the work and the materials furnished or being furnished by the City of Sisters.
Intention of Terms - Whenever, in these specifications or on the plans, the words "require", permitted", "ordered", "designated", "prescribed" or words of like import are used, it shall be understood that the requirements, permission, order, designation, or prescription of the City Engineer is intended; and similarly, the words "approved", "acceptable", "satisfactory", or words of like import shall mean approved by, or acceptable to, or satisfactory to the City Engineer, subject in each case to the final determination of the City.
Laboratory - The official testing laboratories of the City or such other laboratories as may be designated by the City Engineer.
Legal Holiday - The following are legal holidays for the City, subject to subsequent change by law: Sundays, New Year's Day, M.L. King's Birthday, President's day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving and the Friday after Thanksgiving, Christmas, and other days declared as holidays by public proclamation. When a legal holiday, other than Sunday falls on a Sunday, the Monday immediately following is a legal holiday.
Materials - Any natural or manmade substance specified for use in the construction of the Project or for incorporation into the Work.
Modification -

(a) A written amendment of the Contract Documents signed by both parties.
(b) A Contract Change Order issued by the City or Owner.
(c) Written clarification or interpretation issued by the City Engineer.
(d) A written order for a minor change or alteration in the work issued by the City Engineer.
(e) A modification may only be issued after execution of the Agreement.

Notice of Award - The written notice by City to the apparent successful Bidder stating that upon compliance with the conditions precedent to be fulfilled by him within the time specified, the City will execute and deliver the Agreement to him.
Notice to Proceed - A written notice authorizing the Contractor to begin performance of contract work. If applicable, the Notice to Proceed shall state the date on which the Contract Time will commence to run.
Or Equal - The term "or equal" shall be understood to mean that an "equal" product is the same or better than the product named in function, performance, reliability, quality, and general configuration. Determination of equality in reference to the project design requirements will be made by the City Engineer. Such "equal" products shall not be purchased or installed by the Contractor without the City Engineer's written approval.
Owner - The legal entity or contracting agency for which the work is being performed. Where applicable the Developer is the owner until such time as the improvements are accepted by the City for maintenance.
Pavement – Asphalt Concrete or Portland cement concrete placed for the use of motor vehicles, bicycles, or pedestrians on streets, roadways, shoulders, Multi-use paths and parking areas.

Pay Item – A specific unit of Work for which a price is provided in the Contract.
Payment Bond - The approved form of security furnished by the Contractor and Contractor's surety as a guaranty of the Contractor's performance of its obligation to pay promptly in full all sums due for materials, equipment, and labor furnished to complete construction of the work.
Performance Bond - The approved form of security furnished by the Contractor and Contractor's surety as a guaranty that the Contractor will complete the work in accordance with the terms of the Agreement.
Plans – Standard and Supplemental Drawings, profiles, cross sections, elevations, details and other working drawings and supplementary drawings, or reproductions thereof, signed by the City Engineer, which show the location, character, dimensions, and details of the work to be performed. Plans may either be bound in the same book as the balance of the Contract Documents or bound in separate sets, and are a part of the Contract Documents regardless of the method of binding.
Project – The sum of all Work to be performed under the Contract.
Proposal - The written offer of a bidder submitted on the approved proposal form(s) agreeing to enter into a Contract with the City to perform the Work described in the Contract Documents and stating the unit prices or lump sum amounts for the items of Work.
Proposal Guaranty - See Bid Security.
Reference Specifications - Bulletins, standards, rules, methods of analysis or test, codes and specifications included by reference in the Contract Documents.
Special Provisions - See SPECIAL SPECIFICATIONS.
Special Specifications - Requirements peculiar to the project; and modifications to the Standards and Specifications. Special Specifications are used interchangeably with Special Provisions.
Specifications - The terms, provisions and requirements contained herein as supplemented by such special conditions as may be necessary, pertaining to either the materials and/or work to be furnished under the Agreement.
Standard Specifications - Codes, rules and regulations referred to in these specifications by basic name or designation only, shall be considered to be of the latest issue with all amendments as of the date of these specifications. Applicable portions of such shall become a part of these Contract Documents.
Structures - Facilities such as bridges, culverts, catch basins, inlets, retaining walls, cribbing, storm and sanitary sewer lines, water lines, utility cables and pipelines, underdrains, electrical ducts, manholes, lighting fixtures and bases, transformers, flexible and rigid pavements; buildings, vaults, and other man-made features that may be encountered in the work and not otherwise classified herein.
Subcontractor - An individual, firm, or corporation having a direct contract with the Contractor or any other subcontractor for the performance of a portion of the work on the project, or those who furnish material for the project.
Subbase – A course of specified material of specified thickness between the Subgrade and a Base.
Subgrade – The top surface of completed earthwork on which Subbase, Base, Surfacing, Pavement, or a course of other material is to be placed.
Superintendent - The Contractor's executive representative who is present on the work during progress, authorized to receive and fulfill instructions from the City Engineer, and who shall supervise and direct the construction.
Surety - A corporation, licensed to conduct the business of surety in the State of Oregon, and named in the current list of approved sureties published by the U. S. Treasury Circular 570. All bonds signed on behalf of the Surety must be accompanied by a certified copy of

the authority to act.
If the Surety on any bond furnished by the Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in the State of Oregon, or it ceases to meet the requirements outlined above, Contractor shall within five (5) days thereafter, substitute another Bond and Surety, both of which shall be acceptable to City of Sisters.
Topsoil – Soil ready for use in a planting bed.
Traveled Way – That part of a street or highway for moving vehicles, exclusive of auxiliary lanes, berms, curbs, and shoulders.
Typical Section – The Cross Section established by the Plans which represents in general the lines to which the Contractor shall work in the performance of the Contract.
Unsuitable Material – Frozen material, or material that contains organic matter, muck, humus, peat, sticks, wood chips, debris, chemicals, toxic matter, or other deleterious materials not normally suitable for use in earthwork.
Utility – A line, facility, or system for producing, transmitting, or distributing communications, power, electricity, heat, gas, oil, water, steam, waste, storm water not connected with highway drainage, or any other similar commodity which directly or indirectly serves the public.
Work - the term shall signify all materials, labor, tools and all appliances, machinery and appurtenances necessary to perform and complete the construction of all facilities specified in the Contract Documents or shown on the Plans, and such additional items of labor, material, and equipment not specifically indicated or described which can be reasonably inferred as belonging to the item described or indicated and as required by good practice to provide a complete and satisfactory system or structure. As used herein, "provide" shall be understood to mean "furnish and install".
Working Day - Any and every calendar day excluding Saturdays, Sundays, and legal holidays. Unless otherwise permitted a working day occurs between the hours of 7:00 am and 5:00 pm.
Written Notice - A written communication delivered to the individual, or to a member of the firm, or to an officer of the corporation for whom it is intended, or, if delivered or sent by registered mail, to the last business address known to him who gives the notice.

101.2.00 ABBREVIATIONS

Meanings of abbreviations used in the Standard Specifications, Supplemental Specifications, Special Provisions, on the Plans, and in other Contract Documents are as follows:

AASHTO	American Association of State Highway and Transportation Officials
AC	Asphalt Concrete
ACI	American Concrete Institute
AGC	Associated General Contractors of America
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
APA	American Plywood Association
APWA	American Public Works Association
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWG	American Wire Gage
CRSI	Concrete Reinforcing Steel Institute
DEQ	Department of Environmental Quality, State of Oregon
FHWA	Federal Highway Administration, U.S. Department of Transportation
HMAC	Hot Mixed Asphalt Concrete
MFTP	(ODOT) Manual of Field Test Procedures
MUTCD	Manual on Uniform Traffic Control Devices for Streets and Highways, FHWA, U.S. Department of Transportation
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFPA:	National Fire Protection Association
NIST	National Institute of Standards and Technology
NPDES	National Pollutant Discharge Elimination System
NPS	Nominal Pipe Size (dimensionless)
OAR	Oregon Administrative Rules
ODOT	Oregon Department of Transportation
ORS	Oregon Revised Statutes
OR-OSHA	Oregon Occupational Safety and Health Division of the Department of Consumer and Business Services.
OSHA	Occupational Safety and Health Administration, U.S. Department of Labor
PCA	Portland Cement Association
PCP	Pollution Control Plan
RAP	Reclaimed Asphalt Concrete Pavement
SRCM	Soil and Rock Classification Manual (ODOT)
UBC	Uniform Building Code (as adopted by the City of Redmond and State)
UL	Underwriters Laboratories, Inc
UPC	Uniform Plumbing Code (as adopted by the City of Redmond and State)
WWPA	Western Wood Products Association

102 CONTRACT DOCUMENTS

102.1.00 INTENT OF CONTRACT DOCUMENTS

The intent of the Contract Documents is to describe a complete project to be constructed in accordance with the Agreement, Standard and Supplemental Specifications, Special Provisions, Plans and Details. The Contract Documents are complimentary, and what is called for by any one shall be as binding as if called for by all. Any work that can be reasonably inferred from the Contract Documents as being required to produce the intended results shall be supplied whether or not it is specifically called for. Materials or work described in words which so applied have a well known technical and trade meaning shall be held to refer to such recognized standards.

102.2.00 INCONSISTENCIES AND OMISSIONS

Any inconsistency, conflict, error or omission found in the Contract Documents shall be reported to the City Engineer in writing immediately and before proceeding with the work affected thereby; however, Contractor shall not be liable to City of Sisters or City Engineer for failure to discover any conflict error or inconsistency in the Contract Documents. The City Engineer will clarify inconsistencies or omissions, in writing, within a reasonable time. The decision of the City Engineer shall be final.

In resolving inconsistencies among two or more sections of the Contract Documents, precedence shall be given in the following order:

1. Modifications, the last in time being the first in precedence, including all Addenda and Change Orders.
2. Agreements
3. Supplemental Specifications
4. Special Provisions or Specifications
5. Standard Specifications
6. Instructions to Bidders
7. General Conditions
8. Reference Specifications
9. Plans

Figure dimensions on plans shall take precedence over scale dimensions. Detailed Drawings and Approved Shop Drawings shall take precedence over general plans.

102.3.00 ALTERATIONS AND CHANGE ORDERS

The City of Sisters, without invalidating the Agreement, may at any time or from time to time, order extra work or make changes by modifying, adding to, or deducting from the work. All such work shall be authorized by Change Order and executed under the conditions of the original Agreement, except that claim by either party for time and payment increase or decrease caused thereby shall be adjusted at the time of ordering such change.

The City Engineer may authorize minor changes in the work not involving extra cost, and not inconsistent with the overall intent of the Contract Documents.

Additional work performed by Contractor, without authorization of a Change Order, will not entitle the Contractor to an increase in the Contract Price except for an emergency endangering life or property.

If the work is reduced by modifications directed by the Engineer, such action shall not

constitute a claim for damages based on loss of anticipated profits.

102.4.00 VERIFICATION OF DATA

It is understood and agreed that the Contractor has, by careful examination, satisfied him/herself as to the nature and location of the work; the conformation of the grounds; the character, quality, and quantities needed preliminary to and during the prosecution of the work; the general and local conditions; and all other matters which may in any way affect the work under this Agreement. No verbal agreement or conversation with any officer, agent, or employee of the City of Sisters, either before or after the execution of this Agreement, shall affect or modify any of the terms or obligations contained in the Agreement.

102.5.00 DOCUMENTS TO BE FURNISHED

The City Engineer will furnish to the Contractor, on request, three copies of the Contract Documents and three sets of full scale Plans. Additional copies of Contract Documents or Plans may be obtained on request by paying the actual cost of reproducing the Contract Documents or Plans.

102.6.00 DOCUMENTS TO BE KEPT AT THE WORK SITE

The Contractor shall keep one copy of the Contract Documents at the work site, in good condition, available to the City Engineer and to the City Engineers' representatives.

The Contractor shall maintain on the job site, and make available to the City Engineer upon request, one current marked-up set of the Design Drawings, which accurately indicate all approved variations in the completed work that differ from the design information shown on the Drawings.

102.7.00 OWNERSHIP OF DOCUMENTS AND DRAWINGS

All Plans, Drawings, Specifications and copies thereof furnished by the City Engineer are the property of the City of Sisters and are not to be used on other work; and are to be returned upon request at the completion of the work, with the exception of the signed contract set. Any reuse of these materials without specific written authorization by the City Engineer will be at the sole risk of the user and without any liability or legal expense to the City. All models used in the Work are the property of the City of Sisters.

102.8.00 RECORD DOCUMENTS

The Contractor shall maintain copies of all Drawings, Specifications, Addenda, Change Orders, Contract Modifications, and written interpretations and clarifications in good order and annotated to show changes made during construction. Upon completition of the Work, these record documents, samples and shop drawings will be delivered to the City Engineer for Owner.

103 THE CITY ENGINEER

103.1.00 AUTHORITY OF THE CITY ENGINEER

The City Engineer shall be the City of Sisters representative during the construction and shall observe the work in progress on behalf of the City. The general inspection of the construction will not, however, relieve the Contractor(s) from their obligation to conduct comprehensive inspections and to maintain full responsibility for the methods and sequence of construction, the safety precautions incidental thereto, and for performing the

construction work in accordance with the Contract Documents. The City Engineer shall also have the authority to reject all work and materials which do not conform to the Plans or Specifications, or other Contract Documents. The City Engineer will render decisions, in writing, on all claims of the City or the Contractor, and on all other matters relating to the execution and progress of the work or the interpretation of the Contract Documents. The City Engineer's estimates and decisions shall be the condition precedent to the right of the Contractor to any action on the Agreement and to any right to receive additional money under the Agreement. The City Engineer shall have the authority to order changes in the work or extra work, as provided in the paragraph "Alterations and Change Orders" of the Section CONTRACT DOCUMENTS.

The City Engineer will not be responsible and has not been retained or compensated to provide design and construction review services relating to the Contractor's safety precautions or to means, methods, techniques, sequences, or procedures required for the Contractor to perform work.

103.2.00 CITY ENGINEER'S REPRESENTATIVES (INSPECTORS)
Assistants may be assigned to various portions of the work by the City Engineer. It is understood that such assistants shall have the power, in the absence of the City Engineer, to issue clarifications and make decisions within the limitations of the authority of the City Engineer.

103.2.01 AUTHORITY AND DUTIES OF THE ENGINEER'S REPRESENTATIVE
The City Engineer may appoint assistants to inspect all materials used and all work done. Such inspection may extend to any or all parts of the work and to the preparation or manufacture of the materials to be used. The Inspectors will be authorized to revoke, alter, enlarge, or relax the provision on the work, to check the necessary lines and grades, and to keep the Engineer informed as to the progress of the work and the manner in which it is being done; also to call the attention of the Contractor to any discrepancies from approved plans and specifications. Failure of the Inspector or the Engineer to call the attention of the Contractor to faulty work or discrepancies from the plans or specifications shall not constitute acceptance of said work.

The Inspector will not be authorized to approve or accept any portion of the work, nor to issue instructions contrary to the approved plans and specifications. The Inspector will have authority to reject defective material and to suspend any work that is being improperly done, subject to the final decision of the Engineer. The Inspector will exercise such additional authority as may, from time to time, be delegated to the Inspector by the Engineer. The authority of such Engineer's, representatives, assistants, and inspectors shall, however, be limited to the particular portion or phase of the work to which they are assigned, and by the particular duties assigned to them. Upon request, the assignment and duties of the Inspector(s) will be provided in writing.

103.3.00 INSPECTION
The City Engineer and/or Inspector will make periodic visits to the site to observe the progress and quality of the executed work and to determine, in general, if the work is proceeding in accordance with the Contract Documents. The City Engineer and/or Inspector will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the work. His/her efforts will be directed toward providing assurance for the City of Sisters that the completed project will conform to the requirements

of the Contract Documents. On the basis of his/her on-site observations as an experienced and qualified professional, the Inspector will keep City of Sisters staff informed in the progress of the work and will endeavor to guard City of Sisters against defects and deficiencies in the work of Contractors.

103.4.00 REJECTED MATERIAL
Any material condemned or rejected by the City Engineer, or authorized Inspector, because of non-conformity with the Contract Documents shall be removed at once from the vicinity of the work by the Contractor, at Contractors' own expense, and shall not be used on the work.

103.5.00 UNNOTICED DEFECTS
The City Engineer will not be responsible for the acts or omissions of Contractor, or any subcontractor, or other persons at the site performing any of the Work. Any defective work or material that may be discovered by the City Engineer before the final acceptance of work, or before final payment has been made, or during the guarantee period, shall be removed and replaced by work and materials which shall conform to the provisions of the Contract Documents. Failure on the part of the Engineer to condemn or reject bad or inferior work or materials shall not be construed to imply acceptance of such work or materials.

103.6.00 RIGHT TO RETAIN IMPERFECT WORK
If any part or portion of the work done or material furnished under this Agreement shall prove defective and not in accordance with the Plans and Specifications, and if the imperfection in the work shall not be of sufficient magnitude or importance as to make the work dangerous or undesirable, or if the removal of such work will create conditions which are dangerous or undesirable, the City shall have the right and authority to retain such work. In such case, an appropriate amount shall be deducted from amounts due the Contractor for that portion of the Work, or if acceptance occurs after approval of final payment, an appropriate amount shall be paid by Contractor to City of Sisters.

103.7.00 LINES AND GRADES
The Design Engineer after consultation with the City Engineer will provide survey monuments or reference points for use in determining lines and grades. The Contractor is responsible for determining the lines and grades to be used for the construction as shown on the plans and in these Contract Documents.

All monuments, stakes, marks, and other information shall be carefully preserved by the Contractor, and in case of their careless or unnecessary destruction or removal by the Contractor or Contractors' employees, such stakes, marks and other information will be replaced at the Contractor's expense.

103.8.00 DETAIL DRAWINGS AND INSTRUCTIONS
The City Engineer will furnish, with reasonable promptness, additional instructions by means of drawings or otherwise, as are necessary for the proper execution of the work. All such drawings and instructions will be consistent with the Contract Documents.

103.9.00 SHOP DRAWINGS AND SAMPLE SUBMITTAL
The Contractor shall submit in quadruplicate to the Engineer for this review such shop drawings, electrical diagrams, and catalog cuts for fabricated and manufactured items

(including mechanical and electrical equipment) as required by the Contract Documents. Drawings shall be submitted in sufficient time to allow the City Engineer not less than ten (10) regular working days for examining the drawings.

The drawings shall be accurate, distinct, and complete, and shall contain all required information, including satisfactory identification of items, units, and assemblies in relation to the contract drawings and specifications.

Unless otherwise approved by the City Engineer, shop drawings shall be submitted only by the General Contractor, who shall indicate by a signed stamp on the drawings, or other approved means, that the Contractor has checked the shop drawings for dimensions and relationship with work of all other trades involved, and that the work shown is in accordance with contract requirements. The practice of submitting incomplete or unchecked shop drawings for the City Engineer to correct or finish will not be acceptable. Shop drawings which in the opinion of the City Engineer clearly indicate that they have not been checked by the General Contractor will be considered not complying with the intent of the Contract Documents, and will be returned without review to the Contractor for resubmission in the proper form.

When the shop drawings have been reviewed by the City Engineer, two sets of submittals will be returned to the Contractor appropriately stamped. If major changes or corrections are necessary, the drawing may be rejected and one set will be returned to the Contractor with such changes or corrections indicated. The Contractor shall have the drawings corrected, and resubmit the corrected drawings in quadruplicate, unless otherwise directed by the City Engineer. No changes shall be made by the Contractor to resubmitted shop drawings other than those changes indicated by the City Engineer.

The review of such drawings and catalog cuts by the City Engineer shall not relieve the Contractor from the responsibility for correctness of dimensions, fabrication details, and space requirements, or for deviations from the contract drawings or specifications, unless the Contractor has called attention to such deviations in writing by a letter accompanying the drawings, and the City Engineer approves the change or deviations in writing at the time of submission. Nor shall review by the City Engineer relieve the Contractor from the responsibility for errors in the shop drawings. When the Contractor does call such deviations to the attention of the City Engineer, the Contractor shall state in the letter whether or not such deviations involve any deduction in the Contract Price or extra cost adjustments. The approval of a separate item as such will not indicate approval of the assembly in which the item functions.

The Contractor shall also submit to the City Engineer for approval with such promptness as to cause no delay in the Work all samples required by the Contract Documents. All samples shall be clearly identified as to material, manufacturer, and any pertinent catalog number if applicable, and the use in the Work for which it is intended.
Where a shop drawing or sample submittal is required by the Contract Documents, no related work shall be commenced until the submittal has been approved by the City Engineer.

104 THE CONTRACTOR AND EMPLOYEES

104.1.00 CONTRACTOR AS AN INDEPENDENT AGENT

The Contractor shall perform all work under this Agreement as an Independent Agent and shall not be considered as an agent of the City, nor shall the Contractor's subcontractors or employees be considered as sub-agents of the City.

104.2.00 SUBCONTRACTING

The Contractor shall include, in the space provided in the Letter for Employment of Subcontractors, the legal corporate names of all proposed subcontractors and the portion of the work that these proposed subcontractors or other persons or organizations shall perform.

The Contractor agrees that she/he is as fully responsible to the City for the acts and omissions of subcontractors and of persons either directly or indirectly employed by them as he/she is for the acts and omissions of persons directly employed by Contractor.
Nothing contained in the Contract Documents shall create any contractual relation between any subcontractor and the City of Sisters.

Subcontractors shall be in accordance with, and the Contractor shall be bound by, the following provisions:

1. All subcontractors shall be subject to the approval of the City Engineer.
2. All subcontracts shall be in writing and shall provide that all work to be performed thereunder shall be performed in accordance with the terms of these Contract Documents.
3. If requested, true copies of any and all subcontracts shall be furnished to the City Engineer; however, prices may be omitted.
4. Subcontractors shall conform to the regulations governing employment of labor and payment of wages.
5. The subcontracting of any part of the work will in no way relieve the Contractor of his/her responsibility or liability or obligations under these Contract Documents.

104.3.00 INSURANCE AND LIABILITY

The Contractor shall at all times maintain in force, at Contractor's expense, each insurance policy noted below. Insurance coverage must apply on a primary and non-contributory basis. All insurance policies, except Professional Liability, shall be written on an occurrence basis and be in effect for the term of this contract. Policies written on a "claims made" basis must be approved and authorized by the City of Sisters. Formats of insurance certificates and endorsement(s) must be acceptable and approved by the City.

All contractors shall obtain Workers Compensation insurance in compliance with ORS 656.017, requiring Contractor and all subcontractors to provide workers' compensation coverage for all subject workers, or provide certification of exempt status. Employers' Liability Insurance with coverage limits of not less than $500,000 must be included.

Contractors who provide specific professional advice which the City relies on (e.g. - engineers, attorneys, architects, insurance agents) are required to obtain Professional Liability insurance with a combined single limit of not less than $1,000,000 per occurrence/ $2,000,000 aggregate. Professional Liability insurance covers damages caused by error, omission, or negligent acts related to professional services provided under this Contract. The policy must provide extended reporting period coverage, sometimes referred to as "tail

coverage" for claims made within two years after this contract is completed. The City will determine the contractor's need to obtain Professional Liability insurance.

All contractors shall obtain Commercial General Liability insurance with a combined single limit of not less than:

Projects with value up to two million dollars: $1,000,000 per occurrence/ $2,000,000 aggregate.
Projects with value from two million dollars to five million dollars: $2,000,000 per occurrence/ $5,000,000 aggregate.
Projects with value over five million: Insurance amount to be determined by the City of Sisters on individual contract basis.

Commercial General Liability insurance shall include coverage for personal injury, bodily injury, advertising injury, property damage, premises, operations, products, contractual liability, and completed products/operations. *By separate endorsement,* the policy shall name The City of Sisters, its officers, directors, agents, employees and volunteers as an additional insured. The additional insured endorsement shall not include declarations that reduce any per occurrence or aggregate insurance limit and shall be primary and non-contributing endorsements. The contractor shall provide additional coverage based on any outstanding claim(s) made against policy limits to ensure that minimum insurance limits required by the City are maintained. Construction contracts may include aggregate limits that apply on a "per location" or "per project" basis.

Automobile Liability insurance with a combined single limit of not less than $1,000,000 coverage for bodily injury and property damage resulting from operation of a motor vehicle driven by or on behalf of Contractor during the course of providing services under this contract. Commercial Automobile Liability Insurance shall provide coverage for *any* motor vehicle (symbol 1 on some insurance certificates).

Additional Requirements: Contractor shall pay all deductibles and retentions. A cross liability clause or separation of insured's condition must be included in all commercial general liability policies required by this Contract. Contractor's coverage will be primary in the event of loss.

Certificate of Insurance Required: Contractor shall furnish a current Certificate of Insurance to the City with the signed Contract. The Certificate shall provide that there shall be no cancellation, termination, material change, or reduction of limits of the insurance coverage without at least 30 days written notice from the Contractor's insurer to the City. The Certificate shall also state the deductible or, if applicable, the self-insured retention level. For commercial general liability coverage, the Certificate shall also provide, by policy endorsement, that The City of Sisters, its agents, directors, officers, employees and volunteers are additional insureds with respect to Contractor's services provided under this Contract. The endorsement must be in a format acceptable to The City of Sisters. If requested, complete copies of all insurance policies shall be provided to the City.

The Contractor's liability and property insurance with a Completed Products/Operations Endorsement shall be maintained after the completion of the project for the full warranty period. Nothing contained in these insurance requirements is to be construed as limiting the extent of the Contractor's responsibility for payment of damages resulting from

operations under this Agreement.

When the construction is to be accomplished within a public or private right-of-way requiring special insurance coverage, the Contractor shall conform to the particular requirements and provide the required insurance. The Contractor shall include in liability policy all endorsements that the said authority may require for the protection of the authority, its officers, agents, and employees. Insurance coverage for special conditions, when required shall be provided as set forth in the SUPPLEMENTARY CONDITIONS.

In case of the breach of any provision of this article, the City, at its option, may take out and maintain at the expense of the Contractor such insurance as the City may deem proper and may deduct the cost of such insurance from any monies which may be due or become due the Contractor under this Agreement.

104.4.00 CONTRACTOR'S AND SUBCONTRACTOR'S INSURANCE
The Contractor shall not commence work under this Agreement until Contractor has obtained all the insurance required hereunder and such insurance has been reviewed by the City of Sisters, nor shall the Contractor allow any subcontractor to commence work on subcontract until all similar insurance required for that portion of the work has been so obtained. Review of the insurance by the City shall not relieve or decrease the liability of the Contractor hereunder.

104.5.00 NO PERSONAL LIABILITY OF PUBLIC OFFICIALS
In carrying out any of the provisions hereof in or exercising any authority granted by the Agreement, there will be no personal liability upon any public official.

104.6.00 SUPERVISION
The Contractor shall keep on the project, during its progress, competent supervisory personnel. The Contractor shall designate, in writing, before starting work, an authorized representative who shall have complete authority to represent and to act for the Contractor. The Contractor shall give efficient supervision to the work, using his/her best skill and attention. The Contractor shall be solely responsible for all construction means, methods, techniques, and procedures, and for providing adequate safety precautions and coordinating all portions of the work under the Agreement. The Contractor shall be responsible to see that the finished work complies accurately with the Contract Documents.

104.7.00 NONRESPONSIBILITY OF THE CITY OF SISTERS
Indebtedness incurred for any cause in connection with this work must be paid by the Contractor, and the City is hereby relieved at all times from any indebtedness or claim other than payments due under terms of the Agreement.

104.8.00 PROPERTY RIGHTS IN MATERIAL
Nothing in the Agreement shall be construed as vesting in the Contractor any right to the property or in the material used after they have been attached or affixed to the work or the soil and accepted by the City. All such materials shall become the property of the City upon being so attached or affixed and accepted.

104.9.00 RECEPTION OF CITY ENGINEER'S DIRECTION
The superintendent, or other duly authorized representative of the Contractor, shall represent the Contractor in his/her absence; and all directions given to him/her shall be as

binding as if given to the Contractor.

104.10.00 FACILITIES AND SANITATION

Necessary sanitary conveniences, properly secluded from public observation, shall be erected and maintained by the Contractor at all times while persons are employed on the work; and the use of such sanitary conveniences shall be strictly enforced. The location of such conveniences shall be approved by the City Engineer.

104.11.00 EMPLOYEES

The Contractor shall employ only competent skillful labor to perform the work. The Contractor shall at all times enforce strict discipline and good order among employees. The Contractor shall comply with all applicable labor rules, wage scales, and regulations, including nondiscriminatory laws, of the Government of the United States, the State, County, and City or Town in which the work is to be done.

105 OREGON LAW FOR PUBLIC CONTRACTS

105.1.00 DESCRIPTION

When the Contract Documents concern Public Works for the state or any county, municipality, or political subdivision created by its laws, the applicable statutes of the State of Oregon shall apply. For this reason, Sections 279C.800 through 279C.870 of the Oregon Revised Statutes, as amended or superseded, including the latest additions and revisions, are incorporated by reference as part of these Contract Documents.

105.2.00 REQUIREMENTS

ORS Sections 279C.800 *et seq.* provide for the prevailing wage requirements of Oregon law for Public Contracts.

1. Concerning payments for laborers and material, contributions to Workmen's Compensation Board, prevention of liens, payment of withholding taxes.
2. Concerning the maximum hours of labor, payment of medical care and attention to employees, liability to workers for violation of minimum wage rate requirements.
3. Concerning written notice to all employees of the number of hours per day and days per week that they may be required to work.
3. Concerning payment of claims by public officers, termination of Agreement because of a national emergency, conditions concerning the forfeiture of the Agreement.
4. Concerning payment of not less than prevailing wage rates, the Contractor shall pay not less than the prevailing rate of wages in conformance with ORS 279C.825. Certification of wage payments by the Contractor shall be submitted to the City of Redmond in conformance with ORS 279C.845. Wage certification forms shall be provided by the Contractor.
5. The schedule of minimum hourly wage rates, as determined by the Commissioner of the Bureau of Labor and Industries (BOLI) of the State of Oregon is included by reference within these Contract Documents. Any revisions will be delivered to all bidders in the form of Addendum to the Agreement.
6. The City does not guarantee that labor can be procured for the minimum wages in the wage scale. The rates of wages listed are minimums only, below which the Contractor cannot pay. The Contractor shall ascertain the wages above the minimum set forth that the Contractor may have to pay.
7. It is understood and agreed that all parties to this Agreement shall determine the

contents of these applicable statutes and comply with their provisions throughout the performance of the Agreement.

106 SAFETY

The City Engineer has not been retained or compensated to provide design and construction review services relating to the Contractor's safety precautions or to means, methods, techniques, sequences or procedures required for the Contractor to perform work.

The Contractor will be solely and completely responsible for conditions of the work site, including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal working hours. Safety provisions shall conform to all applicable State, County, and local laws, ordinances and codes, and to the current safety regulations as set forth in the Oregon Safety Codes adopted and published by the Workmen's Compensation Board, Salem, Oregon.

The Contractor shall also comply with "U.S. Department of Labor Occupational Safety and Health Act," the "Construction Safety Act" administered by the U.S. Department of Labor, the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, and the "Manual on Uniform Traffic Control Devices", except where these are in conflict with state laws, in which case the more stringent requirements shall be followed.

The Contractor shall maintain at office or other well known place at the work site, all articles necessary for giving first-aid to the injured, and shall establish the procedure for the immediate removal to a hospital or a doctor's care of all persons (including employees) who may be injured on the work site.
The duty of the City Engineer or Designee to conduct construction review of the Contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures in, on, or near the construction site.

If death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger to both the City Engineer and the City of Sisters. In addition, the Contractor must promptly report in writing to the City Engineer all accidents whatsoever arising out of, or in connection with, the performance of the work whether on, or adjacent to, the site, giving full details and statements of witnesses.

If any claim is made by anyone against the Contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the City Engineer, giving full details of the claim.

107 PROTECTION OF PROPERTY

The Contractor shall adopt every practical means and comply with all laws, ordinances, and regulations in order to minimize interferences to traffic and inconveniences, discomfort, and damage to the public, including the provision of adequate dust control measures. All obstructions to traffic shall be guarded in accordance with the "Manual on Uniform Traffic Control Devices".

The Contractor shall not trespass upon private property and shall be responsible for all injury or damage to persons or property, directly or indirectly, resulting from Contractors operations in completing this work. The Contractor shall comply with the laws and regulations of the City of Redmond, county, and state, relating to the safety of persons and property, and will be held responsible and required to make good any injury or damage to persons or property caused by carelessness or neglect on the part of the Contractor or subcontractor(s), or any agent or employee of either during the progress of the work and until its final acceptance.

The Contractor shall protect against injury any pipes, conduits, utilities, lawns, gardens, shrubbery, trees, fences, or other structures or property, public and/or private, encountered in this work except as stipulated elsewhere herein. The Contractor shall be responsible and liable for any damage to such pipe, structures, and property.

The Contractor shall protect this work and materials from damage due to the nature of the work, the elements, carelessness of other contractors, or from any cause until the completion and acceptance of the work. All loss or damages arising out of the nature of the work to be done under the terms of these Contract Documents, or from any unforeseen obstruction or defects which may be encountered in the prosecution of the work, or from the action of the elements, shall be sustained by the Contractor.

In an emergency affecting the safety of life or of the work or of adjoining property, the Contractor, without special instruction or authorization from the City Engineer, is hereby obligated to act, at her/his discretion, to prevent such threatened loss or injury; and he shall so act, without appeal, if so instructed or authorized. Any compensation claimed by the Contractor on account of emergency work shall be determined by agreement or as covered under the section 'Change Orders'.

107.1.00 SITE RESTORATION AND CLEANUP

At all times during the work, the premises are to be kept clean and orderly, and upon completion of the work, the project shall be free of rubbish or excess materials of any kind. During construction, stockpile the excavated trench materials so as to do the least damage to adjacent lawns, grassed areas, gardens, shrubbery or fences, regardless of whether these are on private property, City, State or County rights-of-way. Remove all excavated materials from grassed and planted areas; and leave these surfaces in a condition equivalent to their original condition and free from all rocks, gravel, boulders or other foreign material. Replace topsoiled areas as specified in SURFACE RESTORATION, raked and graded to conform to their original contours. All existing drainage ditches and culverts shall be reopened and graded and natural drainage restored. Restore culverts broken or damaged to their original condition and location. Upon completion of pipe laying and backfilling operations in any section, hand rake and drag all former grassed and/or planted areas leaving all disturbed areas free from rocks, gravel, clay or any other foreign material. The finished surface shall conform to the original surface and shall be free draining, free from holes, rough spots or other surface features detrimental to a seeded area.

107.2.00 STREET CLEANING

Clean all spilled dirt, gravel or other foreign material caused by the construction operations from all streets and roads at the conclusion of each day's operation.

108 MATERIALS AND APPLIANCES

Unless otherwise stipulated, the Contractor shall provide and pay for all materials, labor, water, tools, equipment, light, power, transportation, and other facilities necessary for the execution and completion of the work.

Unless otherwise specified, all materials shall be new, of U.S. Domestic manufacture or as allowed by the North American Free Trade Agreement, and both workmanship and materials shall be of good quality as determined by the City Engineer or designee. The Contractor shall, if required, furnish satisfactory evidence as to the kind and quality of materials.

All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable manufacturer, fabricator or processors, except as otherwise provided in the Contract Documents.

If the specifications, law, ordinance or applicable rules or regulations permit Contractor to furnish or use a substitute that is equal to any material or equipment specified and if Contractor wishes to furnish to use a proposed substitute, Contractor shall make written application to City Engineer for approval of such a substitute certifying in writing that the proposed substitute will perform adequately the functions called for by the general design, be similar and of equal substance to that specified and be suited to the same use and capable of performing the same function as that specified; stating whether or not its incorporation in or use in connection with the project is subject to the payment of any license fee or royalty; and identifying all variations of the proposed substitute from that specified and indicating available maintenance service. No substitute shall be ordered or installed without the written approval of City Engineer who will be the judge of equality and may require Contractor to furnish such other data about the proposed substitute as he/she considers pertinent. No substitute shall be ordered or installed without such performance guarantee and bonds as City of Sisters may require which shall be furnished at Contractor's expense.

In selecting and/or approving equipment for installation in the project, the City of Sisters and City Engineer assume no responsibility for injury or claims resulting from failure of the equipment to comply with applicable national, state, and local safety codes or requirements, or the safety requirements of a recognized agency, or failure due to faulty design concepts, or defective workmanship and materials.

108.1.00 MATERIALS FURNISHED BY THE CITY OF SISTERS

All materials and/or services furnished by the City shall be obtained by the Contractor as indicated in these Contract Documents. The cost of handling and placing City furnished materials shall be included in the price paid for the Agreement item involving such material.

108.2.00 SAMPLES, TESTING AND INSPECTION

All materials to be incorporated in the work shall be subject to sampling, testing, and approval. The City Engineer may select samples in the presence of the Contractor to be delivered and tested as required by the Specifications at a laboratory approved by the City,

at no additional cost to the City of Sisters. Testing shall conform to City of Sisters Standards and Specifications and be performed by a certified/independent testing laboratory as approved by City Engineer.

All sampling and testing of materials shall be done in accordance with the latest designated standard methods of AASHTO, ASTM, etc., or in accordance with special methods designated in the Specifications.

The Contractor shall furnish, without extra charge, the necessary test pieces and samples, including facilities and labor for obtaining the same, as requested by the City Engineer. When required, the Contractor shall furnish certificates of tests of materials and equipment made at the point of manufacture by a independent, certified testing laboratory.

The City Engineer may require additional testing of any portion of the work. When additional testing is required by City Engineer, the City shall pay cost of any passing test. The Contractor shall pay the cost of any non-passing test.

The City Engineer and representatives, and authorized representatives of public agencies shall at all times have access to the work wherever it is in preparation or progress, and the Contractor shall provide facilities for such access and for inspection, including maintenance of temporary and permanent access routes.

If the Specifications, laws, ordinances, or any authorized representative require any work to be specially tested or approved, the Contractor shall give the City Engineer timely notice of its readiness for inspection. If the inspection is by authority other than the City Engineer's, the City Engineer shall be given timely notice of the date fixed for such inspection. Inspections by the City Engineer will be promptly made, and where practicable, at the source of supply. If any work should be covered without approval or consent of the City Engineer, it shall, if required by the City Engineer, be uncovered for examination at the Contractor's expense.

Re-examination of questioned work may be ordered by the Engineer; and, if so ordered, the work shall be uncovered by the Contractor. If such work be found not in accordance with the Contract Documents, the Contractor shall correct the defective work at no additional cost to the City of Sisters.

Neither observations by City Engineer nor inspections, tests, or approvals by persons other than Contractor shall relieve Contractor from obligations to perform work in accordance with requirements of the Contract Documents.

108.3.00 CONTRACTOR'S RESPONSIBILITY FOR MATERIALS

108.3.01 RESPONSIBILITY FOR MATERIAL FURNISHED BY CONTRACTOR

The Contractor shall be responsible for all material furnished by Contractor. All such material shall be examined by a City Representative and any material not meeting specifications, or that is defective in manufacture, or that has been damaged after delivery, shall be replaced or corrected by the Contractor at Contractor's expense.

108.3.02 RESPONSIBILITY FOR MATERIAL FURNISHED BY CITY

The Contractor's responsibility for material furnished by the City shall begin upon

Contractor's acceptance at the point of delivery to Contractor. All such material shall be immediately examined, and material defective in manufacture and/or otherwise damaged shall be rejected by the Contractor at the time and place of delivery to Contractor, to be replaced by the City. Once accepted by the Contractor, defective and/or damaged material discovered prior to final acceptance of the work shall be removed by the Contractor and shall be replaced, at Contractors own expense, the defective material. In such case the Contractor shall furnish all labor, equipment and material incidental to replacement and necessary for the completion of the work to the satisfaction of the Engineer.

108.4.00 CONSTRUCTION STAKING

108.4.01 SCOPE

The purpose of this section is to define the responsibilities for surveying. All survey work shall be conducted under the supervision of a Registered Professional Land Surveyor, licensed in the State of Oregon. The Contractor will be responsible for providing all construction staking as required to complete the work. The Design Engineer will provide bench marks, control points, and reference points as shown on the plans or as required by the Contractor to the City Engineer for review and approval prior to establishing control for construction staking. The Contractor will be responsible for establishing centerline location and elevations.

108.4.02 STAKES

Construction stakes and stakes which are reference points for construction work will be conspicuously marked. It shall be the responsibility of the Contractor to inform his/her employees and her/his subcontractors of their importance and the necessity for their preservation.

The Contractor will provide vertical and horizontal construction staking in the proximity of the work. Construction staking will be provided at 50' intervals on tangent and 25' intervals on curve. The grade stakes at a minimum should contain the following information:

Engineer's station
Offset from line
Cut or fill to grade

108.4.03 FLAGGING CODE

A color code may be established during the course of the project indicating specific colors for the various kinds of stakes to be set.

108.4.04 SEWER

Both gravity and pressure sewer lines will be construction staked by means of an offset line with pipe invert cut information provided. Grades for pressure sewer will be provided by the subgrade stakes for streets. Finish grades will be provided as required.

Manholes will have two reference points (swing-ties) indicating the center of the manhole and, flow invert elevation. Ends of services will be staked.

108.4.05 WATER

Water lines will be staked every 50ft. by means of an offset line after the street subgrade has been constructed. No cut stakes will be provided in existing streets where 36" of cover is all that is required. However, cut stakes will be required if deeper cuts are needed to go

under or over utilities, etc. Appurtenances will be staked as required. Fire hydrants will have two reference points (swing ties) indicating the hydrant cap nut with elevations. Finish grades will be provided as required.

108.4.06 STREET

Prior to commencing construction, clearing limits shall be established.

Where a significant (greater than 5') cut or fill is required for subgrade, slope stakes and construction staking for subgrade will be provided.

Curb line shall be staked by means of an offset line no more than 6' offset from the top face of curb, showing the cut or fill to the finish work. Said stakes shall be protected and saved for a period of five (5) working days after construction of curbs to enable the Inspector to approve the alignment and grade.

Base rock shall be staked by painting an appropriate target on the curb and providing construction stakes (blue tops) on centerline. Blue tops will also be provided at the gutter line for the centerline and gutter lines of any intersecting street.

108.4.07 STRUCTURES

All structures shall be staked to the line and grade as shown on the plans or as directed by the Engineer.

109 CONTRACT LEGALITIES

109.1.00 PERMITS AND LICENSES

The Contractor shall keep fully informed of all local ordinances, State and Federal laws, ordinances and regulations, in any manner affecting the work herein specified. Contractor shall at all times comply with said ordinances, laws, and regulations, and protect and indemnify the City of Sisters and officers and agents against any claim or liability arising from or based on the violation of such laws, ordinances, or regulations. Permits and licenses of a temporary or construction nature including government charges and inspection fees necessary for the prosecution of the work shall be secured and paid for by the Contractor. Easements and rights-of-way shall be secured by the City of Sisters, unless otherwise specified in the Supplementary Conditions.

109.2.00 ROYALTIES AND PATENTS

The Contractor shall pay all royalty and license fees. Contractor shall defend all suits or claims for infringement of any patent rights and shall save the City of Sisters harmless from loss on account thereof, except that the City of Sisters shall be responsible for all such loss when a particular process or the product of a particular manufacturer or manufacturers is specified; but if the Contractor has information that the process or article specified is an infringement of a patent, contractor shall be responsible for such loss unless contractor promptly gives such information to the City Engineer or City of Sisters.

109.3.00 TAXES AND CHARGES

The Contractor agrees to withhold and pay any and all withholding taxes, whether State or Federal, sales tax, and to pay all Social Security charges and also all State Unemployment Compensation charges, and to pay or cause to be withheld, as the case may be, any and all taxes, charges, or fees or sums whatsoever which are now or may hereafter be required

to be paid or withheld under any laws.

109.4.00 INDEMNITY

The Contractor shall hold harmless, indemnify and defend the City of Sisters, the City Engineer and its consultants, and such of their officers and employees and agents, from any and all liability claims, losses, or damages arising or alleged to arise from or during the performance of the work described herein, by reason of any negligent, reckless, or intentional act or omission of the Contractor, any subcontractor or suppliers, or any agent, employee, or representative of any of them.

The obligation of Contractor shall not extend to the liability of City Engineer, his/her agents or employees arising out of the preparation or approval of maps, drawings, opinions, reports, surveys, Change Orders, designs or specifications.

109.5.00 UNFORESEEN DIFFICULTIES

The Contractor shall protect work and materials from damage due to the nature of the work, the elements, carelessness of other contractors, or from any cause whatever until the completion and acceptance of the work. All loss or damage arising out of a nature of the work to be done under these Contract Documents, or from any unseen obstruction or defects which may be encountered in the prosecution of the work, or from the action of the elements shall be sustained by the Contractor.

109.6.00 CONTRACTOR'S RIGHT TO STOP WORK OR TERMINATE CONTRACT

If the work should be stopped under an order of any court or other public authority for a period of three (3) months, through no act or fault of the Contractor or of anyone employed by Contractor; or if the City Engineer should fail to issue any estimate for payment within thirty (30) days after it is due; or if the City of Sisters should fail to pay the Contractor within thirty (30) days after the time specified in the paragraph "Partial Payment" of the section "Payment" any sum certified by the City Engineer, then the Contractor may, upon fifteen (15) days written notice to the City of Sisters and the City Engineer, stop work or terminate this Agreement and recover from the City of Sisters payment for all work executed and any loss sustained upon any plant or material and reasonable profit and damages, unless said default has been remedied within said time.

109.7.00 CORRECTION OF DEFECTIVE WORK AFTER FINAL ACCEPTANCE (WARRANTY)

All work shall be guaranteed for a period of one (1) year against defects in materials and workmanship. The Contractor hereby agrees to make, at own expense, all repairs or replacements necessitated by defects in materials or workmanship supplied by Contractor or subcontractors that become evident within one (1) year after the date of written notice from the City Engineer recommending final acceptance of the entire project, or entire schedule, by the City of Sisters. The Contractor also agrees to hold the City of Sisters harmless from claims of any kind arising from damage due to said defects. The Contractor shall make all repairs and replacements promptly upon receipt of written orders for same from the City of Sisters. If the Contractor fails to make the repairs and replacements promptly, the City of Sisters may do the work, and the Contractor and Contractors' surety shall be liable for the cost thereof.

109.07.01 WARRANTY

Upon acceptance of the construction by the City Engineer, a minimum one year warranty

agreement on materials and workmanship shall be initiated between the City of Sisters and the Developer.

The warranty shall be comprised of a bond or other approved security in a minimum value of 10% of the original improvement construction costs.

109.8.00 RELEASE OF LIENS OR CLAIMS

On public projects, neither the final payment nor any part of the retained percentage shall become due until the Contractor submits to the City a signed affidavit, satisfactory to the City Engineer, stating that so far as the Contractor has knowledge or information, all accounts for materials, labor, and incidentals in connection with the work have been paid in full. The form of affidavit shall be satisfactory to the City of Sisters.

If any lien or claim remains unsatisfied after all payments are made, the Contractor shall refund to the City all monies that the latter may be compelled to pay in discharging such a lien, including all costs and a reasonable attorney's fee.

109.9.00 CONTRACTOR'S AND MANUFACTURER'S COMPLIANCE WITH STATE, OSHA, AND OTHER CODE REQUIREMENTS

The completed work shall include all necessary permanent safety devices such as machinery guards and similar ordinary safety items required by the State and federal (OSHA) industrial authorities and applicable local and national codes. Further, any features of the work (including City selected equipment) subject to such safety regulations shall be fabricated, furnished, and installed in compliance with these requirements. Contractors and manufacturers of equipment shall be held responsible for compliance with the requirements included herein.

110 PROGRESS OF THE WORK

110.1.00 BEGINNING OF THE WORK

Before work shall be started and materials ordered, the Contractor shall meet and consult with the City Engineer or designee relative to materials, equipment, and all arrangements for prosecuting the work. The Contractor shall provide and comply with work schedule, as agreed upon in the preconstruction conference. The Contractor shall commence the work contemplated under these Contract Documents within three (3) days after the City of Sisters written notice to proceed unless otherwise notified by the City Engineer, and shall complete the work within the time specified in the Agreement, it being expressly understood and agreed that the time of beginning, rate of progress, and time of completion of the work are of the essence of this Agreement. Prior to beginning construction, the Contractor shall submit to the City Engineer a preliminary progress schedule; indicating the times (number of days or dates) for starting and completing the various stages of the work, including any milestones specified in the Contract Documents.

110.2.00 PROSECUTION OF THE WORK

The work shall be prosecuted at such time, and in or on such part or parts of the project as may be required, to complete the project as contemplated in the Contract Documents. Time is essence of this contract. Upon starting construction, the Contractor shall diligently and continuously pursue completion of the work with adequate crew and equipment. Should the Contractor, without the express approval of the City Engineer, reduce this effort,

it shall be considered a failure of the Contractor to complete the work in the time agreed upon. As such it shall fall under the provisions of 110.9.00 LIQUIDATED DAMAGES and liquidated damages may be assessed for each day of reduced operations. It is expressly understood and mutually agreed between all parties to the Agreement that the City Engineer shall not determine or be responsible for construction methods.

The Contractor shall perform the work and take such precautions as contractor may deem necessary to complete the project so all work will be in conformance with the Contract Documents within the Contract time.
If the Contractor desires to carry on work at night or outside the regular hours, contractor may submit application to the City of Sisters; but Contractor shall allow ample time to enable satisfactory arrangements to be made for inspecting the work in progress. The Contractor shall notify all business and Property owners within 500' of the construction limits at least 48 hrs prior to commencing night work and shall maintain a public relations log of all communications with effected parties for review by the City. If granted permission, Contractor shall light the different parts of the work in a manner satisfactory to the City Engineer and shall comply with all regulations of the City or State or other public body having jurisdiction.

The Contractor shall complete the work called for under the contract in all parts and requirements within the number of workdays, or before the completion date, as set forth in the contract

Where such case applies, a notice to proceed may be issued to the Paving Contractor when individual streets have been constructed and approved for base rock by the Engineer. Once the base rock has been delivered and spread, it shall be the Paving Contractor's responsibility to maintain the surface, including blading and watering as may be required. It is the intent of these specifications that paving commence immediately following the placement of base rock.

110.3.00 COOPERATION WITH UTILITIES
The Contractor is responsible for coordinating with utility owners. Before the Contractor performs any excavation she/he is to contact the Utilities Notification Center at 1-800-332-2344 at least forty-eight (48) hours prior to excavation. The Contractor shall conform to the requirements of ORS 757.541 to 757.571.

110.4.00 MAINTAINING TRAFFIC
The Contractor will be responsible to maintain two-way traffic at all times unless otherwise specified and approved by the City. The streets shall be open for two-way traffic at all times when the Contractor is not performing work unless otherwise specified. Approaches to all properties accessing to the project shall be maintained by the Contractor at all times except for short periods necessary to the progress of the construction.

110.4.01 PUBLIC SAFETY AND CONVENIENCE
The Contractor shall conduct the project with proper regard for the safety and convenience of the public. When the project involves use of public ways, Contractor shall provide flagmen when directed and install and maintain means of free access to all fire hydrants, service stations, warehouses, stores, houses, garages and other property.

Private residential driveways shall be closed only with approval of the Engineer or specific permission of the property owner. The Contractor shall not interfere with normal operation of public transit vehicles unless otherwise authorized. The Contractor shall not obstruct or interfere with travel over any public street or sidewalk without approval. Where detours are necessary, they shall be maintained with good surface and shall be clearly marked. The Contractor shall provide open trenches and excavations with adequate barricades of an approved type which can be seen from a reasonable distance. At night, the Contractor shall mark all open work and obstructions by lights. The Contractor shall install and maintain all necessary signs, lights, flares, barricades, railings, runways, stairs, bridges and facilities. The Contractor shall observe all safety instructions received from the Engineer or governmental authorities, but following of such instructions shall not relieve the Contractor from the responsibility or liability for accidents to workers or damage or injury to person or property.

Emergency traffic such as police, fire and disaster units shall be provided reasonable access to the work area at all times.

The Contractor shall be liable for any damages which may result from failure to provide such reasonable access or failure to notify the appropriate authority.

110.5.00 ASSIGNMENT

Neither party to the Agreement shall assign the Agreement or sublet it as a whole without the written consent of the other; nor shall the Contractor assign any monies due or to become due to Contractor hereunder without the previous written consent of the City of Sisters.

110.6.00 CITY OF SISTERS RIGHT TO DO WORK

If the Contractor should, in the opinion of the City Engineer, neglect to prosecute the work properly or should neglect or refuse at Contractors' own cost to take up and replace work as shall have been rejected by the City Engineer, then the City of Sisters shall notify the Surety of the condition and after ten (10) days written notice to the Contractor and the Surety, or without notice if an emergency or danger to the work or public exists, and without prejudice to any other right which the City of Sisters may have under the Agreement, take over that portion of the work which has been improperly executed and make good the deficiencies and deduct the cost thereof from the payments then or thereafter due the Contractor.

110.7.00 CITY OF SISTERS RIGHT TO TERMINATE AGREEMENT

If the Contractor should be adjudged as bankrupt; or if the Contractor should make a general assignment for the benefit of her/his creditors; or if a receiver should be appointed to account of her/his insolvency; or if the Contractor should persistently or repeatedly refuse or should fail, except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper materials; or if the Contractor should fail to make prompt payment to subcontractors for material or labor; or persistently disregards laws, ordinances, or the instructions of the City Engineer; or otherwise be guilty of substantial violation of any provision of the Agreement or any laws or ordinance; then the City, upon the certification of the City Engineer that sufficient cause exists to justify such

action, may without prejudice to any other right or remedy, and after giving the Contractor and Surety seven (7) days written notice, transfer the employment for said work from the Contractor to the Surety. Upon receipt of such notice, such Surety shall enter upon the premises and take possession of all materials, tools, and appliances thereon for the purpose of completing the work included under this Agreement and employ, by Contractor or otherwise, any qualified person or persons to finish the work and provide the materials therefore, in accordance with the Contract Documents, without termination of the continuing full force and effect of this Agreement. In case of such transfer of employment to such surety, the Surety shall be paid in its own name on estimates according to the terms hereof without any right of the Contractor to make any claim for the same or any part thereof. In lieu of the foregoing, if the City so elects, the City may terminate the employment of the Contractor and take possession of the premises and of all materials, tools, and appliances thereon and finish the work by whatever method the City may deem expedient. In such case, the Contractor shall not be entitled to receive any further payment until the work is finished. If the expense of completing the Agreement, including compensation for the additional managerial and administrative services, shall exceed such unpaid balance, the Contractor shall pay the difference to the City. The expense incurred by the City, as herein provided and the damage incurred through the Contractor's default shall be certified by the City Engineer.

Where Contractor's services have been so terminated by the City, said terminations shall not affect any rights of the City against Contractor then existing or which may thereafter accrue. Any retention or payment of monies by the City due Contractor will not release Contractor from liability.

Upon seven (7) days written notice to Contractor and City Engineer, the City may, without cause and without prejudice to any other right or remedy, elect to abandon the Project and terminate the Agreement. In such case, Contractor shall be paid for all work executed and any expense sustained plus a reasonable profit.

110.8.00 DELAYS AND EXTENSION OF TIME

If the Contractor shall be delayed at any time in the progress of the work by any act or neglect of the City or the City Engineer, or of any employee of either; or by any separate contractor employed by the City; or by changes ordered in the work; or by strikes, lockouts, fire, unavoidable casualties, or any cause beyond the Contractor's control which justified the delay, or by delay authorized in writing by the City Engineer, then the date for completion of the work shall be extended. Within 14 days after the Contractor submits to the City Engineer a written request for an extension of time, the City Engineer will determine the number of extension days due the Contractor. The City of Sisters will make the final decision on all requests for extension of time.

No such extension shall be made for delays occurring more than seven (7) days before a claim is made in writing to the City Engineer. In case of a continuing cause of delay, only one claim is necessary.

If no schedule or agreement stating the date upon which supplemental drawings shall be furnished by the City Engineer is made, then no claim for delay shall be allowed the Contractor on account of failure to furnish drawings until two (2) weeks after demand for such drawings, and not then unless such claim be reasonable.

No extension of time will be granted to the Contractor for delays occurring to parts of the work that have no measurable impact on the completion of the total work under this Agreement.

No extension of time will be considered for weather conditions normal to the area in which the work is being performed. Unusual weather conditions, if determined by the City Engineer to be of a severity that would stop all progress of the work, may be considered as cause for an extension of Agreement completion time.

Delays in delivery of equipment or material purchased by the Contractor or subcontractors (including City selected equipment) shall not be considered as a just cause for delay. The Contractor shall be fully responsible for the timely ordering, scheduling, expediting, delivery, and installation of all equipment and materials.

The Contract Time may only be changed by a Change Order.

110.9.00 LIQUIDATED DAMAGES

Should the Contractor fail to complete the work, or any part thereof, in the time agreed upon in these Contract Documents or within such extra time as may have been allowed for delays by extensions granted as provided in these Contract Documents, the Contractor shall reimburse the City for the additional expense and damage for every day specified that the Agreement remains uncompleted after the date of specified completion. It is agreed that the amount of such additional expense and damage incurred by reason of failure to complete the work shall be as given in the following schedule for each workday the work exceeds the number of workdays specified.

Original Contract Amount	Liquidated Damages
Up to $100,000	$200
$100,000 to $500,000	$500
Greater than $500,000	$800

The said amounts are hereby agreed upon as liquidated damages for the loss to the City on account of expenses for the employment of engineers, inspectors, and other employees after the expiration of the time of completion, and on account of the value of the operation of the work dependent thereon. It is expressly understood and agreed that this amount is not to be considered in the nature of a penalty, but as liquidated damages which have accrued against the Contractor; and the City is authorized to deduct the amount of such damages from any monies due the Contractor for work performed or material furnished under this Agreement; and the Contractor and Contractors' Sureties shall be liable for any excess.

110.10.00 OTHER CONTRACTS

The City reserves the right to let other contracts in connection with this work. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and execution of their work and shall properly connect and coordinate Contractors work with theirs.

If any part of the Contractor's work depends, for proper execution or results, upon the work of any other contractor, the Contractor shall inspect and promptly report to the City Engineer any defects in such work that render it unsuitable for such proper execution and

results. The Contractors failure to so inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the reception of his/her work, except as to defects which may develop in the other contractor's work after execution of work.

110.11.00 USE OF PREMISES

The City shall furnish, as indicated in the Contract Documents and not later than the date when needed by Contractor, the lands upon which the work is to be done, rights-of-way for access thereto, and such other lands which are designated for the use of Contractor. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by the City, unless otherwise specified in the Contract Documents. If the Contractor believes that any delay by the City in furnishing these lands or easements entitles Contractor to an extension of the Contract Time, she/he be entitled to make a claim under the terms of the Agreement. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

The Contractor shall confine equipment, the storage of materials, and the operation of workmen to limits shown on the plans or indicated by law, ordinances, permits, or directions of the City Engineer, and shall not unreasonably encumber the premises with materials.

110.12.00 USE OF COMPLETED PORTIONS

The City shall have the right to take possession of and use any completed or partially completed portions of the work, notwithstanding the time for completing the entire work or such portions which may not have expired. Such taking possession and use shall not be deemed an acceptance of any work not completed in accordance with the Contract Documents. If such prior use increases the cost of the work, or delays the completion of the work, the Contractor shall be entitled to extra compensation or an extension of time, or both. Should such condition or conditions prevail, the Contractor shall submit a claim for additional compensation or extension of time, in writing, to the City Engineer. The City Engineer will review the claim and determine its validity.

110.13.00 CUTTING AND PATCHING

The Contractor shall do all cutting, fitting, or patching of work that may be required to make its several parts come together properly and fit it to receive or be received by work of other contractors shown upon or reasonable implied by the plans.

110.14.00 CLEANING UP

Cleaning up shall be a continuing process from the start of work to final acceptance of the project. The Contractor shall, at all times, at Contractors' own expense and without further order keep property on which work is in progress free from accumulations of waste material or rubbish caused by employees or by the work, and at all times during the construction period shall maintain structure sites, rights-of-way, adjacent property, and the surfaces of streets and roads on which work is being done in a safe condition for the Contractor's workers, and the public. Accumulation of waste materials that might constitute a fire hazard will not be permitted. Spillage from the Contractor's hauling vehicles on traveled public or private roads and parking areas shall be promptly cleaned up. Upon completion of the construction, the Contractor shall, at his own expense, remove all temporary structures, rubbish, and waste materials resulting from operations.

Upon failure of the Contractor to provide cleanup within 24 hours of being so directed by the Engineer in writing, the City, or an agent retained by the City, may complete the cleanup and the cost thereof plus 10% for handling shall be deducted from any payment due the Contractor.

110.15.00 CHANGES IN QUANTITY

The City reserves the right to increase or decrease quantities without limit or to omit portions of the work without invalidating said proposal or re-negotiating the unit bid price.

110.16.00 PERFORMANCE TESTING

Operating equipment and systems shall be performance tested in the presence of the City Engineer to demonstrate compliance with the specified requirements. Performance testing shall be conducted under the specified design operating conditions or under such simulated operating conditions as recommended or approved by the City Engineer. Such testing shall be scheduled with the City Engineer at least one (1) week in advance of the planned date for testing and include a factory representative on site.

110.17.00 SUBSTANTIAL COMPLETION DATE

The City Engineer may, at his/her sole discretion, issue a written notice of substantial completion for the purpose of establishing the starting date for specific guarantees, and to establish the date that the City will assume the responsibility for the cost of operating such portions of the project. Said notice shall not be considered as final acceptance of any portion of the work or relieve the Contractor from completing the remaining work within the specified time and in full compliance with the Contract Documents. All equipment contained in the work, plus all other components necessary to enable the City of Sisters to operate the facility in the manner that was intended, shall be complete including acceptable testing as specified in these Contract Documents on the substantial completion date.

The City shall have the right to exclude Contractor from the project after the date of substantial completion, but the City shall allow Contractor reasonable access to complete or correct remaining items of work.

111 PAYMENT

111.1.00 BASIS OF PAYMENT

In consideration of the faithful performance of all the covenants, stipulations, and conditions in these Contract Documents, the City agrees to pay the Contractor the amount bid as adjusted when so stipulated in the Contractor's Proposal on the basis of the unit prices named in the contractor's Proposal for the work actually performed as determined by the final estimate of the City Engineer, together with any amounts due for extra work not classified under the items listed in the Contractor's Proposal as provided in the paragraph "Extra Work" of these GENERAL CONDITIONS; less any deduction for failure to complete the work within the time specified; and less any deductions for claims and damages paid by the City due to acts or omissions of the Contractor and for which the Contractor is liable under this Agreement.

111.2.00 PARTIAL PAYMENT

At least ten (10) days before the 25th of each month, but not more often than once a month, Contractor shall submit to City Engineer for review an application for payment filled out and signed by Contractor covering the work completed as of the date of the application

and accompanied by such data and schedules as City Engineer may reasonably require. If payment is requested on the basis of materials and equipment not incorporated in the work but delivered and suitably stored at the site or at another location agreed to in writing, the application for payment shall also be accompanied by such data, satisfactory to the City, as will establish City of Sisters title to the material and equipment and protect interest therein, including applicable insurance. Each subsequent application for payment may be required to include an affidavit of Contractor's obligations reflected in prior applications for payment.

Contractor warrants and guarantees that title to all work, materials and equipment covered by any application for payment, whether incorporated in the project or not, will pass to the City at the time of payment free and clear of all liens, claims, security interests and encumbrances.

City Engineer will, within ten (10) days after receipt of each application for payment, either indicate in writing, approval of payment and present the application to the City Finance Department, or return the application to Contractor indicating, in writing, reasons for refusing to approve payment. In the later case, Contractor may make the necessary corrections and resubmit the application.

The amount of said application for payment, after deducting five percent (5%) and all previous payments, shall be due and payable to the Contractor not more than thirty (30) days after the last day of said month. The five percent (5%) deducted, as above set forth, shall be withheld by the City to insure faithful completion of the work under the terms of the Contract Documents and to provide a fund for the payment of any claims which may accrue against the City of Sisters because of some act or omission on the part of the Contractor.

Nothing contained in this article shall be construed to affect the right, hereby reserved, to reject the whole or any part of the aforesaid work should such work be later found not to comply with any of the provisions of the Contract Documents. All estimated quantities of work for which progress payments have been made are subject to review and correction on the final estimate. Payment by the City and acceptance by the Contractor of progress payments based on periodic estimates of quantities of work shall not, in any way constitute acceptance of the estimated quantities used as the basis for computing the amounts of the progress payments.

Furthermore, on all Agreements for the construction, reconstruction, maintenance or repair of any public work in the State of Oregon, The City will withhold 25 percent of any payment due the Contractor until the Contractor files with the City the signed Wage Certification Form certifying that the Contractor has paid not less than the prevailing rate of wages as required by ORS Chapter 279C.845 (7), as set forth in General Conditions.

111.3.00 CHANGE ORDERS
Payment or credit for any alterations covered by a Change Order shall be determined by one or a combination of methods set forth in 111.3.01, 111.3.02, or 111.3.03 below:

111.3.01 UNIT PRICES
If applicable, those unit prices stipulated in the Proposal or unit prices negotiated and mutually acceptable to the Contractor and City of Sisters.

111.3.02 LUMP SUM

A total sum for the work negotiated and mutually acceptable to the Contractor and City. Contractor's quotations for Change Orders shall be in writing and firm for a period of forty-five days. Any compensation agreed upon, and subsequently paid by the City for work defined in a Change Order shall be deemed to include all costs and expenses related to such work, including the costs and expenses of a direct, indirect, and consequential nature, or otherwise, and it is specifically understood and agreed that no additional compensation may be subsequently sought or charged by the Contractor for the work covered by the applicable Change Order.

The City's request for quotations on alterations to the work shall not be considered authorization to proceed with the work prior to the issuance of a formal Change Order, nor shall such request justify any delay in existing work.

111.3.03 FORCE ACCOUNT WORK

If the method of payment cannot be agreed upon prior to the beginning of the work, and the City or the City Engineer directs that the work be done by written Change Order or on a force account basis, then the Contractor shall furnish labor equipment, and materials necessary to complete the work in a satisfactory manner and within a reasonable period of time. For the work performed, payment will be made for the documented actual cost of the following:

A. Labor, including foremen, who are directly assigned to the force account work: (actual payroll cost, including wages, fringe benefits as established by negotiated labor agreements, labor insurance, and labor taxes as established by law). No other fixed labor burden will be considered unless approved in writing by the City of Sisters.
B. Material delivered and used on the designated work, including sales tax, if paid for by Contractor or subcontractor.
C. Rental, or equivalent rental cost of equipment, including necessary transportation for items having a value in excess of one hundred dollars ($100). Equipment use approved by the Engineer will be paid at the rental rates given in the most current edition of the Rental Rate Blue Books for Construction Equipment ("Blue Book"), Volumes 1,2, and 3, published by Primedia Information, Inc., 1735 Technology Drive, Suite 410, San Jose, CA 95110-1313 (phone 800-669-3282). Equipment rental rates will be the maximum allowable rate.
D. Additional bond, as required and approved by the City of Sisters.
E. Additional insurance (other than labor insurance) as required and approved by the City of Sisters.

To costs under 111.3.03 FORCE ACCOUNT WORK, there shall be added the following fixed fees for the Contractor or subcontractor actually performing the work:

1. A fixed fee of fifteen percent (15%) added to the cost of Items A, B and C; and
2. A fixed fee of six percent (6%) added to the cost of items D and E above.
3. An additional fixed fee of ten percent (10%) shall be allowed the Contractor for the administrative handling of portions of the work that are performed by an approved subcontractor. No additional fixed fee will be allowed for the administrative handling of work performed by a subcontractor of a subcontractor unless by written permission from the City. The added fixed fees shall be considered to be full compensation, covering the cost of general supervision, overhead, profit, and any other general expense.

The City reserves the right to furnish such materials and equipment, as it deems expedient, and the Contractor shall have no claim for profit or added fees on the cost of such materials and equipment.

For equipment under Item C above, rental or equivalent rental cost will be allowed for only those days or hours during which the equipment is in actual use. Rental and transportation allowances shall not exceed the current rental rates prevailing in the locality. The rentals allowed for equipment will, in all cases, be understood to cover all fuel, supplies, repairs, and renewals, and no further allowances will be made for those items, unless specific agreement to that effect is made.

The Contractor shall maintain records in such a manner as to provide a clear distinction between the direct costs of work paid for on a force account basis and the costs of other operations. The Contractor shall furnish the City Engineer report sheets in duplicate of each day's force account work no later than the working day following the materials used, and shall cover the direct cost of labor and the charges for equipment rental, whether furnished by the Contractor, subcontractor, or other forces. The daily report sheets shall provide names or identifications and classifications of workers, the hourly rate of pay and hours worked, and also the size, type, and identification number of equipment and hours operated.

Material charges shall be substantiated by valid copies of vendors' invoices for materials used in the alterations covered by Change Orders. Such invoices shall be submitted with the daily report sheets, or, if not available, they shall be submitted with subsequent daily report sheets. Said daily report sheets shall be signed by the Contractor or authorized agent.

To receive partial payments and the final payment for force account work, the Contractor shall submit in a manner approved by the City Engineer, detailed and complete documented verification of the Contractor's and any of subcontractor's actual current costs involved in the force account work pursuant to the issuance of an approved Change Order. Such costs shall be submitted within thirty (30) days after said work has been performed.

No payment will be made for work billed and submitted to the City Engineer after the thirty (30) day period has expired. No extra or additional work shall be performed by the Contractor, except in an emergency endangering life or property, unless in pursuance of a written Change Order.

111.4.00 CLAIMS

If the Contractor claims that any instructions involve extra cost under this Agreement, the Contractor shall give the City Engineer written notice thereof within forty-eight (48) hours after the receipt of such instructions, and in any event before proceeding to execute the work. If such notification is not given, or if the City Engineer is not afforded proper facilities by the Contractor for keeping strict account of actual cost, then the Contractor hereby agrees to waive the claim for such additional compensation. Such notice by the Contractor, and the fact that the City Engineer has kept account of the cost as aforesaid, shall not in any way be construed as proving the validity of the claim.

Claims for additional compensation shall be made in itemized detail and submitted, in writing, to the City Engineer within ten (10) days following completion of that portion of the

work for which the Contractor bases a claim is found to be just. It shall be allowed and paid for as provided in the section covering Change Orders.

111.5.00 FINAL PAYMENT

To receive final payment, the Contractor must do the following:

1. Notify the City Engineer, in writing, that the Contractor has completed the work in accordance with the Contract Documents and request final payment.
2. Submit to the City of Sisters appropriate waivers of lien and claims for itself and all subcontractors and a signed affidavit, satisfactory to the City of Sisters, stating that so far as the contractor has knowledge or information, all accounts for materials, labor, and incidentals in connection with the work have been paid in full.
3. On agreements for public works, furnish to the City of Sisters a completed wage certification as required by ORS 279, as amended.
4. Provide required warranty letter and bond. (See Section #8 Development Provisions)

Within thirty (30) days of written notice from the Contractor that the work has been completed, the City Engineer shall conduct a final inspection of the work. If the work has been completed to the satisfaction of the City Engineer, he/she shall submit a certificate of acceptance of the completed work, together with a final estimate of the amount due the Contractor under this Agreement, less any amount to be withheld by the City to ensure guarantees, as may be provided in the Supplementary Conditions.

The City shall, within thirty five (35) days, pay to the Contractor all monies due under the conditions of the Agreement upon the following:

1. The City of Sisters acceptance of the City Engineer's final estimate.
2. The City of Sisters approval of the affidavit of the release of lien and claim.
3. Inspection and approval by all or any concerned public works of the State, of any county, municipality or political subdivision created by law, or Public Utility.

111.6.00 MATERIALS DELIVERED TO THE WORK SITE BUT NOT USED

Monthly progress payments will include compensation for materials received on the site during the pay period but not incorporated in the work providing they are properly stored and protected and the Contractor submits to the City Engineer, in writing, ten (10) days prior to the end of each pay period, a list, with costs supported by invoices from suppliers for such materials on the job for which the Contractor feels credit is due.

Payments for material delivered to the site and not incorporated in the work during the pay period shall be understood to be advance payments for the Contractor's convenience. Final payment will be made only for materials actually incorporated in the work. Upon acceptance of the work, all materials stored on the site for which advance payments have been made, unless otherwise agreed upon in writing, shall revert to the Contractor and all remaining advance payments on materials shall be deducted from the final payment for the work.

Advance payments by the City of Sisters for materials on the site, but not incorporated in the work, shall not be considered as acceptance by the City of Sisters and shall not relieve the Contractor from his/her responsibilities.

111.7.00 ACCEPTANCE OF FINAL PAYMENT CONSTITUTES RELEASE

The acceptance by the Contractor of the final payment shall release the City of Sisters and the City Engineer as agent of the City from all claims and all liability to the Contractor for all things done or furnished in connection with the work, and every act of the City and others relating to or arising out of the work. No payment, however, final or otherwise, shall operate to release the Contractor from obligations under these Contract Documents.

111.8.00 NO WAIVER OF RIGHTS

Neither the inspection by the City, through the City Engineer or any of City employees, nor any order by the City for payment of money, nor any payment for, or acceptance of, the whole or any part of the work by the City or City Engineer, nor any extension of time, nor any possession taken by the City or its employees, shall operate as a waiver of any provision of these Contract Documents, or any power herein reserved to the City, or any right to damages herein, nor shall any waiver of any breach in this Agreement be held to be a waiver of any other or subsequent breach.

111.9.00 LITIGATION FEES AND EXPENSES

In the event suit or action shall be instituted to enforce any of the terms or conditions of the Agreement, the losing party shall pay to the prevailing party, in addition to the costs and disbursements allowed by statute, such sums as the court may adjudge reasonable as attorney's fees in such suit or action, in both trial and appellate courts.

CITY OF SISTERS, OREGON

2013 STANDARD SPECIFICATIONS

DESIGN STANDARDS

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DESIGN STANDARDS

I. GENERAL

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

II. DESIGN PARAMETERS

A. STREET

1. General

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

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

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

Note:

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

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

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

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

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

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

2. Slope

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

Maximum street grades are as follows:

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

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

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

3. Sight Distance

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

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

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

4. Vertical Curves

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

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

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

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

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

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

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

5. Horizontal Curves

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

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

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

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

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

6. Superelevation Rate

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

7. Superelevation Runoff

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

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

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

8. Reverse Curves

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

9. Compound Horizontal Curves

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

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

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

10. Road Crown

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

the City Engineer.

12. All Weather Service Road Standard

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

13. Curb Radius

The minimum intersection curb radius shall be as follows:

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

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

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

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

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

14. Street Striping

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

15. Street Signs

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

16. Cluster Postal Delivery Boxes

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

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

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

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

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

17. Street Lights

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

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

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

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

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

18. Asphalt Concrete Pavement

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

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

19. Dead End Streets and Alleys

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

20. Roundabouts

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

B. Stormwater

1. General

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

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

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

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

3. Storm Sewer Design

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

4. Storm Facility Testing

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

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

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

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

1) **Drywells:**
   - i. **Storage Volume:** Confirm the storage volume by tracking the quantity of drain rock used with load tickets and measuring the diameter and depth of the drywell. Calculate interior volume of the drywell from the base to the bottom of the lowest pipe. Calculate the storage volume in the drain rock using a void ratio of 35 percent unless a different void ratio is provided by a materials testing lab.
   - ii. **Infiltration Rate:** For drywells with a convenient hydrant, fill the drywell with water from a metered source and adjust the flow rate to maintain the level of water at the top of the barrel section or the base of the inlet pipes (whichever is lower). Measure and record the flow rate at 10 minute intervals. Maintain the flow rate necessary to keep the drywell at the top of the barrel section or pipe invert for one hour. After the one hour period, turn off the water supply and record the depth to the water surface every 10 minutes for one hour. If the drywell cannot be filled, measure the depth to the water surface and record depth and flow rate at 10 minute intervals. Stop filling after 60 minutes and measure and record the depth to the water surface every 10 minutes for one hour. If a hydrant is not readily available, a water truck is required. Place four water truck loads (3,500 to 4,000 gallons) in the drywell within a 2-hour period. After the water has been placed, let the drywell drain and record the depth to the water surface every 10 minutes for one hour.
   - iii. **72-hour Drainage:** Check 72 hours after stopping the flow to see if the drywell has emptied.

2) **Ponds, swales and infiltration galleries:**
   - i. **Storage Volume:** For ponds, swales and other surface facilities, confirm the storage volume with as-built measurements and calculations provided by the project surveyor. For infiltration galleries, track the quantity of drain rock used with load tickets. Calculate the storage volume in the drain rock using a void ratio of 35 percent unless a different void ratio is provided by a materials testing lab.
   - ii. **Infiltration Rate:** For infiltration swales and ponds in general and for infiltration galleries constructed with filter soil placed above the drain rock, measure the infiltration rate at the surface after the filter soil is placed. If the infiltration gallery is designed so that runoff enters directly into the drain rock with filter soil below, measure the infiltration rate of the soil prior to placing the drain rock. Use the single-ring infiltrometer test (Appendix D of the Central Oregon Stormwater Manual) or other test recommended by a Geotechnical Engineer.
   - iii. **72-hour Drainage:** Use the Swale Flood Test described in Appendix 4E of the Central Oregon Stormwater Manual. For sloped swales and swales with check dams, introduce flow at the high end and allow it to overtop each check dam until it pools to a depth of 6 inches in the low end. Check 72 hours after stopping the flow to see if the facility has emptied. Use standpipe to monitor water level in infiltration galleries.

C. SEWER

1. General

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

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

2. Sewer Main

a. Design Parameters

1) **To and Through:** All main lines shall be extended through the property to be served within a Public Right of Way and extend to neighboring property lines on all sides of the property planned for development.
2) **Location** Sewer mains should be located in accordance with the Department of Environmental Quality and OAR Chapter 340, Division 52. Sewer mains shall be located on roadway centerline on tangent sections and as close as practicable to this configuration on curves. Gravity sewer mains from manhole to manhole shall run in a straight alignment.
3) **Sewer Main Stub** Stub outs for the future continuation of the sewer shall terminate at a manhole unless approved by the City Engineer due to unusual circumstances. In phased subdivisions the sewer should be extended to the next adjacent manhole as shown on the master plan to minimize the number of manholes required.
4) **Depth** Minimum cover for all standard sewer lines except sewer services shall be 36".
5) **Minimum Diameter** For gravity sewer, the minimum size shall be 8". Size of pressure lines will be determined by the design engineer. The design engineer shall submit a summary of design criteria for line sizing to the City with construction plans.
6) **Minimum Velocity:** 2 fps for gravity sewers. 3 fps for pressure and inverted siphons
7) **Maximum Velocity:** Velocity shall not exceed 8 fps for pressure sewers.
8) **Minimum Grade (Gravity):** From DEQ design criteria:

Pipe I.D.	Slope (ft/100 ft)
6"	0.60
8"	0.40
10"	0.25
12"	0.19
15"	0.14
18"	0.11
21"	0.09
24"	0.08

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

Concrete	120
Cast iron/steel	125
PVC	135

10) **Flow Estimation**
   Domestic waste: 125 gallons per equivalent dwelling unit (EDU)

Commercial and Industrial: 20,000 SF per EDU
Schools: Elementary: 10 gallons per student per day
Middle: 15 gallons per student per day
High School: 20 gallons per student per day
Infiltration: Negligible

11) Peak Factor: 2.4

12) Manholes

Spacing: Not more than 400' apart

Design Fall: Not less than 0.1' without prior approval by City Engineer

External Drop Manhole: Required when fall greater than or equal to 18"

Dead-end lines: End with a manhole, cleanouts allowed at the upper end of lines not exceeding 250 feet with approval by the City Engineer..

Diameter: Standard diameter for pipes up to and including 15-inch diameter is 48 inches. For 18-inch and larger pipes and for unusual pipe angles, 60 inch diameter or larger manholes are required to maintain structural integrity. Submit manhole design for pipes sizes 18 inches and larger.

13) Wet Wells

Operating Capacity: The minimum operating capacity of the wet well, from first pump on to pumps off, shall be not less than 5 minutes times one pump flow rate.

Emergency Capacity: The emergency capacity, from alarm on to an overflow condition, shall be determined on a case by case basis, but in no case shall be less than 30 minutes times the peak flow rate. This 30 minute response time shall generally apply to areas not adjacent to water courses and within 10 road miles of the treatment facility.

Pump Flow Rate: A single pump flow rate should sufficiently exceed the peak inflow rate to be effective.

Pump Cycle Times: Pump cycle time, from "pump off" to "pump on" shall not be less than 10 minutes at peak flow and shall take into consideration any line back-draining requirements.

Design Line Size and Volume Requirements

Given:

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

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

Conditions:

$Q_p >> Q_i$

For 3" line: $66 \text{ gpm} < Q_p < 150 \text{ gpm}$
For 4" line: $118 \text{ gpm} < Q_p < 270 \text{ gpm}$
For 6" line: $265 \text{ gpm} < Q_p < 600 \text{ gpm}$

$V_e > (30)(Q_i)$ (minimum)
$V_w > (5)(Q_p)$
$V_w > (10)(Q_i) + V_b$

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

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

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

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

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

3. Sewer Services

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

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

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

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

4. Sanitary Sewer Manholes

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

D. WATER

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

1. Main Line

a. To and Through: All main lines shall be extended through the property to be served within a Public Right of Way and extend to neighboring property lines on all sides of the property planned for development.

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

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

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

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

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

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

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

e. Required Information on Drawings
All drawings that include water and sewer mains submitted for review by the City Engineer shall have the street station and offset, size, number, and type of fittings specified at the location they occur. Specifying only the deflection angle of the line, e.g. 30°, is not acceptable.

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

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

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

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

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5. Cleanouts

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

6. Access to Sewer Facilities

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

7. Sampling Manholes

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

8. Grease Interceptor

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

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

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

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

h. Valves

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

i. Detection Tape and Wire

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

j. All Weather Access

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

k. Thrust Restraint

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

2. Meters

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

3. Fire Hydrants

a. General

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

b. Location

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

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

c. Staking

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

d. Concrete Pad

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

e. Bollards

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

E. UTILITIES

1. Prohibition on Cutting Recently Constructed Streets

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

2. Utility Conduit

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

3. Shared Trenches

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

4. Utilities in Public Rights of Way

a. General

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

b. Plan Submittal

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

5. Trench Patching in Paved Right of Way Areas

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

6. Trench Backfill

Trench backfill shall conform to the Standards and Specifications.

F. IRRIGATION

1. General

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

2. Materials

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

III. DRAWINGS

A. SUBMITTAL

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

B. PLAN SCALE & SIZE

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

C. INFORMATION REQUIRED ON PLAN

1. General

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

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

2. Streets

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

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

3. Stormwater – See Chapter 3 Central Oregon Stormwater Manual

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

4. Sanitary Sewer

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

5. Water

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

6. Construction Cost Estimate and Fees

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

DIVISION I TRENCHES

101 TRENCH EXCAVATION, BEDDING AND BACKFILL

101.1.00 DESCRIPTION

Minimum general standards for facilities shall be as set forth in Section 00405 of the Oregon Standard Specifications for Construction, current edition. This work consists of excavating trenches, constructing trench foundations, placing bedding, pipe zone material, and trench backfill.

101.1.01 PIPE ZONE

The pipe zone is defined as the full width of the trench from 4-inches below the bottom outside surface of the barrel of the pipe to 12-inches above the top outside of the barrel of the pipe.

101.1.02 TRENCH FOUNDATION

The trench foundation shall be undisturbed material. Where ground water, unsuitable material, or other unstable conditions exist additional excavation may be required.

101.2.00 MATERIAL

101.2.01 BEDDING & PIPE ZONE

Pipe zone material and bedding for pipes and structures shall be Class C backfill, or other select material as directed by the Engineer. Samples of the proposed material including technical information such as gradation, proctor test results, and certifications shall be submitted to the Engineer for approval prior to construction.

101.2.02 TRENCH BACKFILL

Material used for trench backfill below subgrade shall be earth, gravel, rock, or combinations thereof, free of frozen material and with less than 1 percent by weight of deleterious material such as humus, organic matter, vegetable matter, clods, sticks, and debris. The backfill material shall predominate in the finer sizes and, in place, shall present no isolated voids, silt pockets, or areas of larger stones, which could cause fracture or denting of the utility or structure, or subject it to undue point stresses.

Pumice and cinders are not acceptable for trench foundations, pipe bedding, pipe zone or trench backfill material. Material with a compacted density less than 80 pcf based on AASHTO T-99 standard proctor is not acceptable.

Trench backfill shall consist of the following material:

101.2.02A Class A Backfill

Class A backfill shall be native or common material acceptable to the Engineer. The intent is that material excavated on the site may be used for backfill after being screened on a 3-inch screen. Class A backfill shall meet the following:

1) No rock, soil clod or hardpan fragment has a dimension of greater than 3-inches.

2) No more than 30 percent by weight shall be larger than ¾-inch.
3) Material passing the #200 sieve shall not exceed 25 percent by weight of the total sample.

101.2.02B Class B Backfill
Class B backfill shall be pit run or bar run material, well graded from coarse to fine. The maximum dimension shall be 3 inches and meet the following criteria:

1) Shall have more than 90 percent by weight passing a 3/4-inch screen
2) Shall contain no rock, soil clod or hardpan fragment larger than 1-inch
3) Shall be free of humus, organic matter, vegetable matter, frozen material, clods, sticks and debris
4) Shall contain no more than 10 percent by weight passing the #200 sieve.

101.2.02C Class C Backfill: Minimum standards under new or existing aphalt and pipe zone.
Class C Backfill shall be ¾- clean, well graded crushed rock /gravel, free from organic matter and in accordance with the latest ODOT Standards and Specifications.

101.2.02D Cement Treated Base (CTB) Backfill
Cement Treated Base shall conform to the requirements of the Oregon Department of Transportation, State Highway Division. It shall contain 4.5%- 5.5% cement by weight (1 to 2 sacks of cement per ton). CTB shall be used as trench backfill for street crossings where subgrade conditions are likely to cause differential settlement of the trench section, and for high traffic areas as directed by the Engineer.

101.2.02F Controlled Low Strength Material
Controlled Low Strength Material (CLSM) shall conform to Section 00442 of the Oregon Standard Specifications for Construction. The minimum proportions of the mix shall be one sack cement to one ton of sand. CLSM may be placed in one lift, but do not agitate or use mechanical compaction. CLSM shall be required as backfill for trenches less than 18 inches in width (section 101.3.01C) or in high traffic areas as required by the Engineer.

101.3.00 CONSTRUCTION

101.3.01 TRENCH EXCAVATION

101.3.01A General
The Contractor shall be solely responsible for obtaining all applicable State, County, or City street cutting permits, and shall comply with all provisions of the permits. The Contractor shall comply with all City, County, State and Federal Highway Construction Safety and Health Standards pertaining to trenches and excavations, and traffic control. Prior to installing pipe or other utility in an unimproved street, the roadway shall be staked for subgrade to assure that adequate bury, depth of cover, and utility separation is acquired.

101.3.01B Trench Width and Depth
The trench depth below the finish profile elevations and width at the bottom shall be as listed in the following table for the size and type of pipe as indicated on the approved plans. The top of the ditch shall be 6 inches wider than the nominal width, and shall conform to all safety standards and regulations.

Pipe Size I.D.	Min. Depth Wtr & Sewer	Max Width Wtr & Sewer	Min. Width Water	Min. Width Sewer
Less than 6"	32"	30"	24"	30"
6"	48"	36"	24"	30"
8"	50"	36"	24"	30"
10"	52"	42"	30"	30"
12"	54"	42"	30"	30"
14" - 16"	56" – 58"	48"	36"	36"
18" - 24"	60" - 66"	52"	40"	40"
Greater than 24"	66"	60"	48"	48"

101.3.01C Trenches Narrower Than 18 Inches
Trenches less than 18 inches in width under pavement shall be backfilled with controlled low strength material (CLSM).

101.3.02 PIPE BEDDING
The bottom of the trench shall be graded by hand to the elevation at which pipe is to be placed with a 6 inch depth of compacted pipe bedding material as specified in 101.2.02. Before each section of pipe is installed the grade shall be checked with a straight-edge, level/rod, or laser level, and any irregularities found shall be corrected. The pipe bedding shall form a continuous and uniformly compacted bearing surface and support for the pipe or structure.

A coupling or bell hole shall be dug in the trench bottom having a length, width and depth sufficient to allow assembly of the pipe, and to maintain a minimum clearance of 6 inches between coupling and undisturbed trench bottom. The trench bottom between coupling holes shall be dug flat and cut true and even to grade so as to provide continuous contact of the bedding with the pipe.

No blocking shall be used to achieve the required depth of bedding.

101.3.03 PIPE ZONE
Pipe zone material shall be Class C material as specified in 101.2.02C. Backfill material above, and around the pipe shall be carefully and thoroughly tamped in layers no more than 6 inches deep to achieve 95% of maximum density as determined by AASHTO T-99 or ODOT Manual of Field Test Procedures.

101.3.04 TRENCH BACKFILL
Backfill material shall be Class C placed in accordance with APWA Section 00405.46 except for the following options:

1) For trenches outside of the existing or new asphalt roadway the backfill material may be Class A backfill as specified in 101.2.02A from 12" above the pipe zone to subgrade.
2) For trenches under ODOT and Deschutes County roadways and for specific other cases designated by the City Engineer the backfill material shall be Class D or F depending on jurisdiction as specified in 101.2.02D or F from 18" above the pipe zone to subgrade..

The material shall be carefully and thoroughly tamped in layers to achieve 95% of maximum density as determined by AASHTO T-99. Methods of testing materials in the field may include nuclear

densometer, sandcone, WA densometer, or other methods approved by the Engineer.

101.3.05 COMPACTION TESTING

For trenches with three feet or less of cover over the pipe zone, one compaction test shall be taken per 100 lineal feet of trench at top of pipe zone and at finish subgrade elevations. For installations deeper than three feet trench backfill shall be tested at one passing test for each 3 feet of fill and 100 LF of trench, or as directed by the Engineer. Passing tests shall meet the requirements for compaction in that segment of the trench backfill. All sampling and testing shall be performed by an independent testing laboratory acceptable to the City of Sisters. All results, including failing tests, shall be submitted to the City of Sisters inspector or Engineer prior to any subgrade inspection and approval.

101.4.00 MEASUREMENT AND PAYMENT

101.4.01 LINEAR FOOT BASIS

The length of trench shall be measured horizontally from center to center of manholes, or to the end of pipe, whichever is applicable.

Payment for TRENCH EXCAVATION will be at the unit price bid per lineal foot for the specified pipe class and diameter as measured. Payment shall include all materials, tools, labor, equipment, bedding, backfill and incidentals required to excavate and backfill the trench as specified. All excavation shall be considered as unclassified as specified in Section 204.1.02, unless specifically called for in the Schedule of Bid Items.

101.4.02 INCIDENTAL BASIS

When not listed in the Schedule of Bid Items as a separate pay item, TRENCH EXCAVATION shall be considered incidental to the price bid for the specified pipe or conduit and diameter.

DIVISION II - STREETS AND RELATED WORK

201 MOBILIZATION

201.1.00 DESCRIPTION

This work consists of operations necessary to move personnel, equipment, supplies, and incidentals to the project site, set up all field offices and facilities, and other preparatory work necessary in preparation to perform contract work.

201.4.00 MEASUREMENT AND PAYMENT

201.4.01 LUMP SUM BASIS

When listed in the proposal as a pay item, payment for mobilization will be the Contract lump sum amount. There will be no measurement of work performed under this section.

The amounts paid for mobilization in the progress payment(s) will be based on the percentage of the original Contract amount that is earned from other contract items, not including advances on materials, and as follows:

1) When 15% is earned from other bid items, 50% of the amount for mobilization or 15% of the original contract amount, whichever is the least, less normal retainage, will be paid.
2) When 50% is earned from other bid items, 100% of the amount for mobilization or 50% of the total original contract amount, whichever is the least, less normal retainage, will be paid.
3) Upon completion of all work on the project, payment of any amount for mobilization in excess of 50% of the total original contract amount will be paid.

a. The above schedule of payments for mobilization shall not be construed to limit or preclude progress payments otherwise provided for in the contract.

201.4.02 INCIDENTAL BASIS

When neither specified nor listed in the proposal for separate payment, mobilization shall be considered incidental work for which no separate payment will be made.

202 TEMPORARY TRAFFIC CONTROL

202.1.00 DESCRIPTION

This work consists of maintaining facilities to accommodate public traffic through and within the project site as necessary to conduct construction operations so as to offer the least possible obstruction and inconvenience to the public, and to protect pedestrian and vehicular traffic. Where applicable, Section 00220 of the ***Oregon Standard Specifications for Construction*** and the ***Manual of Uniform Traffic Control Devices*** shall apply. The work shall include, but is not limited to the following, hereafter referred to as Traffic Control Devices:

A. Semi-permanent Traffic Control Devices are defined as devices maintained at one location during the life of the contract or until replaced by other signs.
B. Temporary Traffic Control Devices are such devices as certain warning signs and traffic cones which may be moved frequently.

C. Flaggers include personnel, pilot cars and associated warning signs.

202.1.01 TRAFFIC CONTROL PLAN

At the pre-construction conference, the Contractor may be required to submit to the City Engineer for approval a Traffic Control Plan and Schedule for the type and placement of all Traffic Control Devices and other Temporary Traffic Control. The Contractor's plan shall include such items as the spacing and size of Traffic Control Devices, the legends of warning signs, the methods of supporting Traffic Control Devices, the number of flaggers required, and periods of operation requiring flaggers.

During the performance of the work, the Contractor shall notify the Engineer, and obtain approval from the Engineer, for any revision or modification of this plan.

All Traffic Control Devices shall remain the property of the Contractor.

202.1.02 FAILURE TO MAINTAIN TRAFFIC CONTROL DEVICES

Failure to maintain Traffic Control Devices in accordance with the plans and specifications shall result in the immediate suspension of work. During suspension of the work for failure to maintain Traffic Control Devices, workdays will continue to be charged to the Contract. The following representatives of the City of Sisters shall have the authority to suspend work for failure to maintain Traffic Control Devices:

City Engineer or authorized representatives
Public Works Director
Uniformed officers of the Deschutes County Sheriff's Department

During suspension of work, for any reason, the Contractor shall continue to be responsible for and shall maintain temporary Traffic Control.

202.2.00 MATERIALS

Flaggers, procedures, barricades, signs, and other Traffic Control Devices shall conform to the latest edition of the ***Manual on Uniform Traffic Control Devices for Streets and Highways***, published by the U.S. Department of Transportation Federal Highway Administration, and the Oregon Sign Policy and Guidelines for the State Highway System, published by the Oregon Department of Transportation.

202.3.00 CONSTRUCTION

Semi-permanent Traffic Control Signs shall be mounted on single or double posts such that the bottom of the sign is 7' above the ground. All other signs may be mounted on acceptable portable and temporary bases.

All devices shall be maintained by the Contractor in proper position, clean, and legible at all times. Lights, flashers, and similar devices shall be kept clean, visible, and operable. Devices damaged or destroyed by any means shall be immediately repaired, restored, or replaced by the Contractor. On a daily basis, and prior to beginning and ceasing operation, the Contractor shall patrol the traffic control area for the purpose of maintaining devices and removing or covering all non-applicable signs during periods not needed. Unless otherwise specified in these documents, public traffic shall be permitted to pass through the work with as little inconvenience and delay as possible. The Contractor shall provide access to private properties at all times except during brief, urgent stages of construction.

The Contractor shall delineate all business accesses with blue tubular markers on 10 foot maximum spacing. Mark the access with Type "B" "BUSINESS ACCESS" signs. Locate and install these signs on Type 2 barricades as directed. Business owner(s) shall be given 72 hours notification in advance of operations requiring temporary closures of business access, when necessary and when no other access to the business can be provided.

The Contractor shall give occupants of property fronting a street at least 48 hours notice before more than half the street is closed to vehicular traffic due to his operations. The Contractor shall not close a street without prior knowledge of the Engineer and permission of the City of Sisters. The Contractor is responsible for coordinating the closing of a street with all concerned and affected individuals and public agencies. Notify, in writing, the Engineer, all affected emergency services, school district, and U.S. Postal Service a minimum of seven (7) calendar days prior to any road closure.

For pipe installation in major City streets and intersections, backfill and pave the excavation at the end of each shift, or use other methods as approved by the Engineer to provide a traversable surface across the entire roadway width during non-working hours. If this requirement is not met, provide additional traffic control measures, including flagging, as required by the Engineer at no additional cost to the City.

202.4.00 MEASUREMENT AND PAYMENT

202.4.01 LUMP SUM BASIS

When listed in the proposal as a separate pay item, measurement and payment for Temporary Traffic Control will be made on Lump Sum basis. Payment will be pro-rated based on workdays charged over the contract time. Upon completion of the contract any remaining portion of the lump sum amount will be paid.

202.4.02 INCIDENTAL BASIS

When neither specified nor listed in the Proposal as a separate pay item, Temporary Traffic Control will be considered incidental work for which no separate payment will be made.

202.4.03 PER ITEM BASIS

When listed in the proposal as a separate pay item, Semi-permanent Traffic Control Signs shall be measured by the square foot of sign area. Payment will be only for those signs approved by the Engineer and called for in the Traffic Control Plan and Schedule. Payment shall be full compensation for constructing, providing and maintaining the traffic control signs for the life of the contract. Where flashers, lights or the equivalent are specified, any cost for such items shall be incidental to the price bid. Payment will be at the contract unit price bid for Semi-permanent Traffic Control Signs.

When listed in the proposal as a separate pay item, semi-permanent Traffic Control Barriers shall be measured by the lineal foot of barrier face. Payment will be only for those barriers approved by the Engineer and called for in the Traffic Control Plan and Schedule. Payment shall be full compensation for constructing, providing, and maintaining the Traffic Control Barriers for the duration of contract work requiring barriers. Where flashers, lights, or the equivalent are specified, any cost for such items shall be incidental to the price bid. Payment will be at the contract unit price bid for Traffic Control Barriers.

When listed in the proposal as a separate pay item, Flaggers shall be measured by the actual

hours each Flagger is required to work. Hours will be measured to the nearest whole hour. All associated safety equipment, signs, tools and materials shall be incidental to the price bid. Payment will be only for Flaggers approved by the Engineer and called for on the Traffic Control Plan and Schedule. Payment shall be at the contract unit price bid for Flaggers.

203 CLEARING AND GRUBBING

203.1.00 DESCRIPTION

Except as modified or supplemented herein the provisions of Section 00320 of the ***current edition Oregon Standard Specifications for Construction*** shall apply.

CLEARING AND GRUBBING shall include, but not be limited to, the removal and disposal of all concrete including curbs, sidewalks and walls; all vegetative growth such as trees, snags, down timber, vines, shrubs, brush, stumps; fences, guard rails, irrigation pipe and street structures, pavement, debris and rubbish of any nature; and other similar items not specifically covered by unit price. All debris shall be broken up and removed from the site. The work also includes preserving vegetation and objects designated to remain in place and cleanup of the work area.

203.3.00 CONSTRUCTION

Trees, shrubbery and flowerbeds designated on the plans or directed by the Engineer to remain shall be left in place and care shall be taken by the Contractor not to damage or injure such trees, shrubbery or flowerbeds by any of Contractor's operations.

Where trees exist in parking areas and are not to be removed, it shall be the Contractor's responsibility to trim low limbs which will interfere with the normal operation of Contractor's equipment. The trimming shall be performed in a professional manner by competent personnel prior to Contractor's machine operations and in such a manner as the Engineer or designee may direct.

The Contractor shall be responsible for all damages to existing improvements resulting from his construction operations or acts by his employees.

203.3.01 DISPOSAL

All matter and debris accumulated from clearing and grubbing operations become the Contractor's property. The Contractor shall make arrangements for disposal of this material in accordance with local laws and regulations. All expenses for disposal of waste materials shall be the responsibility of the Contractor.

203.3.02 EROSION AND SEDIMENT CONTROL

Erosion and sediment control measures shall be installed in accordance with Appendix 9B of the Central Oregon Stormwater Manual to insure that sediment laden runoff does not leave areas disturbed by construction.

203.4.00 MEASUREMENT AND PAYMENT

CLEARING AND GRUBBING will not be measured. Removal and disposal of all trees not specifically covered under TREE REMOVAL item shall be considered incidental to CLEARING AND GRUBBING. Payment will be at the contract lump sum amount bid for CLEARING AND GRUBBING. Payment shall include full compensation for all labor, equipment, tools, and incidentals necessary to complete the work and dispose of all waste materials.

204 EARTHWORK

204.1.00 DESCRIPTION

Except as modified or supplemented herein, the provisions of Section 00330 of the ***current edition APWA Oregon Standard Specifications for Construction*** shall apply.

This work consists of excavation and grading the roadway, side streets, sidewalk and planting areas, alleys, cuts, embankments, slopes, roadway ditches, side streets, driveway and alley approaches and all other earth moving work required in the construction of the project including disposal of all surplus material. The term "earthwork" will be used as a general term to designate the work included within the scope of this section.

204.1.02 UNCLASSIFIED EXCAVATION

Unclassified excavation is defined as all excavation regardless of the type, nature, or condition of the materials encountered. The Contractor shall assume full responsibility to estimate the kind and extent of the various materials to be encountered in the work.

204.2.00 MATERIALS

Excavated materials may be used on the project unless declared unsuitable or surplus by the Engineer. It is the responsibility of the Contractor to separate unsuitable material from the excavated material, and to make arrangements for disposal of surplus material.

204.2.01 BORROW AND EMBANKMENT MATERIAL

Fills and embankments shall be constructed with material from the excavations or borrow material, subject to approval by the Engineer. Should additional fill material be needed, the Contractor shall supply borrow material in accordance with specifications acceptable to the Engineer.

204.3.00 CONSTRUCTION

204.3.01 PRESERVATION OF EXISTING IMPROVEMENTS

Asphalt pavement saw cuts shall be straight lines, having vertical faces and are required wherever existing pavement is to be matched or removed to a line designated on the plans and as directed by the Engineer.

204.3.02 EXCAVATION OF EXISTING IMPROVEMENTS AND MISCELLANEOUS

Removal of existing roadbeds and driveways are included in the general excavation quantities. The Contractor will be responsible for the excavation of areas to be patched with asphalt concrete.

The Contractor shall place base material in all areas designated for asphalt patching as shown on the drawings. Base material shall be provided by the Contractor where a separate contract for paving work exists. No separate payment will be made for this work, but shall be considered incidental to General Excavation.

Base material shall be provided by the Contractor designated to provide base material, such that immediately upon approval by the Engineer, traffic ramps of base material shall be placed at such locations as Driveway AC Patch, ends of existing cut pavement, and other areas as directed by the Engineer. Placing of base material ramps shall not be measured or paid for separately, but shall be considered incidental to GENERAL EXCAVATION.

204.3.03 PREPARATION OF EMBANKMENT FOUNDATION

The area to be filled shall first be cleared and grubbed. The Contractor shall break up and roughen the ground surface before embankment material is placed. Areas designated as Obliterate Roadway shall be broken up so no fragment has a dimension greater than 6". The loosened and broken fragments shall be mixed and blended such that no seams shall form in the compacted fill. The Contractor shall compact the natural ground underlying embankments to the depth of the grubbing, or a minimum of 12", to the relative density specified for the embankment material to be placed.

204.3.04 EMBANKMENT CONSTRUCTION

A. **Earth Embankment Construction**

Earth embankments shall be defined as those embankments constructed of materials less than 6 inches in greatest dimension. The material shall be placed in lifts as directed by the Engineer not to exceed 3 feet in depth. Within 3 feet of subgrade or finished slope, the placement of fill shall be in lifts not to exceed 8 inches. Each lift shall be compacted by tamping, sheepsfoot rollers, pneumatic tire rollers, or other mechanical means approved by the Engineer, to produce the specified relative compaction. At locations where it would be impractical to use such compacting equipment, fill layers shall be compacted to the specified requirements by hand directed compaction equipment.

Unless otherwise specified, each lift shall be compacted to a relative density of 95% of maximum as determined by AASHTO T-99 Method A.

When soil types or a combination of soil types are encountered that develop densely packed surfaces as a result of spreading or compaction operations, the surface of each lift shall be sufficiently roughened after compaction to insure bonding to the next succeeding layer.

B. **Rock Embankment Construction**

Rock embankments shall be defined as those embankments constructed of material containing particles greater than 6 inches in greatest dimension.

No rock embankments shall be constructed of material larger than 3 feet in greatest dimension. The material shall be placed in lifts as directed by the Engineer not to exceed 3 feet in depth. Within 3 feet of subgrade or finished slope, the placement of fill shall be in lifts not to exceed 8 inches with any rock fragments having a dimension greater than 8 inches. The rock shall be distributed and manipulated in such a manner that the interstice space between the larger pieces shall be filled with smaller pieces, forming a dense homogeneous and compact mass. All materials shall be maintained at the optimum moisture content during all phases of the embankment operation.

After each lift of material is placed and spread in such a manner to completely fill all interstices with material no greater than 1/4" in greatest dimensions, said lifts shall be compacted with sufficient compaction effort to achieve the required density. Compaction effort shall at a minimum equal or exceed the following levels:
Each 6 inch depth of lift or fraction thereof shall be compacted with at least one full pass with a vibratory roller having a minimum dynamic force of 40,000 pounds impact per vibration and a minimum frequency of 1,000 vibrations per minute, providing this

produces the specified density of material.

If the nature of the material and the Contractor's operation demonstrates that a lift thickness of 1.50 feet is not exceeded and complies with all applicable specifications, then each lift shall be compacted with 4 full passes per 6 inch depth, or portion thereof, of lift with an approved vibratory roller with a dynamic force of not less than 30,000 pounds impact per vibration and a minimum frequency of 1,000 vibrations per minute, providing this produces the specified density.

Rollers shall be so constructed that they exert uniform pressure over the area covered. Vibratory rollers shall be operated at speeds not to exceed 1.5 miles per hour. In addition to the above rolling, each lift shall be further compacted by routing loaded and unloaded hauling equipment uniformly over the entire length and width of the embankment.

Unless otherwise specified, each lift shall be compacted to a uniform density of 95% of maximum as determined by AASHTO T-99 Method A.

204.3.05 COMPACTION AND DENSITY REQUIREMENTS

Fill shall be compacted to not less than 95 percent maximum density as determined by AASHTO T-191, or an equivalent method approved by the Engineer. Compaction testing shall be performed in conformance with Division I, Section 101.3.05

204.3.06 FINISHING

Areas, where "grade only" is called for on the plans, shall be graded to meet the tolerances for the subgrade where base material is to be placed. The surface shall be constructed to a straight grade from the finished improvement elevations shown on the plans to the elevations of the existing ground at the extremities of the area to be graded. Driveways shall be constructed to a straight grade from the finished improvement elevations to the elevation of the existing driveway for the width of the driveway as shown on the plans. The area shown on the plans for "grade only driveway" does not include cut and fill slopes. Such slopes shall conform to the specifications given with the typical section for the station of the driveway. Grade only shall not be paid for separately, but shall be considered incidental to GENERAL EXCAVATION.

204.4.00 MEASUREMENT AND PAYMENT

204.4.01 UNCLASSIFIED AND CLASSIFIED EXCAVATION

Unless otherwise indicated in the Contract Documents, all excavation shall be considered unclassified. GENERAL EXCAVATION has been computed from cross sections and the excavation will not be re-measured unless there are plan changes that are directed or approved by the Engineer. The estimated quantity on the Schedule of Bid Items will be the measured quantity for payment. In the event of plan changes, the estimated quantity will be adjusted to reflect the change. Changes in general excavation will be measured by the cubic yard and payment will be made at the contract unit price bid for GENERAL EXCAVATION.

The unit price bid per cubic yard shall include full compensation for all labor, equipment and materials required to excavate the roadway to the lines and grades shown on the plans.

Asphalt pavement cuts will not be measured or paid for separately, unless specified on the plans and listed in the Schedule of Bid Items. If not listed separately, Asphalt pavement cuts will

be considered incidental work to GENERAL EXCAVATION.

204.4.02 EMBANKMENT

The pay quantities of "Embankment in Place" will be limited to the neat lines of specified cross sections, lines, grades and slopes and above the ground or base elevations existing at the time embankment construction thereon begins. The pay quantities will not include additional quantities required caused by subsidence or settlement of the ground or foundations, to settlement of materials within the embankments, or to shrinkage, washout, slippage or loss of material regardless of cause. If at any time during construction the contractor feels that this is not an accurate representation of actual embankment constructed, he/she shall notify the City immediately of the possible discrepancy. The Contractor shall be responsible for collection of data necessary to determine the actual amount of construction embankment. The cost of data collection will be considered incidental to payment for unit prices, and no separate payment will be made. Cross-Sectional information used in the design of the project will be made available by the City.

205 WATERING

205.1.00 DESCRIPTION

Except as modified or supplemented herein, the provisions of Section 00340 of the ***current edition Oregon Standard Specifications for Construction***, shall apply.

This work consists of furnishing and applying water, or combinations of water and additives for compacting and preparing excavations, embankments, backfills, subgrades, subbases, surfacings or for dust control, clean-up, or other purposes as determined by the Engineer. Excluded from this section is water used in portland cement concrete construction and water used for testing purposes.

205.2.00 MATERIAL

205.2.01 WATER

Water used in the work shall be free of silts and hazardous or deleterious substances. The Contractor shall maintain an adequate supply of water at the job to conduct operations in a timely manner.

The City may provide water for a fee to the Contractor from a fire hydrant or similar source. The Contractor must make application to the City Public Works Department for such service prior to using any City water. Only City furnished and approved metering devices connected to designated fire hydrants may be used to obtain water from the City water distribution system. An approved air gap for backflow prevention shall be provided prior to filling any water trucks or tanks.

205.3.00 CONSTRUCTION

The Contractor shall apply water by means which result in uniform and controlled application.

If the Contractor has not provided water as ordered by the Engineer, the Owner may provide water and charge any applicable costs to the Contractor.

205.4.00 MEASUREMENT AND PAYMENT

205.4.01 UNIT PRICE BASIS

When listed in the proposal as a separate pay item, measurement and payment for Watering will be made on a unit price basis. The Contractor shall be responsible for maintaining an accurate record of the amount of water approved or ordered by the Engineer and applied to the project; and for submitting these records with progress payment requests for payment on a monthly basis. Water will be measured by the number of thousands of gallons actually used according to the records maintained by the Contractor on City authorized forms and as verified by the Engineer.

Payment for water will be at the contract unit price bid for each 1,000 gallons (Kgal) of water, as measured to the nearest 1,000 gal increment.

205.4.02 INCIDENTAL BASIS

When neither specified nor listed in the Proposal as a separate pay item, watering will be considered incidental work for which no separate payment will be made.

206 SUBGRADE

206.1.00 DESCRIPTION

This work consists of excavating and disposing of unstable materials, and placing subgrade geotextiles, rock embankment and/or aggregate backfill necessary for the preparation of the subgrade. Subgrade is defined as the surface area upon which additional materials are to be placed as part of the work covered by this contract, or by future work.

206.3.00 CONSTRUCTION

206.3.01 PREPARATION

Prior to starting subgrade work, all underground work and installation of utilities in the area of the subgrade shall be completed.

The Contractor shall blade, shape, and compact the subgrade to lines and grades as shown or directed, removing all irregularities and securing a uniform surface. The Contractor shall remove all unsuitable material as directed and replace with suitable material at no extra cost to the owner.

After the placement of curbs and drainage structures, the Contractor shall fine blade the subgrade surface to the specified tolerances.

206.3.02 TOLERANCES

Subgrade shall not vary by more than 0.05 foot from the specified grades and cross section, except that, at the discretion of the Engineer, the specified grades and cross section at centerline may vary 0.1 foot, provided that the variance is at least 75 feet from a manhole or fixed feature, does not affect drainage, and a uniform and regular cross section is maintained. Variations within the above specified tolerances shall be compensating so that the average grade and cross section shall meet these specifications.

206.3.03 GEOTEXTILE STABILIZATION

Geotextile fabric installation for embankment reinforcement or subgrade/subbase stabilization

will be as directed by the Engineer in locations where unsuitable materials are found below subgrade. Geotextile installation shall be in conformance with Section 00350 of the ***APWA Oregon Standard Specifications for Construction, latest edition.***

206.4.00 MEASUREMENT AND PAYMENT

No measurement or separate payments will be made for work required for the preparation of subgrade. This work is incidental to the price bid for EXCAVATION.

Furnishing and installation of Geotextile fabric, where directed by the Engineer, will be paid for on a square unit measurement basis. Payment will be full compensation for all equipment, labor, and incidentals necessary to complete the work. No separate payment will be made for constructing laps, seams, joints, and patches unless the Engineer orders additional amounts over the minimum.

207 AGGREGATE BASES

207.1.00 DESCRIPTION

This work consists of furnishing and placing, spreading, compacting, and fine grading aggregate base material for streets, driveways, sidewalks, pathways, and other structures. All work shall be in accordance with Section 00641 of the current ***Oregon Standard Specifications for Construction***, and as supplemented or modified hereafter.

207.2.00 MATERIALS

Base aggregates shall consist of crushed gravel or crushed rock, including sand, free of frozen material, with less than the percentage listed below by weight of deleterious material, to include humus, organic matter, vegetable matter, clods, sticks, and debris.

207.2.01 FRACTURE OF GRAVEL

Gravel shall have at least one fractured face on 50 percent of the material retained on each sieve size 1 1/2 inch and above and 70 percent for the material passing the 1 1/2-inch sieve and retained on each of the sieves down to 1/4 inch.

207.2.02 DURABILITY

The source material from which aggregate base materials are obtained, produced or manufactured, shall meet the following qualifying test requirements.

Test	Test Method	Requirements
Degradation (Coarse Aggregate):		
Passing No. 20 sieve	ODOT TM 208	30 percent maximum
Sediment Height	ODOT TM 208	3 inch maximum
Abrasion:	AASHTO T 96	35 percent maximum

207.2.03 SAND EQUIVALENT

Base aggregates to be incorporated in the work shall have a sand equivalent of not less than 30 when tested in conformance with AASHTO T 176.

207.2.04 DELETERIOUS MATERIALS

207.2.04A Wood Waste
Allowable limits of wood waste, as determined by weight by test method OSHD TM 225, follow:

(1) Arterial - 0.1 percent
(2) Collector – 0.1 percent
(3) Local Street & Cul-de-sac - 0.35 percent
(4) All Weather Surface Road - 0.35 percent
(5) Alley - 0.35 percent

Oversize pieces, which are retained on the top sieve size, are limited to 25 percent of the total amount of wood waste allowed.

207.2.04B Metal Waste
Allowable limit of metal waste, as determined by weight, is 0.1 percent.

207.2.05 GRADING REQUIREMENTS
Base aggregates shall conform to the following grading requirements.

Separated Sizes:	**2½"-0**	**2"-0**	**1½"-0**	**1"-0**	**¾"-0**
Sieve Size	% Passing (by weight)				
3"	100				
2 1/2"	95-100	100			
2"		95 - 100	100		
1 1/2"			95 - 100	100	
1 1/4"	55 -75				
1"		55 - 75		90 - 100	100
3/4"			55-75		90 - 100
1/2"				55 -75	
3/8"					55 - 75
1/4"	30 - 45	30 - 45	35 - 50	40 - 55	40 - 60
No. 10	12 -27	12 - 27	14 - 30	16 -33	16 - 36
No. 40	0 - 16	0 - 16	3 - 18	8 - 24	8 - 24
No. 200	0 - 9	0 - 9	0 - 8	0 - 8	0 - 10

Sieve analysis will be determined according to AASTO T 27.

BASE AGGREGATE GRADATION FOR LOCAL STREETS

	1"-0 BASE	3/4"-0 BASE
SIEVE SIZE	% PASSING	% PASSING

1 1/2	100	-
1	90-100	100
3/4 -0	-	90-100
1/2 -0	50-80	-
3/8 -0	-	50-80
*1/4-0	35-50	40-60

Recommendation for base: 1"-0 or 3/4"-0.
* Of amount passing 1/4" sieve, 40-60% shall pass the No.10 sieve.

207.2.06 DRY UNIT WEIGHT
Base aggregates for use on arterials and collector streets shall have a dry unit weight of not less than 100 lbs./C.F. as determined per AASHTO T19.

207.2.07 ACCEPTANCE
Aggregate base will be sampled for acceptance in the following priority order:

(a) Immediately after crushing as long as produced and placed within one year of placement.

(b) In the stockpile after all shaping work has been completed; or, one test per project or 1 test every 5,000 cubic yards.

(c) In its final state on the roadbed after all processing and prior to the placement of subsequent surfacing materials; See Section 108.2.00 General Conditions, for testing procedures. Frequency: One test per job or one test per 1,000 cubic yards.

*Jobs 500 Cu. Yd or less may use letter of certification or an approved testing lab as proof of acceptable aggregate base.

207.3.00 CONSTRUCTION

207.3.01 STOCKPILING

The materials to be furnished in stockpiles shall be of the kinds, sizes and quality specified. Each designated size of material shall be placed in a separate stockpile.

Stockpiles shall be at least 8 feet high with side slopes of 1 1/2 horizontal to 1 vertical. The method used in placing the material in the stockpile shall be such as to minimize segregation of the aggregate particles.

207.3.02 MIXING
The materials shall be mixed until well blended. The contractor shall add water during mixing in an amount sufficient to provide optimum moisture content plus or minus 2 percent.

The subbase or base course materials shall be mixed by one of the following methods:

(a) Stationary Plant Method - Materials mixed by means of a pug mill or other type of mixer, transported to the project at proper moisture content and placed by an aggregate spreader;

(b) Travel Plant Method - Materials mixed and placed on the project in a continuous operation; or,

(c) Road Mix Method - Materials mixed on the project by motor graders or other approved equipment.

207.3.03 PLACING

207.3.03A Weather Limitations

When, in the judgment of the engineer, weather conditions will be detrimental to the work, the contractor shall suspend operations until the weather is favorable. No aggregate base materials shall be placed in the snow or on a soft, muddy or frozen subgrade.

207.3.03B Equipment

Equipment necessary for construction of aggregate base shall provide for efficient and continuous operation and shall conform to the following requirements.

(1) Hauling equipment - Vehicles for hauling aggregate or mixtures of aggregate and water shall be capable of depositing the material into or in front of spreading equipment with minimum of segregation.
(2) Spreading equipment - The equipment shall be capable of spreading and striking off material to the designated line, grade and transverse slope with a uniform surface texture free of excessive segregation or fracture of material.

207.3.03C Thickness of Lifts

If the required compacted depth of the subbase or base course exceeds 6 inches, it shall be constructed in two or more layers of approximately equal thickness. The maximum compacted thickness of any one layer shall not exceed 6 inches.

207.3.04 COMPACTION

207.3.04A Equipment

Equipment used to compact aggregate bases shall be self-propelled steel wheel or pneumatic tire rollers. Rollers shall be capable of compacting materials to a firm, even surface.

207.3.04B Density

During compaction, materials shall be maintained within 2 percent of the optimum moisture content. The Contractor shall begin compaction of each layer immediately after the material is spread and continue until a density of not less than 95 percent of the maximum density has been achieved. Maximum density will be determined by AASHTO T199 (100% Relative Maximum Density of Granular Base Materials).

If the specified compaction is not obtained, the contractor shall notify the engineer. The contractor may be required to use a modified compaction procedure or apply additional compaction effort. If approved materials meeting the specifications cannot be compacted to the required density regardless of compaction effort or method, the engineer may reduce the required density or direct that alternate materials be used. In no case shall aggregate placement proceed until the contractor is able to compact the material to the satisfaction of the engineer.

207.3.04C Frequency

Compaction test results shall be provided at the rate of one test per 500 square yards of

material in place unless otherwise directed by the engineer.

207.3.05 SURFACE TOLERANCE

The surface of the aggregate base shall be within -0.04 foot to +0.02 foot of plan elevation at any one point. The final surface shall not deviate at any point more than 0.04 foot from the bottom of a 12-foot straightedge laid in any direction on the surface on either side of the roadway crown.

When directed by the Engineer, the surface shall be tested with a 12-foot straightedge furnished and operated by the Contractor. The surface shall not vary from the testing edge by more than 0.04 foot at any point. The engineer will observe this testing and may require additional testing. The average of the variation from the design grade shall not be greater than 40 percent of the allowable maximum variation.

207.3.06 AGGREGATE BASE - CURB

The Contractor shall supply base rock to be placed under the curb with minimum depth of 2" under curb. Base rock under curbs is considered incidental to curb construction, and no separate payment will be made.

207.4.00 MEASUREMENT AND PAYMENT

207.4.01 SQUARE YARD BASIS

Aggregate base will be measured on the surface to the nearest 0.1 foot. Payment will be on a square yard basis, to the nearest 0.1 square yard between the hinge points or curb lines.

207.4.02 CUBIC YARD IN-PLACE BASIS

Aggregate base will be measured and paid for on a cubic yard basis, to the nearest 0.1 yard. The thickness will be measured by depth tests, cores, or elevations.

A minimum of one measurement shall be made for each 300 square yards of material placed. The measurements shall be made to the nearest 0.01 foot.

No additional payment will be provided for measurements in excess of the specified thickness.

207.4.04 CUBIC YARD IN STOCKPILE

Aggregate base will be measured and paid for on a cubic yard basis, to the nearest 0.1 cubic yard, for the material in the stockpile.

207.4.05 TON BASIS

Aggregates will be measured and paid for on a ton basis, to the nearest 0.01 ton.

207.4.06 INCIDENTAL BASIS

When not specified nor listed in the bid schedule, base aggregates will be considered incidental work to Curb, Sidewalk, HMAC Pavement or Asphalt Trench Patch, and no separate payment will be made.

211 ASPHALT CONCRETE PAVEMENT

211.1.00 DESCRIPTION

This work consists of furnishing and placing asphalt concrete pavement as designated on the plans. Asphalt concrete paving materials and construction shall be in accordance with applicable sections of Part 00700 of the ***Oregon Standard Specifications for Construction,*** current edition including all ODOT supplements.

Asphalt Patching consists of paving areas as designated on the plans as Asphalt Patching, or as directed by the Engineer. Asphalt Patching areas shall include driveways, cuts in existing pavement areas to facilitate preservation or new construction and other areas that are behind curb or involve a significant amount of hand labor to complete.

211.2.00 MATERIALS

211.2.01 GENERAL

Hot Mixed Asphalt Concrete (HMAC) shall be hot plant mixed, uniformly coated mixture of asphalt cement, graded aggregate and additives as required in accordance with the approved Job Mix Formula. HMAC shall be of the level specified for the class of street and anticipated traffic volume.

Level 1 HMAC - HMAC for use in applications with very low traffic and only limited exposure to trucks.

Level 2 HMAC - HMAC for use in applications with low traffic volumes and low volume truck traffic.

Level 3 HMAC - HMAC for use in applications exposed to moderate truck traffic.

211.2.02 AGGREGATE

Provide coarse and fine aggregates meeting the requirements of APWA Section 0074.10. Aggregates shall be hard, sound, durable, and free of deleterious substances.

(a) Soundness - Provide coarse and fine aggregate for soundness testing using sodium sulfate salt according to AASHTO T104. The weighted average percentage loss shall not exceed 12% by weight.

(b) Durability - Provide aggregate not exceeding the following maximum values:

Test	Test Method	Coarse Aggregates	Fine Aggregates
Abrasion	ASSHTO	30.0%	
Degradation			
Passing No. 20 sieve	ODOT TM208	30.0%	30.0%
Sediment Height	ODOT TM208	3"	4"

Deleterious Substances

The amount of deleterious substances in each test fraction of the crushed aggregate material shall not exceed the following values:

Test	Test Method	Course Aggregates	Fine Aggregates
Lightweight Pieces	AASHTO T113	1.0%	
Wood Particles	ODOT TM225	0.10%	

Friable Particles	ODOT TM221	1.0%	2.05%
Elongated Pieces(at a ratio of 5:1)	ODOT TM229	10.0%	
Plasticity Index	AASHTO T90		0 or NP
Sand Equivalent	AASHTO T176		45 min.

The aggregate shall be free of all other deleterious substances such as soft or disintegrating pieces, clay, loam, or vegetable matter, either in a free state or adherent to the aggregate.

211.2.03 RECLAIMED ASPHALT PAVEMENT (RAP) MATERIAL

Reclaimed HMAC Pavement material used in the production of new HMAC is optional. No more than 30% rap material will be allowed in the new HMAC pavement.

Recycled material used in HMAC pavement shall have a maximum size of 1 inch prior to entering the cold feed. Any recycled material larger than 1 inch shall be separated by screening or broken down by mechanical means to pass a 1-inch sieve, and reincorporated with the balance of the recycled material to form a mixture acceptable to the Engineer.

The recycled material shall be blended with new aggregate to provide a mix conforming to the job mix formula. If there is evidence that the recycled material is not breaking down during the heating and mixing of the asphalt concrete mixture, the Engineer may elect to modify the maximum size requirement.

211.2.04 ASPHALT CEMENT AND ADDITIVES

Provide asphalt cement conforming to the requirement of ODOT's current publication *Standard Specifications for Asphalt Materials.* The applicable specifications are those contained in the current publication on the date the Project is advertised. Use PG 64-28 or PG 70-28 asphalt unless otherwise specified in the Contract Documents. Refer to Design Standards Section 18 for asphalt binder use on various road classifications.

Asphalt in RAP material, when blended with new asphalt shall provide properties similar to the above specified asphalt. When RAP material is used at a rate of less than 30%, no adjustment to the new asphalt will be required. When utilizing RAP at a rate at or above 30%, the combined RAP and new asphalt shall provide blended properties equivalent to the specified grade. Determine the blended properties according to ASTM D 4887. Determine asphalt cement properties for the RAP material from asphalt cement recovered from the RAP according to AASHTO T 170.

Additives to prevent stripping or separation of asphalt coatings from aggregates, and admixtures used to aid in the mixing or use of asphalt mixes shall be standard recognized products of known value for the intended purpose and approved for use on the basis of laboratory tests. They shall have no deleterious effect of the asphalt material and be completely miscible. Do not use silicones as an additive.

211.2.05 MIX TYPE AND BROADBAND LIMITS

(a) Mix Type - Furnish the type(s) of HMAC shown or directed. The Broadband limits for each of the mix types are specified below. When the plans show an option of two types for a course of pavement, use only one type throughout the course.

(b) Broadband Limits - Provide a Job Mix Formula (JMF) for the specified mix type within the control points listed below:

Sieve Size	3/4" Dense Control Points (% Passing by Weight) Min.	Max.	1/2" Dense Control Points (% Passing by Weight) Min.	Max.	3/8" Dense Control Points (% Passing by Weight) Min.	Max.
1"		100				
3/4"	90	100		100		
1/2"		90	90	100		100
3/8"				90	90	100
No. 4						90
No. 8	23	49	28	58	32	67
No. 200	2.0	8.0	2.0	10.0	2.0	10.0

211.2.06 JOB MIX FORMULA (JMF) REQUIREMENTS

Provide a JMF for the mixture to be used on the Project meeting the criteria set forth below. The JMF shall have been performed or verified according to the ODOT Contractor Mix Design Guidelines for Asphalt Concrete within 5 years of the date the contract was advertised. Perform a new TSR when the source of asphalt changes.

	Level 1	Level 2	Level 3
Design Method	Superpave	Superpave	Superpave
Compaction Level	65 Gyrations	65 Gyrations	65 Gyrations
Air Voids %	3.5	4.0	4.0
VMA, % minimum	1/2" - 14.0	3/4" - 13.0	3/4" - 13.0
	3/8" - 15.0	1/2" - 14.0	1/2" - 14.0
		3/8" - 15.0	3/8" - 15.0
VMA, % Maximum	min + 2.0%	min + 2.0%	min + 2.0%
P No. 200/Eff AC ratio	0.8 to 1.6	0.8 to 1.6	0.8 to 1.6
TSR. % minimum	80	80	80
VFA, %	70 - 80	65 - 78	65 - 75

211.2.07 TOLERANCE

After the JMF is determined, the mixture shall conform to the formula within the following tolerances:

Narrow Band Tolerance
(From Job Mix Formula)

Constituents of Mixture	Base and Leveling Courses	Surface Course
Aggregate Passing 1", 3/4", and 1/2" Sieves specifies in subsection 211.2.05	Within the Broadband ranges specified in subsection 211.2.05	Within the Broadband ranges specified in subsection 211.2.05
Aggregate passing 3/8" sieve	+/- 7.0%	+/- 6.0%
Aggregate passing No. 4 sieve	+/- 5.0%	+/- 4.0%
Aggregate passing No. 8 sieve	+/- 4.0%	+/- 4.0%
Aggregate passing No. 200 sieve	+/- 2.0%	+/- 2.0%
Asphalt cement content	+/- 0.6%	+/- 0.5%
Moisture content at time of discharge From the mixing plant (upper limit)	0.6% max.	0.6% max.

Compaction Density (lower limit):
(a) Normal Lift Pavement (2" +) - 92 percent of maximum density tested according to WAQTC TM 8.
(b) Control Strip Method - 98 percent of target density or 92 percent of maximum density, whichever is the lower value.
(c) Thin Lift Pavement (less than 1-1/2" compacted thickness) See 211.3.18B
(d) Open Graded Mixes - compact as directed by the Engineer.

211.2.08 MODIFICATION OF MIXES

The Engineer reserves the right to modify specified mixes for use under various traffic conditions on various segments of the work and for feathering, spot patching, and other special purposes. The Contractor shall provide mixes proportioned as directed by the Engineer for such purposes, and allow for such changes in the sequence of operations necessary for placement of the modified materials.

Upon written request from the Contractor, the Engineer may approve field adjustments to the job mix formula of up to 2 percent of the aggregate passing the 1/4-inch sieve, 1 percent for the aggregate passing the #8 sieve, and 0.5 percent for the aggregate passing the #200 sieve. These field adjustments to the job mix formula may be made by the Engineer provided the change will produce material of equal of better quality. The above adjustments, or any further adjustments ordered by the Engineer, will be considered the JMF. Adjustments beyond these limits will require development of a new JMF. The adjusted JMF, plus or minus the allowed tolerances, shall be within the broadband limits.

211.2.09 HMAC ACCEPTANCE

The mixture will be visually inspected by the Engineer. If the mixture is considered suspect, the Engineer may verify that the mixture is within acceptable tolerance limits. When requested, obtain samples according to appropriate procedures in the MFTP under the observation of the Engineer at a frequency established by the Engineer. The Engineer will test for gradation, asphalt content, moisture, and RAP content according to the procedures specified in the MFTP. The Contractor will take corrective action when testing shows that HMAC is not within acceptable tolerances.

211.3.00 CONSTRUCTION

211.3.01 PRE-PAVING CONFERENCE

The contractor and subcontractors who are to be involved in the paving work shall meet with the Engineer for a pre-paving conference at a time mutually agreed upon. At the conference, the contractor shall discuss the proposed methods of accomplishing all phases of the paving work.

211.3.02 WEATHER LIMITATIONS

Asphalt concrete shall be placed on a dry prepared surface when the surface temperature is not less than specified below:

Normal Specified Compacted Thickness of Individual courses*	Wearing Course	All Other Courses
Less than 1 1/2"	55°F	50°F
1 1/2" to 2 1/2"	40°F	35°F

2 1/2" and over	38°F	35°F

Asphalt concrete shall not be placed during rain, snow, or other adverse weather conditions, except that mix in transit at the time adverse weather conditions occur may be placed if the mix has been covered during transit and is able to be placed at the specified temperature, and if the foundation (base) is free of pools or flow of water, and provided that all other specified requirements are met. Asphalt concrete mixtures shall not be placed when the base is frozen or when, in the opinion of the Engineer or Inspector, existing or expected weather conditions will prevent the proper handling, finishing, and compaction of the asphalt mixture.

211.3.03 STREET WORK

211.3.03A Reconditioning Old Roadbed

Unless otherwise specified, the work required by this section will not be measured or paid for separately as extra work. This work shall be considered incidental to the work required for placing asphalt concrete. An asphalt tack coat shall be applied to all overlay areas and the surface of curbs to the highest pavement elevation.

211.3.03B Tack Coat

An asphalt tack coat shall be applied to all overlay areas, edges and surfaces of existing pavements, portions of concrete structures such as catch basins, manholes, and curbs that will abut asphalt pavement, and any other areas designated by the Engineer. Asphalt tack coat shall be applied by pressure spray equipment. Care shall be taken to shield areas not to directly abut asphalt concrete from being coated by asphalt tack.

211.3.03C Asphalt Concrete Placing

Asphalt shall not be matched to a transverse or longitudinal asphalt edge an end slope of less than 2:1. This requirement shall not apply where the Engineer specifies a feathered edge.

211.3.03D Asphalt Concrete Mixing Plant - DEQ Requirements

Prior to producing and furnishing asphalt concrete from a new or revised stationary plant location or a portable plant, the contractor shall furnish the following items to the engineer:

1. A current air contaminate discharge permit number for the plant being used;
2. The expiration date of the permit; and,
3. A written statement that the DEQ has been advised of the location of the plant and when operation is to commence.

The name and address of the air pollution authority having jurisdiction over the area may be obtained from the engineer.

211.3.03E Plant Scales

Scales shall be accurate to 0.5 percent throughout the range of use and shall be tested and adjusted as often as directed by the engineer to verify continued accuracy.

211.3.04 DRYING, HEATING, and SEPARATING AGGREGATES

211.3.04A Drying

Aggregates shall be dried to the extent that any retained moisture will not result in visible defects in the mixture such as slumping loads, boils, or slicks.

211.3.04B Screening

In batch plants which have screens, the aggregates shall be separated, immediately after drying and heating by screening into the sizes required for separate handling, storing and proportioning at the mixing plant.

211.3.05 HEATING ASPHALT CEMENT

Asphalt heating equipment shall be capable of uniformly heating the asphalt cement to the temperature specified.

The temperature of the asphalt cement when introduced in the mixture shall be not less than 250 degrees nor more than 350 degrees F.

211.3.06 MIXING

All the components of the asphalt concrete mixing plant shall be utilized and operated in a manner to comply with the requirements of this section. The combined materials shall be mixed until the asphalt cement is distributed thoroughly in the mixture and the aggregate particles are completely and uniformly coated.

The moisture content of the mix shall not exceed 0.60 percent at time of discharge from the mixing plant. The temperature of the mix at discharge from the plant shall not exceed 325 degrees F.

211.3.07 TRUCK SCALES

Each pay load of asphalt concrete mixture shall be weighed on vehicle scales meeting the requirements of the APWA Standard Specifications except as follows.

When vehicle scales meeting the requirements of the APWA Standard Specifications are available for check weighing, the contractor, upon written approval of the engineer, will be permitted to use an approved weigh hopper that is accurate within 0.5 percent throughout the range of use. Use of the hopper to determine pay weights will be discontinued when random check weighings indicate that the quantities are not accurate within 0.5 percent.

Each load of mixture shall have a weigh memo provided by the contractor.

211.3.08 HAULING EQUIPMENT

Vehicles used for hauling asphalt concrete mixtures shall have tight, clean, and smooth beds which have been thinly coated with paraffin oil, lime solution, soapy water, or other approved material to prevent the mixture from adhering to the beds. Diesel oil may be used when requested by the contractor and approved by the engineer. During each application of approved coating material, and prior to loading, the vehicle bed shall be drained of all excess coating material.

Hauling vehicles shall be equipped with covers to protect against moisture intrusion and heat loss.

Vehicles which cause excess segregation, leak badly, or delay normal operations shall not be used.

211.3.09 ASPHALT CONCRETE PAVERS

Pavers shall be self-contained, power propelled units with an activated screed or strike-off

assembly, heated if necessary, and capable of spreading and finishing layers of asphalt concrete mixture to the widths, thickness, lines, grades and cross sections required on the project.

The paver shall be equipped with a receiving and distribution system of sufficient capacity for a uniform spreading operation and capable of placing the mixture uniformly in front of the screed without segregation of materials. Extensions added to the paver when used on travel lanes shall have the same augering and screeding equipment as the rest of the paver. The paver shall be equipped with either a manual or electronic line and grade control. When applicable, a windrow pick-up machine shall be used in lieu of an end dump machine.

The paver shall be designed so that minor irregularities in the surface of the base material will not be reflected in the surface of the layer being placed. The weight of the paver shall be supported on tracks or wheels, none of which shall contact the surface being placed. The contact area of the screed or strike-off assembly shall be uniform over the entire width of the mixture being placed, and shall produce a finished surface of the required smoothness and texture without tearing, shoving, or gouging the mixture.

211.3.10 COMPACTORS

Rollers shall be steel wheel, pneumatic tire, vibratory or a combination of these types. They shall be in good condition and capable of reversing without backlash.

211.3.10A Steel Wheel Rollers

Steel wheeled rollers shall have a minimum gross static weight of 8 tons, and a minimum static weight on the drive wheel of 250 pounds per inch of width. For finish rolling, a 6 ton minimum gross static weight is acceptable with the 250 pounds per inch of width not required.

211.3.10B Vibratory Rollers

Vibratory rollers shall be equipped with amplitude and frequency controls and shall be specifically designed for compaction of asphalt concrete mixture. The rollers shall be capable of frequencies of not less than 2,000 vibrations per minute.

211.3.10C Pneumatic Rollers

The pneumatic-tired rollers shall be self-propelled, tandem, or multiple axle, multiple wheeled with smooth-tread pneumatic tires. The tires shall be of equal size and staggered on the axles at spacings and overlaps that will provide uniform compacting pressure for the full compacting width of the roller. Ground pressures shall be at least 80 pounds per square inch of tire contact area. Pneumatic-tired rollers shall be fully skirted to insulate the tires from significant heat loss during compaction.

211.3.11 PREPARATION OF FOUNDATION

All bases and foundations on which pavement is to be constructed shall meet the applicable specifications and be approved by the Engineer prior to the start of paving. Existing bases and foundations shall be reconditioned as specified or as directed.

Broken or ragged edges of existing paved surfaces underlying or abutting the new pavement shall be trimmed back to firm material with a clean vertical edge. Surfaces against which asphalt concrete is to be placed shall be treated with an asphalt tack coat as specified in Section 00730 of the *Oregon Standard Specifications for Construction*.

Depressed areas in existing pavement shall be tacked and leveled with an approved asphalt concrete mixture and compacted with a pneumatic tired roller. This leveling work shall be a separate operation and performed as specified. Leveling material shall be spread by means of a paving machine except in small or irregular areas where the engineer may permit the use of other equipment. At the direction of the Engineer, leveled areas shall have asphalt tack applied prior to placement of subsequent material.

211.3.12 ASPHALT CONCRETE STORAGE

Temporary storing or holding of hot asphalt concrete mixture in storage silos up to 24 hours will be permitted. Trucks shall be loaded from the storage silos in a manner that prevents segregation.

Storing or holding of hot asphalt concrete mixture in open stockpiles will not be permitted.

211.3.14 CONTROL OF LINE AND GRADE

When specified in the contract, the engineer will establish references at reasonable intervals for line and grade control of the placing operations. The contractor shall furnish, place, and maintain supports, wires, devices, and materials as necessary to provide continuous line and grade reference control to the automatic paver control system on either or both sides of the paving machine.

With approval of the engineer, the line and grade reference control may be a floating beam device or multi-footed ski of a length and sensitivity that will control of the paver to the grade specified. After the paving of the first lane, a joint matcher or manual control of line and grade will be permitted with approval of the engineer.

211.3.15 SPREADING, TEMPERATURE CONTROL, AND FINISHING

211.3.15A Spreading

1. General - Asphalt pavers conforming to subsection 211.3.09 shall be used to distribute the mixture. Placing of the mixture shall be continuous and uniform. In areas where patching, irregularities, or unavoidable obstacles make the use of specified equipment impracticable, the mixture may be spread with other equipment approved by the Engineer.

2. Dropoffs - When placing asphalt concrete pavement under traffic in courses in excess of a 2-inch thickness, work shall be scheduled so that at the end of each working shift the full width of the area being paved, including shoulders, shall be complete to the same elevation with no longitudinal dropoffs.

When placing asphalt concrete pavement under traffic in courses between 1 and 2 inches in thickness, work shall be scheduled so that at the end of each working shift a strip of new pavement shall not extend beyond the adjoining strip of new pavement more than a distance normally covered by each shift. Prior to any suspension of operations for a period of one day or more, the full width of the area to be paved, including shoulders, shall be completed to the same elevation with no longitudinal dropoffs.

The transverse dropoff at the end of each strip shall be feathered out in accordance with subsection 211.3.16.

Where abrupt or sloped dropoffs occur within or at the edge of the paved surface, the contractor shall provide suitable warning signs.

3. Construction Joints - The width of the pavement strips shall be adjusted to minimize the number of longitudinal joints required. Longitudinal joints in the wearing course shall be at a lane line or the edge line of a traffic lane. On median lanes and on shoulder areas, joints shall occur only at points designated by the Engineer. The longitudinal joints in one layer or lift shall offset with those in the layer immediately below by a minimum of 6 inches. Underlying longitudinal joints shall be within 12 inches of the edge of a lane or within 12 inches of the center of a lane, except in irregular areas.

211.3.15B Temperature of Mixture

The temperature of the mixture at the time it is placed in final position shall be within 10 degrees of 280°F. The engineer may adjust the lay-down temperature in 10-degree increments to attain maximum workability and compaction. In no case shall the lay-down temperature of mixture be less than 240°F.

211.3.15C Finishing and Details

Segregation of materials, non-uniform texture, fouled surfaces preventing full bonding between lifts of mixture, and other defects determined by the engineer as detrimental, shall be corrected by the contractor at no expense to the owner.

211.3.16 JOINTS

211.3.16A Transverse Joints

On wearing courses, pavement depth, line and grade shall be maintained at least 4 feet beyond the selected transverse joint location. On all courses, a sloped end section shall be constructed. If subject to traffic, the end section shall be sloped at not less than 20.1. If not subject to traffic, the end section shall be sloped at a minimum of 10.1.

When paving is not expected to continue from the transverse joint until the following day of later, paper or other suitable material shall be placed under the material ahead of the transverse joint location.

Prior to continuing the permanent paving lift, the contractor shall remove the material beyond the joint to a vertical face against which paving will resume. The base shall be cleaned of all debris. A tack coat shall then be applied to the vertical edge and surface of the exposed area before paving is continued.

After placement and finishing of the new asphalt concrete, both sides of the joint shall be compacted to the specified density. The joint surface shall conform to the requirements of subsection 211.3.19.

211.3.16B Longitudinal Joints

Pre-determine panel widths to minimize the number of longitudinal joints. For base lifts, longitudinal joints must be within 12 inches of the lane edge. For the surface lift, longitudinal joints must be at the edge of the lane and may not be located directly above the joint in the base lift immediately below. When paving, the roller shall start on the hot mat with the edge of the roller wheel 6 inches from the joint to "pinch the joint". On the second and subsequent compaction passes the roller will roll over the joint with more than half the roller on the hot mat to avoid compacting the cold mat. Any hand raking must be carefully done to avoid segregation of the mix.

211.3.17 THICKNESS AND NUMBER OF LAYERS

The mixture shall be placed in the number of lifts and to the compacted thickness of each lift as shown on the plans. If the compacted thickness of each lift is not shown on the plans, the maximum compacted thickness for any lift shall be 3 inches. Minimum compacted thickness for ½ inch dense graded mix is 2 inches. Maximum compacted thickness for ½ inch dense graded mix is 3 inches. Minimum and maximum compacted thickness for ¾ inch dense graded mix is 3 inches.

211.3.18 COMPACTION

Immediately after the asphalt concrete mixture has been spread, struck off and surface irregularities and other defects remedied, it shall be thoroughly and uniformly rolled until the mixture is compacted.

211.3.18A General
The type, number, and weight of rollers shall be sufficient to compact the mixture while it is still within the specified temperature range. Between October 1 and April 1, pneumatic-tired rollers shall be used for breakdown compaction except on the wearing course where a single coverage with a vibratory or steel-wheel roller shall precede pneumatic-tired rolling. The use of equipment which crushes the aggregate will not be permitted. Rollers shall not be operated in vibratory mode when the temperature of the mixture has dropped below 180 degrees.

Steel roller wheels shall be moistened with water or other approved material to the least extent necessary to prevent pickup of mixture and not cause spotting or defacement of the surface of the mixture.

Rollers shall be operated at speeds recommended by the roller manufacturer and slow enough to avoid displacement of the mixture. The maximum speeds shall be 3 miles per hour for vibratory rollers, 4 miles per hour for steel-wheeled rollers, and 5 miles per hour for pneumatic-tired rollers.

Care shall be exercised not to displace the line and grade of edges. Displacement of any course occurring as a result of the reversing of the direction of a roller, or from other causes, shall be corrected at once by the use of approved rakes and addition of fresh mixture when required.

Any mixture that becomes loose and broken, contaminated, segregated, or is in any way defective, shall be removed and replaced with new mixture at no expense to the owner.

Finishing rolling shall continue until all roller marks are eliminated.

Along curbs and walls, on walks, irregular areas, and other areas not practicably accessible to specified rollers, the mixture shall be compacted with approved self-propelled rollers, mechanical tampers, hot hand tampers, or heavy hand rollers. On depressed areas, a trench roller may be used or cleated compression strips may be used under the roller to transmit compression to the depressed area.

211.3.18B Density Requirements
For a specified lift thickness of less than 1½ inches, the mixture shall be compacted with at least four passes by rollers, excluding finish rolling.

For a specified lift thickness of 1½ inches or greater, the mixture shall be compacted to at least 92 percent of the theoretical maximum density as determined by AASHTO T209.

The engineer may allow the contractor to establish a target density by use of a 200 foot control strip conforming to the Control Strip Method Specified in the ODOT Standard Specifications. The contractor shall shall retain an independent testing firm to perform the compaction testing. Contractor shall attain 98% of target density for duration of the job.

All additional costs associated with the use of the control strip method shall be borne by the contractor.

211.3.19 PAVEMENT SMOOTHNESS

The top surface of the asphalt concrete pavement shall not vary by more than ¼" when tested with a 12-foot straightedge either parallel with or perpendicular to the centerline. The straightedge shall be furnished and operated by the contractor. The engineer will observe this testing and may require additional testing.

The joint between the pavement and the top surface of utility structures, such as manhole covers and valve boxes located in the traveled way, shall meet the pavement surface tolerances.

The surface of the finished pavement shall be within ¼" of the specified line, grade and cross section.

The contractor shall correct any surface tolerance deficiency by a method that has been approved by the engineer. All corrective work shall be completed within 10 work days following notification from the engineer. All corrective work, including furnishing of materials, shall be performed at the contractor's expense and no adjustment in contract time will be made.

211.3.20 SPECIAL PROTECTION UNDER TRAFFIC

No traffic or equipment shall come in contact with the compacted mixture until it has cooled and set sufficiently to prevent marking. Edges shall be protected from being broken down, and edge dropoffs 1 inch or more in height shall be marked with warning devices visible by day and night to the traveling public and placed at spacing as specified or as directed by the engineer.

211.3.21 TEMPORARY PAVEMENT MARKINGS

During paving operations, lane markings shall be maintained throughout the project by applying temporary lane stripes to the roadway each day. Temporary striping shall consist of strips of pavement marking tape a minimum of 1 foot in length on the lane separation line to delineate the path of travel for vehicles. Intervals between marking strips shall be a maximum of 25 feet.

The pavement marking tape shall be 4 inches wide, pressure sensitive, reflective tape of a form suitable for marking asphalt or concrete pavement surfaces. Biodegradable tape with paper backing will not be allowed. Surface preparation and application shall be in conformance with the manufacturer's specifications.

The pavement marking shall be maintained in serviceable condition by the contractor during the interval of time it is in use. All preliminary layout and marking in preparation for application and the application of the temporary striping shall be the contractor's responsibility. If specified, the contractor shall remove the temporary striping prior to placement of subsequent paving materials or permanent lane markings.

211.3.22 SAMPLING AND TESTING

The contractor is responsible for process control and shall conduct sampling, testing, measurement and inspection as necessary to insure the finished pavement meets specifications.

The engineer will determine the suitability of the final product through final acceptance testing. Results of these tests will be used to determine payment deductions, if any to be assessed against the contract.

The engineer shall be permitted to cut samples or to take cores from the compacted mixture for testing purposes. Where samples have been taken, the contractor shall furnish new material and fill the holes as directed with no compensation beyond the unit price for asphalt concrete in place.

211.3.22A Aggregate Gradation and Asphalt Content

The contractor shall take samples from the grade on a random basis in the presence of the inspector for testing by the engineer. A minimum of three samples shall be taken for each 1,000 tons of asphalt concrete or portion thereof.

211.3.22B Compaction

For final acceptance of the pavement, the density of each section of pavement will be determined by random acceptance tests using a nuclear gauge or laboratory analysis of pavement core samples. Density tests will be taken at five randomly selected sites for each section of pavement. The average of the five density tests will constitute the density of the pavement.

A section of pavement will be the area constructed from 500 consecutive tons of mixture or portion thereof. Acceptance tests will not be made within one foot of the edges of the panel or from areas where the specified compacted thickness is less than 1 ½ inches.

When using a nuclear gauge, two readings will be obtained at each site, the second at right angles to the first. The two readings will be averaged to obtain the test density. For any section of pavement, if the contractor requests in writing within two works days after nuclear gauge test results are furnished to the contractor, pavement cores will be obtained at the same randomly selected sites used for the nuclear gauge tests. The density of the core samples will constitute the in-place density of the section of pavement and will prevail over nuclear results. If the Density as determined by the core samples does not meet density requirements, the contractor shall bear the cost of coring and testing.

The engineer shall have the right to test any areas that appear defective in compaction. If the areas are found deficient, the engineer may require the contractor to bring the areas into conformance with the specifications.

211.3.22C Pavement Thickness

The engineer will select locations for non-destructive measurement of core samples to determine pavement thickness.

If non-destructive measurement indicates a pavement section is less than the thickness shown on the plans, or is otherwise out of specification, the contractor may take cores at the same locations to verify the engineer's measurements. If the pavement section is found to comply with specifications, the coring and restoration will be paid for as extra work. Pavement found to be out of specification shall be subject to replacement or to payment at adjusted prices.

In determining deficient or excessive thickness in asphalt concrete overlays, the engineer shall adjust the cross section measurement sequence, average series of measurements, or take other appropriate steps to allow for the desirable leveling of low or high areas on the existing pavement.

Where a deficiency is found and the engineer determines the deficiency serious enough to impair the traffic service expected from the pavement, the area of such deficiency shall be removed by the contractor and shall be replaced with pavement meeting the specifications. The cost of the deficient pavement and of the removal shall be borne by the contractor.

211.4.00 MEASUREMENT AND PAYMENT

211.4.01 TON BASIS

Asphalt concrete will be measured and paid for on a ton basis, to the nearest 0.01 ton. There will be no separate measurement or payment for asphalt cement contained in the mixture

211.4.02 SQUARE YARD BASIS

When listed in the Bid Schedule, Asphalt concrete will be measured on the surface to the nearest 0.1 foot. Payment will be made on a square yard basis, to the nearest 0.1 yard.

211.4.03 SEPARATE TONNAGE OF MIXTURE AND ASPHALT CEMENT

(a) When the bid schedule so indicates, the quantities of asphalt concrete mixture and asphalt cement contained in the mixture will be measured and paid for separately as follows: Asphalt concrete mixture will be measured and paid for on a ton basis, to the nearest 0.01 ton. No deduction will be made for the weight of the asphalt cement or any additive used in the mixture as required by the specifications or ordered by the engineer.

(b) Asphalt cement will be measured and paid for on a ton basis, to the nearest 0.01 ton. If invoice and tank level measurements are not available, the quantities shall be based on extraction tests.

211.4.04 PATCHING AND LEVELING

Patching and leveling work will be measured and paid for in conformance with subsection 211.4.01.

211.4.05 PAYMENT DEDUCTIONS AND REJECTION OF PAVEMENT

211.4.05A Aggregate Gradation and Asphalt Content

A deduction of 1.0 percent of the in-place price for asphalt concrete and cement will be made for each 1.0 percent cumulative weighted deviation beyond the allowable tolerance of each component of the job mix formula specified in subsection 211.2.09.
The following factors shall be used to calculate deductions due to deviations from the job mix formula.

Deviation Weighting

Asphalt Cement	12 x Deviation
200 minus	3 x Deviation
#10	1.5 x Deviation
#40	1.5 x Deviation
All Other Sizes	1 x Deviation

The cumulative weighted deviation is the sum of all weighted deviations as determined from the table above.

A minimum of three samples as a lot shall be averaged to determine any reduction in payment. Where the cumulative weighted deviation equals or exceeds 15.0 percent, the

materials shall be removed and replaced at no cost to the owner.

When asphalt paving materials with a cumulative deviation of less than 15.0 percent are furnished, the engineer may require the contractor to remove and replace defective materials at no cost to the owner or shall deduct from payments to the contractor an amount equal to the cumulative weighted percentage deviations from the job mix formula.

211.4.05B Compaction

Asphalt concrete pavement that does not comply with compaction requirements shall be removed and replaced or, at the discretion of the engineer, be subject to a price reduction determined from the following table:

PRICE REDUCTION SCHEDULE

% MAXIMUM DENSITY (Normal Method)	% Pay*	% TARGET DENSITY (Control Strip Method)
92.0 and above	100	98.0 and above
91.5 – 91.9	95	97.5 – 97.9
91.0 – 91.4	90	97.0 – 97.4
90.5 – 90.9	85	96.5 – 96.9
90.0 – 90.4	80	96.0 – 96.4
89.5 – 89.9	70	95.5 – 95.9
89.0 – 89.4	60	95.0 – 95.4
Below 89.0	0	Below 95.0

* Applies to price for in-place asphalt concrete, including asphalt cement where measured and paid for separately on City of Sisters Public Works contract.

211.4.05C Pavement Thickness

In determining payment reduction for deficient or excessive pavement thickness, a section of pavement will normally be on full roadway station (100 lineal feet). For non-roadway paving and in other situations where the engineer determines the above section is inappropriate, the engineer may establish a different unit of work on which to calculate average thicknesses and price reductions.

When pavement thickness, as determined by the engineer's measurements or test cores, is found deficient by more than the thickness of the specified surface course of asphalt concrete, the engineer may allow the contractor to place an additional lift of asphalt concrete to bring the total thickness of the pavement into conformance with the specifications.

When the thickness in any section of pavement is found deficient by less than the specified thickness of the surface course, and the engineer allows the pavement to remain in place, payment for that pavement will be made at an adjusted price determined from the following table:

% REDUCTION IN PAY * (Payment on Weight Basis)	% DEFICIENCY IN THICKNESS	% REDUCTION IN PAY * (Payment on Area Basis)
No deduction	0.0 – 5.0	No Deduction
No deduction	5.1 – 10.0	1.0 x Deficiency
0.5 x Deficiency	10.1 – 20.0	1.5 x Deficiency
1.0 x Deficiency	20.1 – 30.0	2.0 x Deficiency

* Applies to price for in-place asphalt concrete, including asphalt cement where measured and paid for separately.

No payment will be made for any area of pavement found deficient in thickness by more than 30.0 percent even though the work is permitted by the engineer to remain in place.

212 ASPHALT CONCRETE PATCHING

212.1.00 DESCRIPTION

Except as modified or supplemented herein, the provisions of Section 00495 of the ***Oregon Standard Specifications for Construction,*** current edition shall apply.

212.1.01 GENERAL

Asphalt patching will be required under two general situations:

a. In new construction asphalt patching shall include driveways, trenching in existing pavement areas and other such areas that are behind the curb and/or involve a significant amount of hand labor to complete the work; and

b. In existing pavements where the scope of the work is primarily paving underground utility trenches.

212.2.00 MATERIALS

212.2.01 Backfill

a. Class C Backfill
   See Division 1 Trenches.
b. Cement Treated Base
   See Division 1 Trenches.
c. Pipe Bedding and Pipe Zone
   See Division 1 Trenches.

212.2.02 Aggregate Base Shall conform to Section 207.

212.2.03 Asphalt Concrete Shall conform to Section 211.2.00.

212.2.04 Temporary Cold Mix AC Patches Patches constructed of cold mix AC will be acceptable during times when hot mix plants are not operating or to meet temporary trench surfacing requirements. Cold mix AC shall meet the requirements of Section 00735 of the Oregon Standard Specifications for Construction. All cold mix patches, shall be dug out and replaced with hot mix patches when hot mix AC becomes available.

212.3.00 CONSTRUCTION

212.3.01 PREPARATION

212.3.01a Sawcutting

The existing pavement shall be saw cut back to undisturbed areas and the edges shall be straight and vertical. Saw cuts are not permitted in the wheel line and must be located in the center or edge of the lane. Pavement previously sawcut for trenching and damaged during construction must be re-cut to a continuous straight line. A sawtooth pattern to the edge of the pavement patch is not allowed.

212.3.01b Tacking

All existing pavement or concrete surfaces shall be uniformly tacked with asphalt by brushing or spray equipment. A mist or fog application of tack is not sufficient and surfaces must be fully coated.

212.3.02 BASE MATERIAL

This work includes furnishing, fine grading and compacting crushed rock base material at the depth specified under all patching areas. If aggregate base has been placed by trenching contractor, the paving contractor is expected to insure that road base material meets the thickness and gradation requirements and to re-grade and make up material as required constructing the asphalt patch as specified. Base material that has been contaminated by dirt shall be removed.

212.3.03 PAVING

The pavement patch shall be a minimum of 8 inches of aggregate base and 4 inches of hot mix asphalt concrete. Where the existing section is deeper, the patch shall match the existing section. The asphalt shall be placed in two lifts and shall be thoroughly compacted between lifts. The second lift shall be raked sufficiently higher than the existing pavement so that upon compaction the finished surface will match the existing grade without a dip. When checked with a 4' straightedge, a variation of more than 1/4" from the true line and grade shall be cause of rejection of the patch.

Asphalt concrete shall be placed and raked such that, when compacted, the surface will be uniform and smooth and shall match abutting pavement edges. When checked with a 4' straightedge, a variation of more than 1/4" from true line and grade shall be cause for rejection of the patch.

Compacting shall be performed with a steel wheeled roller having a minimum weight of 4 tons, and shall continue until roller wheel marks are no longer discernible. In confined asphalt patch areas where a larger roller is not practicable, the largest steel wheel roller capable of operating in the asphalt patch area shall be used for breakdown compacting. A vibratory plate compaction device may be used for finishing. A vibratory plate compaction device may be used in small asphalt patch areas for both breakdown and finishing with the approval of the Engineer. Where no mechanical means can be used for compaction and finishing a hand tamper shall be used.

212.3.04 TEMPORARY PAVEMENT RESTORATION

To comply with the requirement of pavement restoration within 48 hours of removal or disturbance, the contractor may provide temporary patching. The temporary patching shall be a hard surface consisting of asphalt concrete, asphalt concrete cold mix. CTB (Concrete Treated Base) may be used, but the top portion will require grinding to provide appropriate AC replacement for permanent restoration. Between construction and the end of the 48 hour period, the street surface may be maintained with backfill or crushed rock provided that no subsidence occurs.

212.3.05 SEALING PATCH EDGES

Completely seal all adjoining asphalt concrete surfaces with an edge sealing tack coat. After the tack coat has been placed, place clean sand over the top of the tack coat.

212.4.00 MEASUREMENT AND PAYMENT

212.4.01 INCIDENTAL BASIS
When neither specified nor listed in the proposal for separate payment, ASPHALT CONCRETE shall be considered incidental work for which no separate payment will be made.

212.4.02 ASPHALT CONCRETE PER TON BASIS
When listed in the Bid Schedule, ASPHALT CONCRETE will be measured by the ton to the nearest 0.01 ton. The Contractor shall provide weigh tickets from certified scales to prove the ASPHALT CONCRETE tonnage. Payment for ASPHALT CONCRETE will be at the contract unit price bid per ton of the class of asphalt specified, complete in place.

214.4.03 ASPHALT CONCRETE PATCHING
When listed in the Bid Schedule, ASPHALT CONCRETE PATCHING will be measured by the square yard to the nearest full square yard. Payment for ASPHALT CONCRETE PATCHING will be at the contract unit price bid for ASPHALT CONCRETE PATCHING. This payment shall include full compensation for all labor, equipment, and materials required to perform the work.

212.4.04 ASPHALT CONCRETE PATCH-TRENCH
When listed in the Bid Schedule, ASPHALT CONCRETE PATCH-TRENCH will be measured by the linear foot of trench over the installed utility measured on a horizontal plane. Payment for ASPHALT CONCRETE PATCH-TRENCH will be at the contract unit price bid for ASPHALT CONCRETE PATCH-TRENCH. This payment shall include full compensation for all labor, equipment, and materials required to perform the work.

212.4.05 ASPHALT TACK COAT AND EDGE SEALING TACK COAT
No separate measurement or payment will be made for furnishing and applying asphalt tack coat. Full compensation for tack coat shall be included in the contract unit price bid for asphalt concrete, or asphalt patching, or other items as listed in the Bid Schedule.

212.4.06 AGGREGATE BASE
Where no separate pay item exists for Base Rock, base rock will be considered an incidental item to the work required, and full compensation for base rock shall be included in the price bid for Asphalt Pavement, Patching, or other items of work as listed in the Bid Schedule.

213 CURBS AND GUTTERS

213.1.00 DESCRIPTION

Except as modified or supplemented herein, the provisions of Section 00759 of the ***Oregon Standard Specifications for Construction,*** current edition shall apply.

This work consists of furnishing, placing and finishing commercial grade concrete curbs, gutters, combination curb and gutter, combination curb, gutter and sidewalk, islands, and traffic separators, hereinafter collectively referred to as structures.

An incidental item included in this work shall be to stamp an "S" or "W" in the concrete curb at all locations where a sewer or water service line crosses under the curb.

The work included in CURB BACKFILL provides for the placing of clean backfill material behind the curbs, between the curb and sidewalk, behind sidewalks, and behind walls, at the grades and slopes shown on the plans.

213.2.00 MATERIALS

213.2.01 PORTLAND CEMENT CONCRETE

Portland cement concrete shall conform to the applicable requirements of Section 00440 of the ***Oregon Standard Specifications for Construction,*** current edition.

Unless otherwise specified, commercial grade concrete shall conform to ODOT Class 3000. Portland Cement shall be Type I or type II. Air entrainment shall be between 4% and 7% as determined by AASHTO T 152 at the time of placing. The chloride content of any admixtures shall not exceed 0.5% by weight for applications with imbedded steel and shall not exceed 2% by weight for applications without imbedded steel. Set accelerating admixtures shall meet the requirements of AASHTO M 194 (ASTM C494, type C or E.)

The amount of deleterious substances shall not exceed the following limits:

Friable Particles	1% (by weight)
Lightweight Particles	1% (by weight)
Material Passing No.200 sieve	4% (by weight)

Concrete supplier shall provide batch tickets for each load to verify mix ingredients.

213.2.02 AGGREGATE BASE

Aggregate base shall conform to the requirements of Section 207.

213.2.03 CURB BACKFILL

Class A backfill material shall be placed behind the curbs, between the curb and sidewalk, behind sidewalks, and behind walls, sloping it as shown on the standard drawings. The top 8" of the backfill shall be good quality topsoil. Topsoil shall be a fertile, loamy, natural surface soil, well-graded and free from substances toxic to plant growth, noxious weeds, roots, refuse, sticks and lumps. Topsoil material shall be spread smoothly over the specified areas to the thickness, grades and slopes indicated on the plans or as otherwise ordered by the Engineer. Compaction shall be performed by a mechanical tamper or other method approved by the Engineer until the material is firm and unyielding. The finished surface shall be raked by hand.

213.3.00 CONSTRUCTION

213.3.01 PREPARATION OF SUBBASE AND BASE

Curb sub-base and base shall be constructed to the grades, and slopes indicated by the plans or as otherwise ordered by the Engineer. Sub-base shall be compacted to 95% of maximum density as determined by AASHTO T-99 prior to placing aggregate base material. Aggregate base shall be compacted to 95% of maximum density prior to placing curbs.

213.3.03 PLACING, FINISHING, AND CURING

213.3.03A Tolerances

The top and face of the finished curb shall be true and straight. The top surface or face shall not vary more than 1/4" from the edge of a 10 foot straightedge, except at changes in grade or in curves.

213.3.03B Finishing

Concrete shall be finished to a smooth and uniform texture by troweling and floating. The surface shall have a light broomed finish transverse to the direction of traffic, unless otherwise specified.

213.3.03C Curing

Concrete shall be cured by application of a liquid membrane forming compound applied uniformly to the damp concrete by pressure spray methods, or by keeping the concrete protected by covering and moist for a minimum of 72 hours. Curing compounds shall conform to the requirements of AASHTO M 148. All compounds shall be Class A. Solvent based compounds shall be Type 1-D.

Concrete curbs shall be allowed to cure for a minimum of 72 hours before starting spreading and compaction operations for aggregate base against or within 2 feet of new curbs. Curbs cracked, chipped or damaged by equipment operations shall be removed and replaced prior to paving. Curbs shall be replaced in sections by sawcutting at the nearest expansion joints.

213.3.03D Weather limitations

1. Concrete is to be placed when the air temperature is at least 25°F and rising.
2. Concrete shall not be placed on frozen ground. Frost and ice shall be removed from all forms, reinforcing steel, imbedded items, and subgrade.
3. Concrete from the chute shall have a temperature of not less than 55° F.
4. Concrete work shall be protected from freezing for at least seven days after placement. A curing sealant or impervious material shall be placed on the concrete.
5. The inspector can require the Contractor to provide a minimum recording thermometer, having not less than 2 degree divisions, to verify that the temperature at the surface of the work does not fall below 32° F. The reading shall be taken as close to the surface of the concrete as possible.
6. Any concrete indicated as being damaged from freezing shall be rejected and replaced by the contractor at no additional cost to the City.

213.3.04 EXPANSION JOINTS

Expansion joints in curbs shall be placed at no less than 100' spacing. Expansion joints are required on both sides of driveway approach where the top of the flare or wing meets the sidewalk, and at each point of tangency in the structure alignment.

213.3.05 CONTROL JOINTS
Concrete shall be scored with control joints at intervals not exceeding 15', or over contraction joints in concrete underlying the structure. Control joints shall be scored into the concrete a minimum of 1/3 the depth.

213.4.00 MEASUREMENT AND PAYMENT

213.4.01 INCIDENTAL BASIS
When neither specified nor listed in the proposal for separate payment, Curb and Curb Backfill shall be considered incidental work for which no separate payment will be made.

213.4.02 CURB
Concrete curb shall be measured to the nearest foot on a linear foot basis along the face of the curb for the actual length constructed. Payment for concrete curb will be at the price bid for concrete curb of the type and size specified and listed in the proposal.

213.4.03 CURB BACKFILL
When listed as an item in the Bid Schedule, Curb Backfill material will be measured by the linear foot of curb backfilled to the nearest foot. Payment for curb backfill will be at the contract bid unit price per linear foot of backfill, which price shall constitute full compensation for supplying and placing curb backfill.

214 DRIVEWAYS AND APPROACHES

214.1.00 DESCRIPTION
Except as modified or supplemented herein, the provisions of Section 00759 of the ***Oregon Standard Specifications for Construction,*** current edition shall apply.

This work consists of forming, furnishing, placing and finishing Portland cement concrete driveways and approaches only. Asphalt concrete driveways shall be covered under Section 212 as ASPHALT PATCHING.

Driveways are considered to be that portion of paved vehicular access that lies behind the sidewalk or driveway entrance. Approaches shall also be referred to as aprons and are generally a transition section 5 feet in width between the grade of the gutter or edge of asphalt and the grade of the top of the curb and/or sidewalk/pedestrian path.

214.1.01 GENERAL REQUIREMENTS
Driveways off all street classifications shall conform to the City of Sisters Access Management Standards. Direct access to an arterial street should be avoided whenever practical, and is subject to approval by the City Engineer or Director of Public Works. Concrete Driveway Aprons are required on all new construction, except asphalt aprons approved by ODOT (Permit required). Driveways to multi-family residences (excluding duplexes) shall meet commercial standards.

Driveways on local streets should be spaced a minimum of 10' apart measured from the top of transition or at the terminus of the radius to the edge of the roadway. The maximum practical spacing should be sought.

The distance between an intersection and the first driveway shall be a minimum of 50 feet, unless variance is approved by City Engineer. The distance shall be measured from the point of tangency of the intersection curb to the nearest edge of the first driveway. The City Engineer may determine the minimum distance for commercial streets and industrial to be greater, dependent upon frontage and type of expected traffic (See Table 7-2 of the **2010 Sisters Transportation Plan**).

Residential driveway maximum width shall be 24'; commercial/Industrial driveway maximum width shall be 36', unless a variance is granted.

214.2.00 MATERIAL

214.2.01 PORTLAND CEMENT CONCRETE
Portland cement concrete shall conform to the requirements of Section 213.2.01.

214.2.02 AGGREGATE BASE
214.2.02A
Portland Cement Concrete Base aggregates for PCC driveways and approaches shall consist of Class C material meeting the requirements of Section 101.2.02C.

214.3.00 CONSTRUCTION
Driveway aprons shall be 6" thick, or as shown on the plans. Any transition from 6" to 4" thickness shall not occur in the apron.

214.3.01 PREPARATION OF SUBBASE AND BASE
Preparation of subbase shall conform to the requirements of section 213.3.01 and the following; If the in-situ material does not meet the material specification for base, then the base shall be excavated 10 inches from finish grade, raked smooth of large rocks and other organic material, and 4 inches of base placed and compacted per standard drawing. If the in-situ material meets the specification for base, as proven by the Contractor and verified by the City Engineer, then the base shall be excavated 6 inches from finish grade, raked smooth of large rocks and other organic material, and compacted.

A minimum of one test every 300 feet, or as directed by the City Engineer, is required. Costs of passing tests are the responsibility of the City. Costs of failing tests are the responsibility of the Contractor.

214.3.02 PLACING, FINISHING, AND CURING PORTLAND CEMENT CONCRETE
This work shall conform to the requirements of Subsection 213.3.03 and the following;

Finish concrete surfaces to smooth and uniform texture by troweling, floating and cross brooming. Lightly groove or mark surfaces into squares or other shapes to match markings on similar existing surfaces in the vicinity, as directed.

On all sidewalk ramps and accessible route islands, install truncated domes as shown. Place according to the manufacturer's recommendation.

Keep the concrete structure free from contact, strain and public traffic for at least seven calendar days or longer as directed. Do not apply curing compounds to the designated truncated dome areas of sidewalk ramps and accessible route islands.

214.3.03 EXPANSION JOINTS
Expansion joints are required at ends of driveway in accordance with the standard drawings.

214.3.04 CONTRACTION JOINTS
Contraction joints are required at the center of the driveway in accordance with the standard drawings.

214.4.00 MEASUREMENT AND PAYMENT

214.4.01 INCIDENTAL BASIS
When neither specified nor listed in the proposal for separate payment, Driveways and Aprons shall be considered incidental work for which no separate payment will be made.

214.4.02 DRIVEWAYS
Driveways shall be measured on a square foot basis to the nearest whole square foot. Payment for driveways shall be at the unit price bid at the thickness and measurement unit specified.

214.4.03 DRIVEWAY APRONS
Aprons shall be measured on a square foot basis to the nearest whole square foot. Transition sections from apron to sidewalks shall not be measured. Payment for aprons shall be at the unit price bid at the thickness and measurement unit specified.

215 SIDEWALKS AND PATHWAYS

215.1.00 DESCRIPTION
Except as modified or supplemented herein, the provisions of Section 00759 of the ***Oregon Standard Specifications for Construction,*** current edition shall apply. The work covered in this section consists of forming, placing, and finishing standard Portland Cement Concrete sidewalks and pathways in accordance with standard drawings 2-12 to 2-18. This section also covers colored Portland Cement Concrete and interlocking paver sidewalks in accordance with standard drawings. The construction of asphalt concrete pathways and sidewalks shall conform to specifications Section 211.

215.1.01 GENERAL REQUIREMENTS
Structures, such as fire hydrants and central delivery mailboxes, shall not be located in the sidewalk except as approved by the City Engineer. The back edge of the sidewalk shall smoothly meander back from the central delivery mailbox station to provide a 5' wide unobstructed pathway. No portion of the mailbox shall be within 12" of the curb.

Sidewalks constructed abutting the property line are the most desirable. When sidewalk is placed abutting curb, the sidewalk shall be poured separate from the curb. When a sidewalk meanders from the curb the alignment may require special approval; and the following conditions shall be met:

The sidewalk shall generally follow a smooth and gradual alignment free of sharp angles or bends. Horizontal curves shall not be less than 20 foot radius. The centerline of the side walk shall not meander more than 35 feet from the street curbline. All sidewalks shall be within the right-of-way or, in particular situations where topographical or vegetation limitations require

sidewalks out of the right-of- way, Public Access easements shall be provided. The location of meandering sidewalks shall be shown on the plans and profile as a condition for approval by the City Engineer.

Sidewalk grades shall not exceed 5% greater than the existing street grade and in no case greater than a 15% grade. The total vertical separation between the top of curb and the top of the sidewalk shall not be greater than 10 feet. In no case shall the cross slope of the parking strip between the curb and the sidewalk be steeper than 2:1. The grade of meandering sidewalks shall be shown on the profile as a condition for approval by the City of Sisters.

Safety is a primary design consideration. All portions of the sidewalk shall be visible from the street. Trees and brush shall be thinned or removed to provide the required visibility.

Meandering sidewalks shall cross intersections no further back than the center of the curb radius or where bulb-outs are located at the end of the curb radius. Accessible ramps meeting the standards of ADA shall be provided.

The landscape strip so created shall not be less than 36" wide, except where the sidewalk meander returns to be adjacent to the curb. To prevent sharp re-entrant angles in the landscape strip, an edge not less than 8" long and squared to the curb shall be constructed at the juncture of the sidewalk to the curb. Provision shall be made for landscaping the landscape strip. Provision shall be made and facilities installed for the irrigation of the landscape strip.

215.2.00 MATERIALS

215.2.01 PORTLAND CEMENT CONCRETE

Portland cement concrete shall conform to the requirements of Section 213.2.01.

215.2.02 COLORED PORTLAND CEMENT CONCRETE-DOWNTOWN SIDEWALKS

Portland cement concrete shall conform to the requirements of Section 213.2.01 and the following; color shall be determined by the Public Works Director in consultation with the Development Code. Color shall be mixed integrally with the concrete.

215.2.03 INTERLOCKING PAVER SIDEWALKS

Furnish permeable interlocking concrete pavers including base preparation, rat slab substrate construction, and joint sand. The rat slab is defined as a 4" concrete leveling substrate to prevent settling of the pavers. Contractor shall comply with ASTM C 936, Standard Specification for Solid Concrete Interlocking Paver Units, as incorporated by reference.

Interlocking concrete pavers shall be hydraulically pressed concrete, configured for interlocking with adjacent units and complying with ASTM C 936, and having the following characteristics:

- **Compressive Strength** – 8,000 psi average, with minimum of 7,200 psi.
- **Absorption** - 5 percent average, with maximum of 7 percent.
- **Thickness** – 3 – 1/8 inches
- **Style** – Square, 8" x 8"
- **Color** – Selected from manufacturer's full range
- **Sand for Joints** – Fine washed 1/4" – 10 sand

The design is based on the following product: Eco-Prioria as manufactured by Mutual Materials.

215.2.04 AGGREGATE BASE

215.2.04A Portland Cement Concrete

Portland Cement Concrete Base aggregates for PCC driveways and approaches, including but not limited to materials for base, foundation courses, leveling courses, or bedding shall meet the requirements of Section 207. If a designated size is not shown or given, furnish either 1" - 0 or 3/4" - 0, as the Contractor elects.

215.2.04B Colored Portland Cement Concrete and Interlocking Pavers

Base aggregates for downtown sidewalks including colored Portland Cement Concrete and interlocking pavers shall be 1"-0 in accordance with Section 207. A ½" leveling course of clean sand shall be placed between pavers and aggregate base.

215.3.00 CONSTRUCTION

215.3.01 PREPARATION OF SUBBASE AND BASE

Preparation of subbase and base shall conform to the requirements of Section 214.3.01.

215.3.02 PLACING, FINISHING, AND CURING PORTLAND CEMENT CONCRETE

This work shall conform to the requirements of Section 213.3.03.

215.3.03 CURB RAMPS

The Contractor shall construct accessible ramps at the locations shown on the plans and in accordance with the details shown on the plans and in conformance with all ADA requirements. Accessible curb ramps shall meet PROWAG standards in all respects. Prior to pouring curb ramps, confirm that forms are constructed to dimensions and grades shown on plans and that grades and dimensions meet PROWAG criteria. Use a digital level to verify that formwork matches plan and PROWAG grades. Correct all discrepancies before pouring concrete to ensure that finished concrete work meets requirements of PROWAG.

215.3.04 EXPANSION JOINTS

Expansion joints shall be constructed at each point of tangency, at connections to existing curbs, driveways, sidewalks, and pathways, around objects which protrude through, into, or about the sidewalk and at spacings not to exceed 25'.

215.3.05 CONTROL JOINTS

Control joints in sidewalks are required at 5' intervals. Control joints shall be scored in wet concrete a minimum of 1/3 the depth of the concrete section.

215.3.06 INTERLOCKING PAVERS

Furnish permeable interlocking concrete pavers including base preparation, concrete rat slab substrate base construction, and joint sand. The rat slab is defined as a 4" concrete leveling substrate base to prevent settling of the pavers. Verify that substrate is level or to correct gradient, smooth, capable of supporting pavers and imposed loads, and ready to receive work of this Section. Verify that gradients and elevations of substrate are correct.

Work shall include the following:

• Spread crushed rock evenly over prepared subgrade surface to a maximum thickness of 4-6 inch. Dampen and roller compact crushed rock to level and even surface.

• Place and joint and cure concrete base as shown in the Paver Sidewalk Standard Detail.
• Place paver units in straight pattern, from straight reference edge.
• Fill openings and joints with specified joint sand. Remove excess sand by sweeping pavers clean.
• Compact paver units using a vibrating mechanical tamper to compact. Apply additional joint sand to the open joints, filling them completely. Complete a minimum two passes over the paver area.

After sweeping the surface clean, check final elevations for conformance and reset as necessary. The following quality control checks shall be performed:

• The surface tolerance of the compacted surface shall not deviate more than plus/minus 1/4 inch over a 12 ft. straight edge.
• Lippage: No greater than 1/8 inch difference in height between adjacent pavers.
• The surface elevation of pavers shall be 1/8 inch above adjacent concrete walks and curbs.

215.4.00 MEASUREMENT AND PAYMENT

215.4.01 INCIDENTAL BASIS
When neither specified nor listed in the proposal for separate payment, sidewalks and pathways shall be considered incidental work for which no separate payment will be made.

215.4.02 SIDEWALKS
Sidewalks shall be measured on a square foot basis to the nearest whole square foot. Payment for sidewalks shall be at the unit price bid at the thickness and measurement unit specified.

215.4.03 PATHWAYS
Pathways shall be measured on a square foot basis to the nearest whole square foot. Payment for pathways shall be at the unit price bid at the thickness and measurement unit specified.

215.4.04 INTERLOCKING PAVER SIDEWALKS
Interlocking paver sidewalks shall be measured on a square foot basis to the nearest whole square foot. The required construction elements including but not limited to base, concrete rat slab and joint sand are considered incidental work for which no separate payment will be made.

216 ADJUSTMENT OF INCIDENTAL STRUCTURES TO GRADE

216.1.00 DESCRIPTION
This work consists of locating, adjusting, leveling, adding to as necessary, and finish paving around water valve boxes, utility vaults, and adjusting the manholes indicated on the plans so that the frame matches the finished pavement grade.

216.3.00 CONSTRUCTION
The manhole frames shall be adjusted with precast grade rings to a maximum of 12 inches. For height extensions greater than 12 inches, the interior diameter of the manhole shall be adjusted as required with precast sections.

Excavated areas around the structure shall not be less than 3' in width. Backfill shall conform to the requirements for Trench Excavation and Backfill. Where the true adjustment is less than 12", but the manhole barrel must be adjusted to conform to this specification, the adjustment

shall be considered as greater than 12".

216.4.00 MEASUREMENT AND PAYMENT

216.4.01 INCIDENTAL BASIS
When neither specified nor listed in the proposal for separate payment, adjusting incidental structures to grade shall be considered incidental work for which no separate payment will be made.

216.4.02 UNIT PRICE BASIS
Measurement for adjusting incidental structures to grade will be made on a per each basis for the class specified in the Schedule of Bid Items. Payment will be for the actual number of structures adjusted to grade as specified.

217 SIGNING AND STRIPING

217.1.00 DESCRIPTION
This work consists of providing painted striping, pavement markers or signs as shown on the plans and detailed in the standard drawings.

217.2.00 MATERIALS

217.2.01 PAINTED PAVEMENT STRIPING
Materials shall conform to Oregon Standard Specifications for Construction Section 00860.

217.2.01 PAVEMENT MARKINGS
217.2.01A MARKINGS
This Specification describes the minimum acceptable design requirements for furnishing permanent preformed thermoplastic pavement markings, hereinafter referred to as pavement markings, for use as roadway and intersection delineation and marking required by the City. The pavement markings shall consist of preformed letters, numbers, legends, bars, lines, and symbols. Pavement markings shall be of standard skid resistance with no pavement pre-heating requirements prior to installation.

The following specifications shall form a part of this specification as referenced herein. All specifications referenced shall be of the most current revisions:

- AASHTO M 247, Type 1
- AASHTO M 249
- Federal Test Standard Number 595A – Color #17778, Highway White
- Federal Test Standard Number 595A – Color #13538, Highway Yellow
- ASTM E 303
- ASTM C 666

207.2.01B COMPOSITION
1. The pavement markings are to conform to the specifications to be a resilient white or yellow thermoplastic product will uniformly distributed glass beads throughout the entire cross sectional area. Lines, legends, and symbols shall be capable of being affixed to hot mix or open graded friction asphaltic concrete and Portland cement concrete pavements by the use of normal heat from a propane type torch.

2. The pavement markings shall conform to pavement contours, breaks, faults, and shall be capable of remaining in place without being displaced by vehicular traffic.
3. The pavement markings shall have resealing characteristics, such that when heated by a torch will fuse with itself and to previously applied thermoplastic materials.

207.2.01C MATERIALS

1. Materials shall be composed of polymetric materials, pigments, binders, and glass beads, factory produced as a product. The dimensions shall meet the requirements of the most recent edition of the Manual of Uniform Traffic Control Devices. The Thermoplastic material shall conform to the American Association of State Highway Transportation Officials (AASHTO) Standard M 249, with the exception of the relevant differences for the material being supplied in the preformed state.
2. Graded Glass Beads: Graded glass beads shall be clear, transparent, and shall meet the General Requirement of the AASHTO Standard M 247, Type 1. The materials shall contain a minimum of thirty percent (30%) graded glass beads by weight with nor more than twenty percent (20%) of the glass beads to consist of irregular fused spheroids or silica. The index of refraction shall not be less than 1.50.
3. Retroreflectivity: The pavement markings shall upon application exhibit uniform adequate nighttime retroreflectivity. The pavement markings shall have average minimum retroreflectivity of 250 millicandelas for white and 150 minicandelas for yellow as measured by fifteen (15) meter geometry with a handheld retroreflectometer.
4. Skid Resistance: New pavement markings with standard skid resistance shall provide a minimum resistance value of 50 British Pendulum Number, when tested in accordance to ASTM E 303.
5. Colors: All legends shall be white unless otherwise specified. White pavement markings shall contain sufficient titanium dioxide pigment to equal Federal Standard 595A color numbered 17778. Yellow pavement markings shall contain sufficient pigment to equal Federal Standard 595A color numbered 13538. The yellow pigment must be of organic mature only and contain no lead chromate.
6. Material Thickness: Pavement markings minimum thickness shall be 120 mils.
7. Bonding: Pavement markings shall retain a minimum of 65% adhesive bond after 100 cycles of freeze thaw action when tested in accordance to ASTM Standard ASTM C 666.
8. Material Resistance: Pavement marking materials shall be resistant to deterioration due to exposure to sunlight, water, salt, oil, gasoline, or adverse weather conditions.
9. Application: Pavement markings will be applied to clean and dry asphaltic concrete or Portland cement concrete, using the propane torch method as recommended by the Manufacturer. The pavement marking shall be capable of being applied at a minimum ambient temperature of 32 degrees Fahrenheit and a maximum pavement temperature of 300 degrees Fahrenheit.
10. Primer/sealer shall be supplied by the contractor if the pavement markings pre-installation primer/sealer is required by the Manufacturer.
11. The shelf life of the pavement markings shall be 2 years from the date of manufacture. The thermoplastic must also melt uniformly with no evidence of skins or unmelted particles for this two-year period.

217.2.01 SIGNS

Sign materials shall conform to the Oregon Standard Specifications for Construction Section 00940 if not specified in the standard drawings except for the Street name signs which are unique to the City of Sisters. Sign posts materials shall conform the Oregon Standard Specifications for Construction Section 00910 if not specified in the standard drawings.

217.3.00 CONSTRUCTION

217.3.01 PAINTED PAVEMENT STRIPING
Installation shall conform to Oregon Standard Specifications for Construction Section 00861. Before installing striping, layout must be inspected and approved by City Engineer's representative.

217.3.01 PAVEMENT MARKINGS
Installation shall conform to Oregon Standard Specifications for Construction Section 00850.

217.3.01 SIGNS
Installation shall conform to City of Sisters Standard Drawings 2-24 to 2-26 or the Oregon Standard Specifications for Construction Section 00905, 00910 and 00940 if not specified in the standard drawings.

217.4.00 MEASUREMENT AND PAYMENT

217.4.01 UNIT PRICE BASIS FOR SIGNS
Measurement for signs will be made on a per each basis for the signs specified in the Schedule of Bid Items. Payment will be for the actual number of signs installed as specified. No separate payment will be made for providing and installing posts.

217.4.02 LUMP SUM BASIS FOR STRIPING AND PAVEMENT MARKINGS
Unless otherwise noted on the plans, striping and pavement markings will be measured and paid for on a lump sum basis.

221 LANDSCAPING

221.1.00 DESCRIPTION
This work consists of furnishing and installing landscaping and irrigation facilities in public rights-of-way, including downtown sidewalks. Except as modified or supplemented herein, the provisions of Sections 01030 and 01040 of the ***Oregon Standard Specifications for Construction***, current edition, shall apply.

221.1.01 DOWNTOWN COMMERCIAL AREA
Furnish labor, materials, equipment, and supervision necessary to complete all work shown on the Drawings and in the Specifications.

Protect active utilities encountered and notify persons or owner agencies. Landscape Contractor shall request utility markouts prior to excavating and verify with General Contractor the location of all underground site utilities.

221.1.02 IRRIGATION
Except as modified or supplemented herein, the provisions of Sections 01120 of the ***Oregon Standard Specifications for Construction***, current edition, and all supplements shall apply.

Furnish all labor, materials, equipment, and supervision necessary to complete all work shown on the Drawings and as described in the specifications. The Landscape Contractor shall

employ and have on site at all times during installation of the system competent individuals knowledgeable about the irrigation products and equipment specified.

Before proceeding with the installation of any section of the irrigation system, Contractor will check and verify the correlation between ground measurements and the drawings. The layout of the irrigation system is schematic. Follow as closely as is practicable. Notify Engineer of changes that have taken place in the field.

Contractor shall have all utilities marked out prior to excavating for irrigation lines. Landscaper shall verify the location of all underground site utilities with General Contractor, and protect all active utilities encountered. Utility owners shall be notified if conflicts occur.

Provide and install sleeves, automatic irrigation system, and valve boxes. Remove existing soil from around existing trees to allow for irrigation heads and new tree grates as detailed. Coordinate installation of sleeves under all hard surfaces with General Contractor.

Points of Connections (P.O.C.) for the irrigation system and valve boxes shall be provided and installed by the Contractor in conformance with the Water Service and Meter Installation Manual. Meters will be provided and installed by the City of Sisters Public Works Department Water.

Protection Of Unfinished Work: Provide protection at all times to keep rock, dirt, gravel, debris and all other foreign materials from entering piping, valves, and other irrigation equipment.

Environmental Conditions: Solvent welding of PVC pipe shall be performed under cover during rainy weather, and is not allowed in freezing conditions.

Storage: PVC pipe and fittings shall not be stored or left out in direct sunlight.

Guarantee And Replacement: Contractor shall guaranty the irrigation system, or any part thereof, against defects in materials and workmanship for a period of one year from the date of acceptance by the City. Any defects appearing during the warranty period shall be repaired or replaced without additional expense to the City of Sisters. Any apparent settling of backfilled trenches occurring during the warranty period shall be properly filled and re-graded, .including repair and complete restoration of all damaged planting, paving, or other improvements of any kind.

221.2.00 MATERIALS

221.2.01 DOWNTOWN COMMERCIAL AREA

221.2.02A General - Materials shall be as shown on the Drawings and specified herein.

221.2.02B Topsoil - Clean, friable, natural sandy loam material, free of debris, roots, stones, weeds and grass.

221.2.02C Textural Soil Amendments - Garden Care Compost, as provided by North American Soils, Inc., Portland, Oregon 97203. Five (5) Cubic Yards required for each 9 trees to be planted.

221.2.02D Tree Grates - Tree grates will be provided by the City of Sisters. Contractor shall arrange to pick up grates at Public Works Department.

221.2.02E Trees - Trees will be minimum 2" caliber to be measured 6" from graft and an approved tree type. The City will approve tree type and location before ordering.

221.2.02 IRRIGATION
Furnish only commercial quality materials and equipment, new and of brands and types shown on Drawings and as specified herein. All items proposed for use will be subject to testing to assure compliance with the Specifications. Provide materials for the same or related function that are of the same type and manufacturer.

221.2.03A IRRIGATION EMITTERS
Techline CV' 17 mm Dripline as manufactured by Netafim USA

221.2.03B PIPE, FITTINGS and TUBING

(1) **PVC Pipe (Polyvinylchloride)** PVC 1120, Type 1, normal impact, I.P.S., NSF approved; plain and/or bell end; conforming to ASTM D1784-69 and D2241-73, color white. Sleeves under paved areas shall be Schedule 40 PVC with minimum 2-inch inside diameter.

(2) **PVC Pipe Fittings** PVC 1120, Schedule 40, Type 1, normal impact, I.P.S., NSF approved, meeting requirements of ASTM tentative specifications D-2466 and D-1784.

(3) **PVC Riser** PVC 1120, Type 1, normal impact, I.P.S., NSF approved schedule 80 PVC, conform to PS 21-70. Cut to required lengths threaded both ends, color: dark grey.

(4) **Irrigation Tubing** Rain Tube - low density polyethylene, manufactured under the strictest ASTM - RB - 1049.

(5) **Emitter distributing Tubing** Techline CV' 17mm Dripline, as manufactured by Netafim USA.

221.2.03C PVC SOLVENTS:

(1) **PVC Solvent Cement** NSF approved solvent for PVC through 4", meeting requirements of ASTM D-2564, #705.

(2) **PVC Primer and Cleaner** Weld-On P-70

221.2.03D BACKFLOW DEVICES Refer to City of Sisters Water Service and Meter Installation Manual. C.O.R. Water Division will determine the final choice for backflow devices.

221.2.03E VALVES and VALVE BOXES:

(1) **Automatic Control Valve** - 1" - 24 volt Irri: -Rainbird solenoid valves.

(2) **Quick-Coupling Valve** - One piece, double slot 1" I.P.S. with vinyl cover and lock top. Rain Bird No. 5 LVC.

(3) **Valve Box** - Jumbo boxes, Traffic rated where exposed to vehicular traffic.

221.2.03F CONTROLLERS and ELECTRICAL:

(1) **Controller** - Rainbird ESP-8LXME' automatic irrigation controller

(2) **Control Wire** - Type UF bearing U/L approval for direct underground burial in National Electric Code Class II circuits. AWG sizes, minimum size #16.

221.2.03G GRAVEL 3/4" x 1/2" clean, washed, round gravel.

221.2.03H ACCESSORIES

(1) **Quick-Coupling Valve Coupler** - Rain Bird No. 55 K-1.

(2) Hose Swivel - Rain Bird No. SH-2.

221.3.00 CONSTRUCTION

221.3.01 DOWNTOWN COMMERCIAL AREAS

221.3.013A General - Remove from all planting openings, stones, mortar, concrete, asphalt, rubbish, debris, and any other materials considered harmful to plant life.

221.3.01B Soil Preparation - Thoroughly mix together 3.0 cubic yards of topsoil and 6 inches textural soil amendment at each proposed tree location.

221.3.01C Tree Grates - Tree grates to be installed after the irrigation and topsoil placement has been completed. Verify tree grate installations with General Contractor.

221.3.02 IRRIGATION

221.3.02A GENERAL

Installation of all materials and equipment will be in accordance with the manufacturer's written instructions and recommendations, and all applicable local and State of Oregon requirements.

221.3.02B EXCAVATION AND BACKFILL

(1) Trenches Pipe trenches shall be straight or 'snaked' slightly allowing for expansion and contraction of PVC pipe.

(a) Grades - Bottoms of uniform slopes 1% minimum grade, except 1/2% minimum where greater slope is not practicable.

(b) Trench Depth - 12" minimum pipe cover.

(c) Trench Width - Provide sufficient width at bottom of trench to allow for proper tamping around pipe.

(d) Preliminary Backfill - Backfill any excess excavation with suitable material free of rocks, sticks, or other material that may damage pipe, and thoroughly compact to give full support to the pipe.

(e) Bell Holes - Provide bell holes to provide support of pipe over its entire length.

(f) Bottom of Trench - Bottom of trenches will be smooth and free of sharp rock and other objects that may damage pipe.

(g) Finish Grade Backfill - Backfill trenches to subgrade, place backfill carefully around and over piping, removing rocks, or other material that may damage pipe; wet and tamp earth in layers not over 6" thick until thoroughly compacted.

(2) Installation

(a) Control Valves - Install control valves, and quick-coupling valves as indicated on Drawings. Verify exact locations in the field with Engineer prior to installation.

(b) Valve Boxes - Install perpendicular/square with building wall, curb or sidewalk for neat uniform appearance.

(c) Emitters - Install emitters at locations shown on Drawings.

(3) Pipe

(a) Install pipe in accordance with standard practice, supported at all points and "snaked" slightly allowing for expansion and contraction.

(b) PVC pipe joints shall be solvent welded except as indicated. Cut pipe square, deburr, wipe from the surface all saw chips, dust, dirt, moisture, and all foreign matter which may contaminate the cemented joint. Apply primer and solvent cement. Make all joints in accordance with manufacturer's recommendations.
(c) Provide a leak-resistance, water-tight joint with freedom of movement at all swing and/or swivel joints.

(4) Control Wiring
(a) Lay in trench under mainline for maximum protection.
(b) Place in conduit and pipe sleeves where indicated.
(c) Single wires (red) to each solenoid from control and a common neutral wire (white) to all solenoids from the controller.
(d) For wire sizes, use wire sizing chart published by manufacturers of battery control valves installed.
(e) No wire splices are permitted.

(5) Automatic Controllers Install as indicated on Drawings.

(6) Flushing and Testing

(a) Mainline Flushing - Flush mainline before installing emitters.
(b) Mainline Testing - Test mainline piping, valves, joints, and fittings for not less than two (2) hours before inspection prior to backfilling. Minimum test pressure will be pre-set by pressure regulator for two hours, with no greater pressure loss than 5 psi.
(c) Defects - Immediately correct any and all leaks or defects found and re-test.
(d) Double-Check Valve Test - Have State Health Department approved double-check valve tested by local State Certified Tester before start up. Have double-check valve tested again at the end of guarantee period. Submit copy of Test Report to Engineer after each test is completed.

(7) Adjusting And Balancing Adjust and balance irrigation system to provide uniform coverage.

(8) Clean Up Keep premises reasonably free from accumulation of debris. On completion of each division of work, remove all debris, equipment, and surplus materials and leave the premises clean.

(9) Maintenance During the first-year guarantee period, shut down and winterize system no later than November 1st. Activate system in spring, no later than April 15th. and balance for coverage. (Shut-down and turn-on is based on weather condition-use best judgment. Notify Engineer of changes due to weather conditions.) Provide the City of Sisters before final payment with "Record Drawings" of irrigation system showing drain valve locations and other revisions, including product information on all materials used. Three copies of product information are required.

(10) Backflow Device Test Report Submit to Public Works Department.

221.4.00 MEASUREMENT AND PAYMENT

221.4.01 DOWNTOWN COMMERCIAL AREA

Payment will be made at the price bid per unit of measurement for each of the items that appear in the proposal. Payment shall be understood to be full and complete compensation for all materials, labor, equipment, tools and incidentals necessary to complete the work as specified in this section.

221.4.02 IRRIGATION

There will be no separate measurement of work done under this section.

Payment will be made at the Contract lump sum amount for the pay item "Irrigation System". The lump sum amount will be considered payment in full for furnishing and placing all piping and fittings, controllers, valves, emitters and sprinklers, and incidentals, leakage testing, and all other work as shown and specified, including excavation, bedding and backfill, electrical service and system orientation.

When not listed in the proposal as a separate pay item, irrigation systems shall be considered incidental to work for Landscaping, and no additional payments will be made.

DIVISION III – SANITARY & STORM SEWER FACILITIES

301 TRENCH EXCAVATION, BEDDING AND BACKFILL

301.1.00 DESCRIPTION

Minimum general standards for sewer facilities shall conform to the ***Oregon Standard Specifications for Construction,*** latest edition. This section covers trench excavation, trench foundation, pipe bedding, pipe zone, trench backfill.

301.1.01 TRENCH EXCAVATION, BEDDING, AND BACKFILL

See Division I Trenches

301.3.00 CONSTRUCTION

301.3.01 TRENCH EXCAVATION

301.3.01A General

The Contractor shall secure and comply with applicable State, County, or City street cutting permits. The Contractor shall comply with all City, County, State and Federal Highway Construction Safety and Health Standards. Prior to installing a sewer facility in an unimproved street, the street shall be brought to subgrade to assure that adequate bury, depth of cover, and utility separation is achieved.

301.3.02 TRENCH BACKFILL

See Division I Trenches

301.4.00 MEASUREMENT AND PAYMENT

301.4.01 LINEAR FOOT BASIS

The length of trench shall be measured horizontally from centerline to centerline of manholes or to the end of the pipe, whichever is applicable. Measurement of the various depth classes, as stated in the Schedule of Bid Items, will be from the pipe invert elevation as constructed to the design subgrade elevation at the point of measurement.

Payment for TRENCH EXCAVATION will be at the unit price bid per lineal foot at the specified diameter for the depth class as measured. Payment shall include all materials, tools, labor, equipment, bedding, backfill and incidentals required to excavate and backfill the trench as specified. There will be no separate payment for rock excavation unless specifically called for in the Schedule of Bid Items.

301.4.02 INCIDENTAL BASIS

When not listed in the Schedule of Bid Items as a separate pay item, TRENCH EXCAVATION shall be considered incidental to the price bid for pipe.

303 PIPE AND FITTINGS (SANITARY SEWER)

303.1.00 DESCRIPTION

This section covers all work necessary for the installation of sanitary sewer pipe and fittings.

303.2.00 MATERIALS

303.2.01 GENERAL

Sanitary sewer pipe shall be designated as either gravity main or pressure main for purposes of this specification. Unless otherwise specified, all gravity sewer and pressure pipe in the project shall be polyvinyl chloride (PVC) of the size and pressure class called for on the plans. Where more than one type of material is considered appropriate, the type required will be designated on the plans.

At the sole discretion of the City, the Contractor and/or material supplier shall provide certified manufacture date of any PVC pipe with visible cracking, discoloration, or fading due to ultraviolet light exposure. Pipe which is one year or older from the date of manufacture may be rejected. The City reserves the right to reject pipe material for cause regardless of the age of pipe.

303.2.02 POLYVINYL CHLORIDE PIPE

303.2.02A Gravity Sewer Pipe

1. Rigid PVC pipe compounds used in gravity sewer pipe shall conform to ASTM D1784, Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (PVC) Compounds.

2. PVC pipe shall conform to ASTM D3034, standard dimensions ratio not to exceed 35, or to ASTM F679, minimum pipe stiffness (F/Δy) at 5% deflection of 46 psi or 115 psi for all sizes when tested in accordance with ASTM D2412. Provide manufacturer's certification, including test results, for all materials supplied under these Specifications.

3. All piping system components of a pipe class shall be the products of one manufacturer.

4. Where minimum cover cannot be maintained, or where directed by the Engineer, pipe shall be PVC water pipe meeting the requirements of AWWA C900 specifications, ***Polyvinyl Chloride (PVC) Pressure Pipe.***

303.2.02B Pressure Sewer Pipe

1. Pipe shall be Class 160 (160 psi) rigid PVC Class 12454-B, conforming to ASTM D1784 and ASTM D2241 or ASTM D1785 and ASTM D2241; or

2. Pipe shall be Class 150- PVC C900 and have a minimum DR of 18 unless otherwise specified.

3. All piping system components of a class shall be the products of one manufacturer.

4. Where minimum cover cannot be maintained, or where directed by the Engineer, Pipe shall be PVC water pipe meeting the requirements of AWWA C900 specifications, ***Polyvinyl Chloride (PVC) Pressure Pipe.***

5. Purple non-metallic tape shall be laid 12inches above the pipe when using white or blue plastic pipe in pressure sewer installation.

303.2.03 JOINTING MATERIALS

303.2.03A Polyvinyl Chloride Pipe

1. GRAVITY SEWER PIPE

Joints shall be rubber gasketed conforming to ASTM D3212 for gravity sewers. Gaskets shall conform to ASTM F477. All bells shall be formed integrally with the pipe and shall contain a factory installed elastomeric gasket. Lubricant for jointing shall be as recommended by the pipe manufacturer.

2. PRESSURE SEWER PIPE

Joints shall be rubber gasketed conforming to the manufacturers recommendations for the pressure class specified. Gaskets shall conform to ASTM F477. Lubricant for jointing shall be as recommended by the pipe manufacturer.

303.2.04 FITTINGS

303.2.04A Poly Vinyl Chloride Pipe

1. GRAVITY SERVICE FITTINGS

a. PVC pipe fittings shall conform to ASTM D3034, standard dimensions ratio not to exceed 35 or to ASTM F679. Provide manufacturer's certification, including test results, for all materials supplied under this Specification.

b. All fittings shall be the same as the joints used on the sewer pipe. Caps or plugs shall be furnished with each tee outlet or stub with the same type gasket and joint as furnished with the service connection pipe specified for future service connections. The plug or cap shall be banded or otherwise secured to withstand all test pressures involved without leakage.

c. Lateral connections to the main shall be made with Tee-Wyes.

2. PRESSURE SEWER FITTINGS

a. Gate Valves (Isolation Valves)

Gate valves shall be iron-body, resilient-seated gate valves conforming to AWWA C509, "Ken-seal" valves as manufactured by Kennedy Valve Co. or equal. Gate valves shall be polymer coated inside and out, have flanged or threaded ends, and a non-rising stem. Unless otherwise specified, gate valves shall be supplied with a 2 inch operating nut and 0-ring joints. Gate valves installed in vaults or above ground shall be supplied with hand wheels.

b. Check Valves

Check valves on pressure sewers, except for service lines, shall be spring loaded, external lever actuated, iron-body, flanged end, resilient seat check valves, Kennedy model 106 ALS or equal. APCO model 104P3 with backflow device may be used in certain applications as approved by the Engineer. Commercially available PVC check valves may be used for individual 3" diameter service lines where the total head at the check valve does not exceed 25 feet.

c. Valve Enclosures

Valve enclosures for check valves and gate valves shall be concrete in traffic areas, and may be plastic elsewhere. Covers shall have the word "SEWER" in raised letters. Top section and base section shall have minimum overlap of 4 inches.

d. Pressure Pipe Cleanouts

Cleanouts shall be constructed as indicated on the Standard Drawings. Box shall be a standard valve box.

e. Pressure Pipe Air-release Valves

Air-release valves shall be installed as indicated on the Standard Drawings, complete with 2" shut-off valve, 1" blow-off valve, quick disconnect coupling and backflushing apparatus, APCO Model 400, or approved equal. Valve shall provide for an operating pressure range of 0-50 psi.

f. Saddles

Saddles shall be nylon coated, ductile iron body saddles with double stainless steel straps equivalent to Type 357 service saddles as manufactured by Smith-Blair.

g. Valve Boxes

Valve boxes subject to traffic loading shall be a two piece grade adjustable box. The valve box shall be 5" I.D. with a slip top section without a dirt flange on the bottom as shown in the Standard Drawing. Valve boxes shall be Rich 926 (c) or equal. The extension piece shall be

of the proper length for depth of cover. The word "SEWER" shall be cast into the top of the lid, and lid shall be filled with concrete.

h. Bends, Tees and Other Fittings

Pressure sewer fittings shall be ductile iron meeting the requirements of AWWA C110 or AWWA C153 and shall have a minimum working pressure of 250 psi. Fittings shall be restrained to meet the anticipated loading using grip ring gaskets or mechanical joint restraint.

303.2.05 Detection Tape and Detection Wire

Detection tape shall be installed on all non-metallic sewer mains. Detection tape shall be manufactured by Allen Systems or an approved equal. One course of detection tape is required at the top of the pipe zone. Detection wire shall be installed on all gravity sewer mains and all service connections. The wire shall be a green-clad, 18 gauge, UF bury, solid copper wire. The wire shall be attached to the top of the pipe. Where a splice is necessary, the wire shall be joined with a King KWC 100 tan watertight connector, or equivalent as approved by the Engineer. For service connections, detection wire shall be brought to the ground surface within the cleanout access box, allowing for adequate length (approximately 6 inches) for locator connection.

303.2.06 Insulation
Pipe insulation when required shall be a minimum of 2-inch thickness, CPR Upjohn-Trymer bun material, Manville Micro-Lok, or equivalent, covered with an aluminum roll jacketing, 0.016-inch minimum thickness, PABCO Surefit Aluminum Jacketing, Manville Micro-Lok, or equivalent. Insulation shall have a maximum conductivity ("K") of 0.40. Insulation at pipe supports shall be calcium silicate or other approved rigid insulation adequate to support the pipe. Jacketing joints shall be sealed within silicone caulk. Pipe supports and hangers shall be plated or hot dipped galvanized after fabrication.

303.2.07 Concrete
Concrete for thrust blocking and support structures shall conform to ASTM C 94, Alternate 2, and shall be proportioned to obtain a 28-day compressive strength of 2500 pounds per square inch or approved equal. Sacrete mix type products are not allowed.

303.3.00 CONSTRUCTION

303.3.01 LINE AND GRADE
Project shall be staked according to General Specifications and City Standards for street construction.

Line and grade may not vary more than 1/32 inch per inch of pipe diameter subject to the following limitations:

a) Variance may not exceed ½ inch regardless of pipe diameter
b) Variance must not result in level or adverse slope

303.3.02 PIPE DISTRIBUTION AND HANDLING

303.3.02A Pipe and Fitting Storage
Material shall be stored on the job from cars, trucks, or storage yard no sooner than can be used to good advantage. Pipe and fittings shall be stored and covered in such a manner as to prevent damage or contamination.

303.3.02B Handling Material
Proper implements, tools, and facilities shall be provided by the Contractor for the safe and convenient prosecution of the work. The Contractor shall protect pipe and fittings from contamination or damage at all times. All pipe, fittings, and valves shall be transported and handled in a manner to prevent damage to the pipeline materials and protective coatings and linings. Under no circumstances shall pipeline materials be dropped or dumped off trucks or into the trench. No more pipe shall be laid out along open ditch prior to installation than can be installed and backfilled in one work shift. Pipeline materials shall be removed from storage area as needed for installation,

303.3.02C Cleaning Pipe and Fittings
All foreign material shall be removed from the bell-and-spigot ends of each pipe as installation proceeds. When deemed necessary by the City Inspector, the outside of the spigot and the inside of the bell shall be wiped clean, dry, and free from oil, grease, or ice before the pipe is laid. The ends of solvent weld pipe and fittings, and of rubber gasket joint pipe and fittings, shall be wiped clean of all dirt, grease and foreign matter.

303.3.03 LAYING PIPE ON CURVES
The Contractor shall lay pipe on horizontal or vertical curves in accordance with the manufacturer's recommendations. Pipelines intended to be aligned straight between manholes shall be so laid, and in no case shall the deviation from the straight line at any joint exceed 1/2-inch.

303.3.05 PIPE PLACING AND JOINTING
Trench excavation, bedding, and backfill shall be in accordance with Division I - Trenches.

303.3.05A Placing Pipe in the Trench
Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed into the trench. If the pipe laying crew cannot place the pipe in the trench and install it without getting dirt in the pipe, the Inspector may require that, before lowering the pipe into the trench, a heavy, tightly woven canvas bag of suitable size shall be placed over each end and left there until the connection is to be made to the adjacent pipe. During laying operations, no debris, tools, clothing, or other materials shall be placed in the pipe. Between each shift, pipe end shall be plugged to prevent any objects or animals from entering.

303.3.05B Unsuitable Conditions for Installing Pipe
Pipe shall not be installed when there is water in the trench bottom, or when, in the opinion of the Inspector, trench conditions are otherwise unsuitable.

303.3.05C Pipe Cutting
Pipe shall be cut in a neat and professional manner with proper tools intended for that purpose and without damaging the ends of the pipe. The pipe shall be cut so as to leave a smooth end at right angles to the axis of the pipe. The cut end shall be dressed in conformance with the pipe manufacturer's recommendation.

303.3.05D Solvent Welded Joints
After a length of Solvent Weld pipe is placed in the trench, both the spigot end and the receiving bell shall receive a thorough application of primer and glue as per the manufacturer's specifications. Precaution shall be taken to prevent dirt from entering the joint space. The pipe (spigot end) shall be centered, inserted, seated, and rotated at least 90 degrees. The pipe shall be brought to correct line and grade along its length, and secured in place with approved backfill material. Pipe and fittings which do not allow a sufficient and uniform space for jointing shall be removed and replaced with pipe and fittings of proper dimensions to assure such uniform space.

303.3.05E Number of Pipes Laid before Jointing
Solvent weld and rubber gasket joint pipe shall be connected immediately as they are placed in the trench.

303.3.05F Prevention of Trench Water from Entering Pipe
When pipe installation is not immediately progressing, the open ends of pipe in the trench shall be sealed with a watertight plug, or other means approved by the Inspector, and no trench water shall be permitted to enter the pipe. These provisions shall apply during midday breaks and at the end of each shift. If water is present in the trench, the seal shall remain in place until the trench is pumped completely dry.

303.3.05G Bell End Direction
Pipe shall be laid with bell ends facing upgrade/upstream unless otherwise directed by Engineer.

303.3.05H Seating Rubber Gasket Joint
After a length of pipe with rubber gasket joint is placed in the trench, the plain end shall be centered in the bell, and the pipe properly seated and brought to correct line and grade along the entire length. Pipe and fittings which do not allow a sufficient and uniform space for jointing shall be removed and replaced with pipe and fittings of proper dimensions to provide for such space. Precautions shall be taken to prevent dirt or contaminants from entering the joint space.

303.3.05I Jointing Rubber Gasket Fittings
PVC fittings with rubber gasket type joint shall be laid and jointed in strict accordance with the manufacturer's recommendations as approved by the Inspector and in accordance with the requirements of the Special Specifications (if applicable). The Contractor shall provide all special tools and devices such as special reamers, rasps, and similar items required for the installation. Lubricant for the pipe gaskets shall be of the type recommended by the pipe manufacturer, and no substitutions will be permitted under any circumstances.

Fittings, plugs, and caps shall be set and jointed to pipe in the manner prescribed by these specifications, or as otherwise approved by the City Engineer or City Representative. MJ Style couplings, such as Romac RC501 or XR501, shall be used for dissimilar pipe materials. Special conditions encountered for which suitable adapter couplings are not available, such as rare or discontinued pipe materials, shall be referred to the City Engineer for consideration of an approved method.

303.3.05J Joints For Dissimilar Pipe
Adaptors for transitioning between ASTM D3034 PVC sewer pipe and AWWA C900 pressure pipe shall meet the requirements of AWWA C907. Concrete pipe to PVC pipe shall be joined with properly sized transition couplings meeting the requirements of AWWA C219. For 8" to 24" pipe, use Romac RC501 Reducing Coupling or approved equal. For pipe larger than 24", use Romac RC400 Steel Reducing Coupling or approved equal.

303.3.05K Pressure Service Connections and Fittings
Service connections shall be designed and approved on an individual basis. Materials required will be specified and designated on approved plans. Pressure service pipe shall be no larger than 3" diameter and shall be connected to the City system by City crews with a gate valve and check valve assembly.

303.3.05L Bridge Crossing Pipe
Pipe for bridge crossing shall be ductile iron as specified herein, except that restrained joint pipe may be used and deflected within the limits of the manufacturer's recommendations to facilitate wingwall penetration and overall alignment. Flanged fittings may be used for the wing wall penetrations. Bridge crossing pipe shall be insulated with a urethane or fiberglass pipe wrap system specifically designed for pipe insulation purposes.

303.3.06 DEFLECTION AT JOINTS
Wherever it is necessary to deflect pipe from a straight line, either in a vertical or horizontal plane, a manhole shall be required. Where long-radius curves are permitted by the Engineer, the amount of deflection allowed at each joint shall be uniform and not exceed that indicated in the manufacturer's specifications.

Variation in invert elevations between ends of jointed pipes must not exceed 1/64 inch per inch of pipe diameter to a maximum of ½ inch regardless of pipe diameter.

303.3.07 REQUIREMENTS PRIOR TO TESTS

303.3.07A General
All gravity systems and appurtenances shall successfully pass a hydrostatic or air test prior to acceptance, and shall be free of visible leakage. Information regarding air testing may be obtained from the Engineer.

On pipe 54" diameter and larger, individual joints may be tested by an approved joint testing device. All details of testing procedure shall be subject to approval of the Engineer.

303.3.07B Plugging of Wyes, Stubs and Service Connections
The Contractor shall plug all wyes, stubs, and service connections with gasketed caps or plugs securely fastened or blocked to withstand the internal test pressure. Such plugs or caps shall be removable, and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension.

303.3.07D Time of Test
The Contractor shall perform system testing during the normal work day, scheduling the plugging, capping and other preparatory work so as to complete the testing during daylight hours.

303.3.07E Lines Not Passing Requiring Testing and Inspection
The Contractor shall repair or replace any portion of the system not passing the air or hydrostatic test In a manner conforming to these specifications. Infiltration of ground water in an amount greater than allowed by specifications following a successful hydrostatic or air test shall be considered as evidence that the original test was in error or that partial failure of the system has occurred. The Contractor shall correct such failures occurring within the warranty period in a manner approved by the Engineer, and at no additional expense to the Owner.

303.3.08 REPAIRS
All repair or replacement of existing sewer pipe must conform to City Standards and Specifications. The City's Wastewater Division must be notified of any damage to existing sewer pipe. The pipe must remain exposed until it is inspected by a City representative. Repair method must be approved by the City and repairs must be inspected prior to backfill. After trench backfill is placed and compacted, the City will conduct a video inspection and any work not meeting City standards will be corrected by the Contractor. Video inspection fees will be charged to the party that damaged the line in accordance with the fee schedule in effect at the time.

303.3.09 HYDROSTATIC TESTING (PRESSURE PIPE)

303.3.09A General
Pressure sewer lines shall be tested by hydrostatic methods. The Contractor shall furnish all necessary equipment and material, and make all taps in the pipe as required for testing purposes. The City Engineer or City Inspector will monitor the tests. The test pressure shall be two times the calculated operating pressure, but not less than 50 psi for the low end of the pipe. For high pressure lines, the test pressure shall not exceed the manufacturer's maximum operating pressure recommendation.

303.3.09B Equipment
Furnish the following equipment and materials for the tests:

Amount	Description
2	Approved Graduated Containers
2	Pressure Gauges
1	Hydraulic Force Pump Approved by the Engineer Suitable Hose and Suction Pipe as Required

303.3.09C Backfilling and Thrust Blocks

Perform the testing after the trench has been completely backfilled. The Contractor may conduct an initial test, if field conditions permit as determined by the Engineer, by partially backfilling the trench and leaving the joints open for inspection. The acceptance test shall not, however, be performed until all backfilling to subgrade has been completed. Where any section of pipe is provided with concrete thrust blocking, the pressure test shall not be conducted until five days after the concrete blocking was placed. If high-early strength cement is used for the concrete thrust blocking, the curing time may be reduced to two days.

303.3.09D Procedure

After backfilling the trench, fill pipe with water. Expel all air from pipe prior to test. Make up any water lost by absorption, and then apply test pressure with suitable pump. Valve off line when test pressure is determined to be stabilized, and conduct pressure test for two hours. At the end of the test period, add water with the pump to raise system back up to test pressure. Measure the quantity of water required to restore test pressure. The pipe shall be deemed to have passed if this makeup water is less than that calculated for allowable leakage.

Allowable leakage shall be determined by the formula -

$$L = \frac{ND(P)^{0.5}}{7400}$$

L= Allowable leakage (gal./hr.)
N = Number of joints in the section tested (pipe and fittings)
In 1000' there are 50 pipe joints. Each fitting has 2 joints
D = Nominal diameter of pipe (in.)
P = Average test pressure. Equal to gage pressure less ½ static head where gage is located at the low point of the line. Where gage is located at the high point, add 1/2 static head.

Allowable Leakage per 1,000 feet for Mechanical Joint or Push-On Joint Pipe in 20 Foot Nominal Lengths Not Including Fittings (gallons per hour)

Nominal Pipe Size	Average Test Pressure in Line (psi)				
Inches	50	100	150	200	250

4	0.19	0.27	0.33	0.38	0.43
6	0.29	0.41	0.50	0.57	0.64
8	0.38	0.54	0.66	0.76	0.85
10	0.48	0.68	0.83	0.96	1.07
12	0.57	0.81	0.99	1.15	1.28
14	0.67	0.95	1.16	1.34	1.50
16	0.76	1.08	1.32	1.53	1.71
18	0.86	1.22	1.49	1.72	1.92
20	0.96	1.35	1.66	1.91	2.14
24	1.15	1.62	1.99	2.29	2.56
30	1.43	2.03	2.48	2.87	3.20
36	1.72	2.43	2.98	3.44	3.85

303.3.10 AIR TESTING (GRAVITY PIPE)

303.3.10A General

The Contractor has the option after completing installation of the system, including all service connections, backfilling and compaction, of conducting a low pressure air test in lieu of the hydrostatic test. The Owner may require testing of manhole to manhole sections as they are completed for the purpose of expediting acceptance of the system and to allow connections to be made before the entire system is complete.

The test shall be performed at no additional expense to the City. The Contractor shall provide all equipment and personnel for the test. The method, equipment, and personnel shall be subject to the approval of the Engineer. The Engineer may, at any time, require a calibration check of the instrumentation used. The pressure gauge shall have minimum divisions of 0.10 psi and have an accuracy of 0.0625 psi (one ounce per square inch). All air used shall pass through a single control panel.

The Air Test described in this section shall be used for plastic pipe. The Air Test indicated in the APWA Standard Specifications shall be used for all other materials. Where a question exists as to the appropriateness of the method to be used, the method resulting in the longest test period shall be used.

303.3.10B Safety Precautions

All plugs used to close the sewer for the air test must be capable of resisting the internal pressures and must be securely braced as necessary.

All air testing equipment must be placed above ground, and no person shall be permitted to enter a manhole or trench where a plugged line is under pressure. All pressure must be released before

plugs are removed. The testing equipment used must include a pressure relief device designed to relieve pressure in the line under test at 10 psi or less, and must allow continuous monitoring of the test pressures in order to avoid excessive pressure. The Contractor shall use care to avoid flooding of the air inlet by ground water. The Contractor shall inject the air at the upper plug if possible. Only qualified personnel shall be permitted to conduct the test.

303.3.10C Ground Water

The presence of ground water will affect results of the test. The average height of ground water over the pipelines must be determined immediately before starting the test. The method of checking the ground water height shall be as approved by the Engineer.

303.3.10D Method

All air testing shall be by the Time Pressure Drop Method. The test procedures are described as follows:

1. Clean the lines to be tested and remove all debris where noted.
2. The Contractor has the option of wetting the lines prior to testing.
3. Plug all open ends with suitable test plugs. Brace each plug securely.
4. Check the average height of the ground water over the pipe. The test pressures required below shall be increased 0.433 psi for each foot of average water depth over the line.
5. Add air slowly to the section of system being tested until the internal air pressure is raised to 4.0 psig greater than the average back pressure of any ground water that may submerge the pipe.
6. After the internal test pressure is reached, allow at least 2 minutes for the air temperature to stabilize adding only the amount of air required to maintain pressure.
7. After the temperature stabilization period disconnect the air supply.
8. At any convenient observed pressure reading between 3.5 and 4.0 pisg greater than the average external pressure of any groundwater above the pipe, begin timing the pressure loss. If the time shown in the table below for the designated pipe size and length elapses before the air pressure drops 0.5 psig, the section is considered to have passed the test. The test may be discontinued once the prescribed time has elapsed, even though 0.5 psig loss has not occurred.
9. Technical data
   a. Allowable air loss rate (Q) - The value for Q is 0.0015 cubic feet per minute per square foot of internal surface.
   b. Testing main sewers with services - If lateral sewers such as services are included in the test because of the difficulty in isolating such lateral sewer, their lengths may be ignored for computing test times. Ignoring the laterals results in a slightly more severe test.
   c. Rounding off pipe lengths - Rounding off pipe lengths shall always be to the next higher length value shown, i.e., the test time for 201' shall be the times shown for 250'. At the discretion of the Inspector, test times for a unique pipe length may be linearly interpolated from the next higher and lower times indicated.

Specification Time for Length (L) Shown
(min:sec)

Pipe Dia.(in)	Min. Time Min:Sec	Length For Min. Time (ft)	Time For Longer Length (sec)	100ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft	500 ft

6	2:50	398	0.427L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12	3:33
8	3:47	298	0.760L	3:47	3:47	3:47	3:47	3:47	4:26	5:04	5:42	6:20
10	4:43	239	1.187L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54	9:54
12	5:40	199	1.709L	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50	14:16
15	7:05	159	2.671L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02	22:16
18	8:30	133	3.846L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51	32:04
21	9:55	114	5.235L	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16	43:38
24	11:20	996	837L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17	56:59

303.3.11 CLOSED CIRCUIT TELEVISION INSPECTION OF SANITARY AND STORM SEWERS

The City shall televise all lines before the placement of street base material and paving. Charge for this service is listed in the Master Fee schedule.

Prior to CCTV inspection the following conditions need to be met:

1) All sewer trenches are to be completely backfilled and compacted as specified in Division 1 Trenches.
2) All manholes to be in place with covers exposed.
3) All grouting of pipes and channels in manholes are to be finished.
4) All curbs in place.
5) Streets clear of materials and debris to allow inspection equipment access to point(s) of inspection.
6) Manholes are to be constructed to grade. If manhole is more than one foot above surrounding grade, ramping is required.
7) The Contractor must remove all large, construction debris from the line prior to inspection. The City will clean and flush sediment from all pipelines just prior to CCTV Inspection.
8) CCTV inspection should be performed prior to base rock placement.

Findings will be recorded, and the Contractor will be required to correct all deficiencies at no additional expense to the City. Deficiencies include, but are not limited to;

1) Horizontal offsets at joints or fittings in excess of 1/32 inch per inch of pipe diameter (Ex. ¼" for 8" pipe)
2) Vertical offsets at joints or fittings in excess of 1/32 inch per inch of pipe diameter (Ex. ¼" for 8" pipe) if drop is in direction of flow. No offset is allowed if it will create a step up in the direction of flow.
3) Standing water in excess of 3/8 inch
4) Fittings protruding into pipe in excess of ½ inch if above spring line. No protrusion permitted below spring line.
5) Damage to pipe or fittings

Upon correction of deficiencies revealed by television inspections, the Contractor shall notify the Engineer. If the pipe has been cut and repaired or opened in any way, the pressure test must be

repeated along with mandrel testing and CCTV inspection. If the corrective work is limited to exposing the pipe and making minor changes to the grade, only mandrel testing and CCTV inspection are required. Additional CCTV inspection testing services will be conducted by the City with cost for inspection charged to the Contractor or developer in accordance with the current fee schedule.

If at any time during the one year warranty period an examination of the sewer line discloses a deficiency from construction, that deficiency shall be corrected by the Contractor, Developer, Property Owner or other responsible party at no additional expense to the City. Pavement, sidewalk, landscaping or other incidental repairs are the responsibility of the Contractor Developer or Property Owner. The City will consider trenchless repair methods provided they can be shown to provide acceptable corrective action. A CCTV inspection will be completed by the City following all repairs.

303.3.12 MANDREL TESTING

PVC sanitary sewer mains shall be deflection tested by pulling an approved mandrel 95 percent of the inside pipe diameter having at least 6 vanes through the pipe from manhole to manhole. Conduct test after pipe has been flushed and cleaned and no less than 30 days after trench has been backfilled and compacted, but prior to paving.

303.3.13 SERVICE CONNECTION INSPECTION

All connections for service lines shall be inspected by the City Inspector prior to backfilling.

303.4.00 MEASUREMENT AND PAYMENT

303.4.01 SEWER PIPE

Payment for stormwater and sanitary sewer pipelines will be made on a lineal foot basis for the various classes, types, and size of pipe listed and installed. The pipeline will be measured horizontally from center-to-center of manholes, or to the end of the pipe, whichever is applicable.

No final payment for sewer pipe in place will be made until the pipeline has successfully passed the air or hydrostatic test and video inspection.

303.4.02 WYE FITTINGS

Payment for tee and wye fittings will be made at the unit price for each size and type as listed and installed. Payment for tee and wye fittings will be in addition to payment for sewer from manhole to manhole.

303.4.03 CONCRETE WYE ENCASEMENT

Payment for concrete tee and wye encasement will be made at the unit price each for the various sizes of pipe as listed and installed.

303.4.04 INCIDENTAL BASIS

When neither specified nor listed in the proposal for separate payment, Pipe and Fittings (Sanitary Sewer) shall be considered incidental work for which no separate payment will be made.

304 SERVICE LINE SEWERS

304.1.00 DESCRIPTION

This section covers the work necessary for the installation of sewer service lines, service taps, and connections. In general, service lines will extend from the sewer main to the street or alley right of way line.

At the sole discretion of the City, the Contractor and/or material supplier shall provide certified manufacture date for any PVC pipe with visible cracking, discoloration and/or fading due to ultraviolet light exposure. Pipe which is one year or older may be rejected. The City also reserves the right to reject pipe material for cause regardless of age of pipe.

304.2.00 MATERIAL

304.2.03 PIPE AND FITTINGS FOR SERVICE LINES

Sewer service connection lines shall conform to the same specifications as sanitary sewer lines unless otherwise modified by these specifications.

304.2.04 SEWER SERVICE MARKERS

Service connection markers shall be new, one piece Douglas Fir or cedar, 2x4's, utility grade or better, or 2" PVC Schedule 40 pipe. All markers shall be painted green.

304.2.05 SERVICE SADDLES

Service saddles shall be Romac "CB" type saddles or equivalent. The type shall conform to style 101S with painted saddle and stainless steel strap. On sewer pipe with a diameter of 12" or larger, INSERTA TEE® service connections will be acceptable. No other type shall be permitted.

304.2.06 SWING CHECK VALVES

Swing valves shall be APCO series 100 or equivalent. The check valve shall be capable of passing a 3" diameter solid.

304.2.07 GATE VALVES

Iron body, resilient seated gate valves shall be "Kennedy Ken-Seal" type 1561x or equal. Gate valves will meet AWWA standards (C-500), have non-rising stems, be rated at 200 lbs. working pressure and 350 lbs. hydrostatic pressure, open left with 2" square operating nuts, with brass fittings, "0" ring stem pressure seals, non-directional, mechanical joints; as manufactured by Kennedy, Mueller, Waterous, or American Darling.

304.3.00 CONSTRUCTION

Sewer service lines shall not have less than 3.0 feet of cover under roadway area and shall not have less than 3.0 feet of cover to natural ground in the right-of-way. Services shall be extended at minimum grade or as required to provide gravity services to each property or building.

Each property shall be connected to the sewer main or lateral by an independent sewer service. Sewer services to adjacent properties may share the same trench.

Where a sewer service is to be connected to an existing sewer main and no connection fitting is available, the actual connection must be made by a licensed and bonded contactor with a City of Sisters business license. Inspection by the Public Works Department is required for work in the

public right-of-way. Sewer services in new construction areas shall extend to the property line and be marked with material described in 304.2.04 extending a minimum of 6" above the natural ground surface. The distance from natural ground surface to the top of the service connection in feet and inches shall be neatly written in permanent ink on the sewer service marker.

304.3.01 SEWER TAPS

All taps on existing sewer mains shall be performed by City of Sisters Wastewater Division personnel. Contractor shall provide 72 hour advance notice to the City for all taps (Hot Tap permit is required prior to installation).

304.3.02 CITY SEWER TAP PREPARATION REQUIREMENTS

The Contractor shall provide a finished trench with appropriate safety shoring meeting OSHA requirements to allow City staff to tap active or existing main lines for service laterals. The full circumference of sewer main shall be exposed and accessible, and wiped free of dirt and foreign material prior to the scheduled arrival of the City tapping crew. When crossing streets, or when required by the City, traffic control shall be provided and maintained by the Contractor. Damage to existing pipe or other utilities in the ground is the responsibility of the excavator.

304.4.00 MEASUREMENT AND PAYMENT

304.4.01 TRENCH EXCAVATION AND BACKFILL

Trench excavation and backfill shall be paid for under the provisions of Sec. 301.4.01.

Where no separate item exists in the Schedule of Bid Items, work for sewer service trench excavation and backfill shall be considered incidental to the work required to provide and install sewer services.

304.4.02 SEWER SERVICE LINE PIPE

Payment for sewer service line pipe will be made on a lineal foot basis for the size and type of pipe shown. Measurement will be made horizontally along the centerline of the service pipe from the main line fitting to the cap or termination of the service line.

No final payment for sewer service line pipe will be made until the section of sewer to which the services are connected has successfully passed the applicable internal pressure test as described in Section 303.

304.4.03 SEWER TAPS

Payment for sewer taps will be made on a per each basis for the type, kind, and size specified, and shall constitute full compensation for constructing the sewer tap complete and in place.

304.4.04 INCIDENTAL BASIS

When neither specified nor listed in the proposal for separate payment, sewer service lines shall be considered incidental work for which no separate payment will be made.

305 PIPE AND FITTINGS (STORM SEWERS)

305.1.00 DESCRIPTION

This section covers the work necessary for the construction of storm sewers. Except as amended or modified herein, the provisions of Section 303 shall apply.

At the sole discretion of the City, the Contractor and/or material supplier shall provide certified manufacture date of any PVC pipe with visible cracking, discoloration and/or fading due to ultraviolet light exposure. Pipe which is one year or older may be rejected. City also reserves the right to reject pipe material for cause regardless of age of pipe.

305.2.00 MATERIALS

305.2.01 GENERAL

Unless otherwise specified, all storm sewer pipe with less than 24 inches of cover to finish grade shall be AWWA C900, 8" thru 12", or AWWA C905, 14" through 24", DR 25 water pipe meeting the requirements of AWWA specifications for ***Poly Vinyl Chloride (PVC) Water Transmission and Distribution Pipe.*** Pipes with more than 24 inches of cover to finish grade may be PVC meeting the requirements of ASTM D3034 SDR 35 for diameters up to and including 15 inch. Pipes larger than 15 inch with more than 24 inches of cover shall meet the requirements of ASTM F679 PS46.

305.3.00 CONSTRUCTION

305.3.01 TRENCH BACKFILL

Trench backfill shall be placed in accordance with the requirements of Division I – TRENCHES, except that the finished backfill shall be water jetted under the direction of the Engineer to demonstrate that all rock crevices that may have been opened up during excavation are sealed.

305.3.02 INSTALLATION

All storm sewer not located under paved roadway shall be provided with one layer of detection tape.

305.3.03 CLOSED CIRCUIT TELEVISION INSPECTION

All storm sewers shall be inspected in accordance with Section 303.3.11.

305.4.00 MEASUREMENT AND PAYMENT

305.4.01 TRENCH EXCAVATION AND BACKFILL

Trench excavation and backfill shall be paid for under the provisions of Sec. 301.4.01. Where no separate item exists in the Schedule of Bid Items, work for storm sewer trench excavation and backfill shall be considered incidental to the work required to construct storm sewers.

305.4.02 STORM SEWERS

Payment for storm sewers will be made on a lineal foot basis. Measurement will be made horizontally along the pipe centerline from the finished end to end of the pipe.

305.4.03 INCIDENTAL BASIS

When neither specified nor listed in the proposal for separate payment, storm drains shall be considered incidental work for which no separate payment will be made.

306 MANHOLES

306.1.00 DESCRIPTION

This section covers the work necessary for the construction of sanitary and stormwater sewer manholes. Except as modified or supplemented herein, the provisions of Section 00470 of the ***APWA Oregon Standard Specifications for Construction,*** current edition shall apply.

Manholes shall be located as shown on the Plans or as directed by the City Engineer, or City representative.

306.2.00 MATERIALS

306.2.01 CONCRETE

Concrete shall conform to the requirements of ASTM C94 Alternate 2. Compressive strength for manhole bases and miscellaneous concrete structures shall be not less than 3000 psi at 28 days. Maximum size of aggregate shall be 1 1/2 ". Slump shall be between 2" and 4".

306.2.02 METAL CASTINGS

Covers for sanitary sewer manholes and storm sewer manholes shall comply with the Standard Drawings. Locking and sealed manhole covers may be required in some locations.

306.2.03 RIM ADJUSTMENT

An adjustment system such as East Jordan Iron Works Infra-Riser or approved equal, shall be used to adjust manhole frame and cover to finish grade.

306.2.04 MANHOLES

306.2.04A Pre-cast Manhole Sections

Materials shall conform to the requirements of ASTM C478. Minimum wall thickness shall be 4 inches. Cones shall have the same wall thickness and reinforcement as riser sections. Joints shall be tongue-and- groove or keylock type. Cone shall be eccentric unless otherwise specified. Flat top manholes shall be used where depth is less than 6 feet.

Minimum manhole diameter shall be as 48" unless otherwise approved by the Engineer

306.2.04B Pre-cast Bases

At the option of the Contractor, pre-cast base sections or manhole bases maybe used provided all details of construction are approved by the City Engineer prior to construction.

306.2.04C Cast In Place Bases

Cast-in-place bases shall be formed prior to setting wall sections, i.e. blocking up walls and casting base beneath will not be acceptable. Options include using block outs in first wall section (over pipe) to use as form or casting base with form ring.

306.2.04D Mortar

Mortar shall conform to the requirements of ASTM C387, or be proportioned 1 part Portland cement to 2 parts clean, well graded sand passing a 1/8-inch screen. Admixtures may be used not exceeding the following percentages by weight of cement: hydrated lime, 10 percent;

diatomaceous earth, or other inert materials, 5 percent. Consistency of the mortar shall be such that it will readily adhere to the pre-cast concrete.

306.2.04E Coatings
When required due to corrosion concerns, manholes shall be spray lined with Polyshield HT Elastomeric Polyurea or approved equal.

306.2.05 PIPE FITTINGS
Pipe and fittings shall conform to the applicable portions of Section 303. Tees, ells, and other fittings for drop manholes shall be of the same material as the pipe in the adjacent mains unless specified otherwise.

306.2.06 PIPE STUB-OUTS FOR FUTURE SEWER CONNECTIONS
Pipe stub-outs shall be the same type as approved for use in the lateral, main, or trunk sewer construction. Strength classifications shall be the same class as specified for adjacent pipelines. Where there are two different classes of pipe at a manhole, the higher strength pipe shall govern strength classification. Rubber-gasketed water tight plugs shall be furnished with each stub-out and shall be adequately braced for hydrostatic or air test pressure.

306.3.00 CONSTRUCTION

306.3.01 GENERAL

306.1.01A Foundation Stabilization
If in the opinion of the Engineer, unstable material exists that will not support the manhole or other structure, the Contractor shall excavate to suitable supporting material and backfill with compacted foundation stabilization material to the design grade as directed by the Engineer.

306.3.01B Pipe Connections
All pipes entering or leaving the manhole or vault shall be provided with flexible joints within 18 inches of the manhole structure, and shall be placed on firmly compacted bedding. Special care shall be taken to see that the openings through which the pipes enter the structure are completely watertight. Flexible joints shall be constructed with rigid PVC repair couplings or the bell end of a PVC pipe section. Flexible rubber couplings are not an acceptable flexible joint.

306.3.02 PRECAST CONCRETE MANHOLES

306.3.02A Bases
If bases are cast-in-place, the concrete shall be consolidated by mechanical vibration. The concrete shall be screed off so that the first manhole section to be placed has a level uniform bearing for the full circumference.

Pre-cast base sections shall be carefully placed on the prepared bedding so as to be fully and uniformly supported in true alignment, and assuring that all entering pipes can be inserted on the proper grade.

The minimum open channel length thru the manhole shall not be less than the diameter of the manhole less 12", i.e., 48" manhole requires a 36" minimum channel length. All pipes entering or leaving shall be provided with flexible mechanical joints (Calder type couplings are not permissible) within 18" of the exterior wall of the manhole structure. .

306.3.02B Frames and Covers

The final elevation for each manhole shall be within 1/4" of the finished street grade. It is permissible to adjust the manhole frame to final grade after street paving provided that the structure is low enough so as not to interfere with the street paving operation. Patching material shall be asphalt concrete or Portland Cement Concrete with a maximum patch diameter of 6 feet.

Manhole cover shall have two holes. A cut out at the rim should be provided for raising the lid.

306.3.02C Cleanouts

Cleanouts are not acceptable on gravity sanitary or storm sewer lines in lieu of a manhole except at the upper end of lateral sewers 250 feet or less in length. Sanitary sewer cleanouts on pressure systems shall be located as shown on the plans.

306.3.03 MANHOLE TESTING

Manholes shall be tested using either hydrostatic or vacuum methods as specified by APWA Oregon Standard Specifications Section 00470.71.

306.4.00 MEASUREMENT AND PAYMENT

306.4.01 MANHOLES

Payment for manholes will be made on a per each basis as listed in the Bid Schedule for the type and size shown. Payment shall include all materials, labor, equipment, and incidentals necessary to construct and test manholes complete and in place as shown.

306.4.02 INCIDENTAL BASIS

When neither specified nor listed in the proposal for separate payment, Manholes shall be considered incidental work for which no separate payment will be made.

307 CATCH BASINS AND INLETS

307.1.00 DESCRIPTION

This section covers the work necessary to construct catch basins at the locations shown on the plans and Standard Drawings. Except as modified or supplemented herein, the provisions of Section 00470 of the ***APWA Oregon Standard Specifications for Construction,*** current edition shall apply.

Construction of City standard double and single or curb inlet catch basins, frames and grates shall conform to the Standard Drawings.

307.2.00 MATERIALS

307.2.01 EXCAVATION AND BACKFILL

Excavation and backfill shall conform to the requirements of Section 301.

307.2.02 WELDED FRAMES AND GRATES

The Contractor shall furnish grates conforming to Standard Drawings. The Owner has the option to supply grates, which will be listed in the Special Provisions. Ductile iron grates matching the dimensions in the Standard Drawings may be substituted for steel grates.

307.3.00 CONSTRUCTION

307.3.01 EXCAVATION AND BACKFILL
After backfilling and mechanical compaction is complete, the backfill around catch basins shall be water jetted if directed by the Engineer. Water jetting shall continue until all evidence of subsidence disappears. When dry, subsided areas shall be backfilled with appropriate material. The Engineer may then require water jetting of the entire backfill to be repeated. Other techniques include mechanical compaction.

307.3.02 FORMING, POURING, AND CURING
Pipe connections shall be grouted on the interior and exterior of all stormwater structures.

307.3.03 FRAMES AND GRATES
The grate frame shall be set into the concrete structure. The dimensions of the various grate frames are shown on the standard drawings.

Catch basin grates shall be placed after street paving has been completed. In the interim, 2" wood planking shall be substituted to protect the structure during street construction.

307.4.00 MEASUREMENT AND PAYMENT

307.4.01 CATCH BASINS AND INLETS
Measurement and payment for catch basins will be made on a per each basis for the number and type constructed. Payment shall constitute full compensation for all tools, materials, work and incidentals required to complete the work.

307.4.02 EXCAVATION
Where not listed as a separate item, excavation for any drainage structure will be considered incidental to the price bid to construct the structure. Where listed as a separate item, excavation will be measured by the cubic yard to the nearest 1 cubic yard. The dimensions for measuring excavation will be the exterior dimensions of the drainage structure as designed and specified by the Engineer. Payment for excavation will be at the contract unit price bid for excavation.

307.4.03 INCIDENTAL BASIS
When neither specified nor listed in the proposal for separate payment, Catch Basins and Inlets shall be considered incidental work for which no separate payment will be made.

308 DRYWELLS, SWALES AND PONDS

308.1.00 DESCRIPTION

This section covers the work necessary to construct drywells, swales, ponds and other storm water disposal facilities at the locations shown on the plans and in accordance with the Standard Drawings. Except as modified or supplemented herein, the provisions of the Central Oregon Stormwater Manual and Section 00470 of the ***APWA Oregon Standard Specifications for Construction,*** current edition shall apply.

308.1.01 DRYWELL LOCATION

No portion of a drywell shall be located within 10 feet of a waterline. Drywells shall be located no closer than 25 feet from a fire hydrant. Drywells and infiltration swales must be located at least 50 feet from a sewer wet well. Drywells shall be spaced at least 40 feet center to center, or twice the depth of the drywell, whichever is greater.

308.2.00 MATERIALS

308.2.01 EXCAVATION AND BACKFILL

Excavation and backfill shall conform to the requirements of Section 301.

308.2.02 DRYWELL FRAME AND COVER

The Contractor shall furnish frame and cover conforming to Standard Drawings. The Owner has the option to supply grates, which will be listed in the Special Provisions.

308.2.03 DRAIN ROCK

Drain rock shall consist of clean 6"-2" river rock containing little or no fines.

308.2.04 DRYWELL FABRIC LINER

A fabric liner is specified for the inside of the drywell barrel. This fabric shall have a smooth finish surface to promote cleaning by washing down. Felted materials are not acceptable. Fabric liner shall have sufficient tensile strength to be hung without undue sagging, and to resist tearing and raveling.

Fullflow Vinyl screen (a0706) or approved equal, available locally, is an acceptable fabric liner.

308.2.05 GEOTEXTILE

When required to protect the drain rock from contamination, geotextile fabric shall be placed against, and to 24" beyond gravel or soil at the limits of the excavation for drain rock, to prevent fine soil particles from migrating into the drain rock. Material shall be equivalent to a Type 1 or Type 2 riprap geotextile fabric per ODOT Spec 02320-1 (8-10 oz. nonwoven).

308.2.06 SWALE SOIL LAYER

The treatment zone soil layer in swales and ponds shall meet the requirements of Section 6.5.1.2 of the Central Oregon Stormwater Manual with a minimum infiltration rate of 0.25 inches per hour and at least 2 percent organic content.

308.3.00 CONSTRUCTION

308.3.01 FORMING, POURING, AND CURING

The concrete cap required by the Standard Drawings need not be formed. It may be placed directly on the moisture barrier. In earth or granular material, the outside two feet (2') of the concrete cap shall be placed over undisturbed earth. In rock excavation, the cap may be placed directly to the rock sidewall, provided that the rock wall is stable.

Pipe connections shall be grouted on the interior and exterior of all stormwater structures.

308.3.02 DRYWELL FRAMES AND GRATES

The grate frame shall be set into the concrete structure. The dimensions of the various grate frames are shown on the standard drawings.

308.3.04 DRYWELLS

Drywells construction details are shown in the Standard Drawings. Drywells are subject to DEQ regulations. Drywells shall comply with standards and facility requirements as specified in the Central Oregon Stormwater Manual, current edition with City amendments.

Drywells shall be protected from and not used for sediment collection during construction. Drywells installed prior to final site stabilization shall be protected from construction site runoff by routing storm runoff to an appropriate sediment control facility and erosion control measures.

308.3.05 DRYWELL TESTING AND ACCEPTANCE CRITERIA

Prior to acceptance and certification, all drywells shall pass a performance test conducted by a City Representative if they are in the right of way and observed by a City Representative if they are on private property. Drywell testing consists of three components; confirmation of storage volume, verification of infiltration rate and ability to drain within 72 hours.

1. The testing process starts during construction. Track the quantity of drain rock placed using load tickets. Record on the testing form and calculate the volume of drain rock storage.
2. Measure the diameter and depth of the drywell. Calculate interior volume of the drywell from the base to the bottom of the lowest pipe and record on the testing form. Verify that total volume exceeds design volume shown on the construction plans.
3. Inspect the drywell for compliance with construction drawings and City Standard Drawings and Specifications.
4. Field check the accuracy of the flow meter to be used for the test.
5. Introduce clean water into the drywell. Monitor flow using an in-line flowmeter.
6. If possible, raise the water level in the structure until it reaches the top of the active barrel section. In the case of structures interconnected by pipes, raise the water level to the invert elevation of the connecting pipe, or use an expandable plug to seal the connecting pipe.
7. Monitor and record the flow rate required to maintain the constant head level in the drywell at 10 minute intervals.
8. If a hydrant is available, it shall be used for the test. Fill the drywell with water from a metered source and adjust the flow rate to maintain the level of water at the top of the barrel section or the base of the inlet pipes (whichever is lower). Measure and record the flow rate at 10 minute intervals.
    a. For drywells in the right of way, maintain the flow rate necessary to keep the water level at the top of the barrel section or pipe invert for one hour. After the one hour period, turn off the water supply and record the depth to the water surface every 10 minutes for one hour. If the drywell cannot be filled, measure the depth to the water surface and record depth

and flow rate at 10 minute intervals. Stop filling after 60 minutes and measure and record the depth to the water surface every 10 minutes for one hour.

b. For drywells on private property, maintain the flow rate necessary to keep the water level at the top of the barrel section or pipe invert for one hour or until the design volume has been reached. At this time, turn off the water supply and record the depth to the water surface every 10 minutes for one hour. If the drywell cannot be filled, measure the depth to the water surface and record depth and flow rate at 10 minute intervals. Stop filling after 60 minutes or when the design volume is reached and measure and record the depth to the water surface every 10 minutes for one hour.

9. If a hydrant is not readily available, a water truck may be used. Place four water truck loads (3,500 to 4,000 gallons) in the drywell within a 2-hour period. After the water has been placed, let the drywell drain and record the depth to the water surface every 10 minutes for one hour.
10. Fill out all of the information on the drywell testing form including a sketch of the installation. Take photos of the installation during construction and after completion. Note any other pertinent data in the comments section

308.3.06 SWALE, POND AND INFILTRATION GALLERY TESTING AND ACCEPTANCE CRITERIA

Prior to acceptance and certification, the storage volume, infiltration rate and ability to drain within 72 hours shall be confirmed.

308.3.06A Storage Volume: For ponds, swales and other surface facilities, confirm the storage volume with as-built measurements and calculations provided by the project surveyor. For infiltration galleries, track the quantity of drain rock used with load tickets. Calculate the storage volume in the drain rock using a void ratio of 35 percent unless a different void ratio is provided by a materials testing lab.

308.3.06B Infiltration Rate: For infiltration swales and ponds in general and for infiltration galleries constructed with filter soil placed above the drain rock, measure the infiltration rate at the surface after the filter soil is placed. If the infiltration gallery is designed so that runoff enters directly into the drain rock with filter soil below, measure the infiltration rate of the soil prior to placing the drain rock. Use the single-ring infiltrometer test (Appendix D of the Central Oregon Stormwater Manual) or other test recommended by a Geotechnical Engineer.

308.3.06C 72-hour Drainage: Use the Swale Flood Test described in Appendix 4E of the Central Oregon Stormwater Manual. For sloped swales and swales with check dams, introduce flow at the high end and allow it to overtop each check dam until it pools to a depth of 6 inches in the low end. Check 72 hours after stopping the flow to see if the facility has emptied. Use standpipe for infiltration galleries.

308.4.00 MEASUREMENT AND PAYMENT

308.8.01 DRY WELLS

Measurement and payment for dry wells will be made on a per each basis for the number and type constructed. Payment shall constitute full compensation for all tools, materials, work and incidentals required to complete the work.

308.4.02 EXCAVATION

Where not listed as a separate item, excavation for any drainage structure will be considered incidental to the price bid to construct the structure. Where listed as a separate item, excavation will be measured by the cubic yard to the nearest 1 cubic yard. The dimensions for measuring excavation will be the exterior dimensions of the drainage structure as designed and specified by the Engineer. Payment for excavation will be at the contract unit price bid for excavation.

308.4.03 INCIDENTAL BASIS

When neither specified nor listed in the proposal for separate payment, drainage facilities shall be considered incidental work for which no separate payment will be made.

310 SEWAGE PUMP STATION

310.1.00 DESCRIPTION

This section shall provide for the furnishing and installation of one new factory-built automatic pump station, service and monitoring equipment and control equipment, complete and ready for operation as shown on the Plans and specified herein. General items of equipment include furnishing of one complete, automatic two pump sewage pumping station for installation on concrete wet wells.

The station manufacturer shall be required to affix an UNDERWRITER'S LABORATORIES (UL) LABEL attesting to the compliance of that assembled equipment under the PACKAGED PUMP SYSTEMS (QCZJ) UL Listing Category. This label shall be inclusive of the entire station with enclosure so as to demonstrate compliance with the National Electrical Code requirements for working clearances and wiring procedures. Equipment manufactured without this third party certification label or equipment manufactured by an outside source or brokered equipment defined as systems not assembled on the premises of the named manufacturer by that company's employees **WILL NOT** be considered as equal and will not be accepted by the City of Sisters. All lift station designs are subject to submittal to D.E.Q. for approval.

City maintained lift stations shall be located in dedicated tracts of land owned by the City. All lift stations not on City owned land will remain the responsibility of the homeowner or homeowner group. Developed subdivisions utilizing pressure systems shall discharge at a single manhole location approved by the City of Sisters Engineer.

310.1.01 INTENT

It is the intent of these specifications that the pump station shall be a unit complete and ready for connection to pressure line, influent line and suction lines.

310.1.02 EQUIPMENT

a. Principal items of equipment for each station shall include two vertical, close coupled, motor driven, vacuum primed, non-clog sewage pumps, valves, internal piping; central control panel with circuit breakers; motor starters and automatic pumping level controllers, heater, ventilating blower, priming pumps and appurtenances; pump running and alarm light; all internal wiring; and an exterior high and low water alarm light. All valves, motors, pumps, and controls shall be accessible from the top of the base plates. Access to the wetwell through the pump station base plate shall be required for wetwell maintenance.

b. Pump station shall be a standard item of the manufacturer. Pump station shall be as manufactured by the Smith & Loveless Division of the Ecodyne Corporation, Lenexa, Kansas; or equal, approved by the Engineer ten days prior to bid date.

c. Connection of gravity and pressure piping. Contractor shall verify required connections before ordering materials and shall be responsible for same. Plans should indicate approximate location and requirements.

d. Operating Conditions.

(01) Pump Station. Each pump shall be designed for 20 year demand and required total dynamic head, when one pump is in operation. The pumps shall be non-

overloading during design conditions with both pumps in operation. Lower than 1750 rpm pump speeds will be used wherever possible. Pumps shall be Smith & Loveless Model 4B2A or approved equal. Motors shall be 240/480 volt, three phase, four wire, 60 cycle rated. Station shall be provided with interior piping.

(02) All openings and passages shall be large enough to permit passages of spheres three inches in diameter and any trash or stringy materials which can pass through a 4" house collection system.

e. Pump Station.

(01) The pump station shall be shown on the plan view of the Drawings. The floor plate shall be minimum 3/8 inch thick mild steel plate.

(02) Pump station shall be enclosed by a hinged fiberglass cover. The cover shall have a suitable drip-lip around the edge and shall be provided with a hasp and staple connection to the floor plate to allow the pump chamber to be locked with a padlock.

(03) The cover shall have a latch mechanism to keep the cover open under load. Adjustable ventilating louvers shall be provided on each end of the fiberglass cover which are capable of being closed during cold weather operation.

(04) A steel manway cover located exterior to the fiberglass pump chamber shall be provided, complete with padlocking provisions. The manway shall be an integral part of the station floor plate and provide access to the wetwell.

(05) A stanchion with lifting arm shall be provided to lift each pump. The lifting arm shall have a hook over the center of the motor to support a hoist (provided by others) to facilitate easy removal of the motors, impellers and pumps from the station.

(06) All steel structural members shall be joined by electric arc welding with welds of adequate section for the joint involved.

(07) In valve vaults 5 feet or more deep, provide an OSHA approved round rung ladder with "Ladder Up" safety extension.

f. Control Panel

(1) The Controller will be housed in two 30"x30"x12" NEMA4 enclosures mounted side-by-side with one enclosure containing the equipment required for 3-phase motor operation and voltages above 24 volts nominal control (Motor Panel), and the other containing the equipment required to provide for operator interface, 24VDC input/output control circuitry and for executing control sequencing (24VDC Panel). In addition, a Federal Signal Model# TERRA 3 SCADA RTU unit shall be mounted on the back of the Controller (SCADA panel).

(2) Each panel will be lockable, dead front with intrusion detection alarms and swing-out internal panels for mounting of control operators and indicators. The enclosure motor panel will be fitted with a separate, external, weather proof, lockable housing for a convenience outlet and light switch. Panel exteriors will be painted bright white using UTEK SIKKENS Polyurethane paint specification number WA5111 in order to minimize component heat rise due to direct sunlight exposure. Enclosures will be

Hoffman or approved equivalent. All exterior penetrations shall be gasketed and made rain tight, or in bottom of enclosures, or both.

g. Transfer Switch. Station shall be equipped with a NEMA 3R, fused transfer switch with high visibility handle and nameplate with on/off/on indication, clear line terminal shields, generous wiring room that meets or exceeds NEC wire bending space requirements, side hinges and rated for 60/700 C wire connection through 200 amps.

h. Generator Receptacle. Stations equipped with a transfer switch will also come equipped with a user specified heavy duty circuit breaking receptacle. Receptacle shall be mounted on the outside of the pump station and will be equipped with a weatherproof spring door. It shall be placed at a 45deg angle. Appleton part number ADR1034P4RS.

i. Emergency Generator. An appropriately sized emergency generator shall be provided for lift stations with a designed flow rate exceeding 400gpm or as determined by the City Engineer as critical infrastructure needing back-up power supply. Generator specifications shall be obtained from the City. An automatic transfer switch integrated with the City's SCADA system is required.

310.1.03 PROTECTION AGAINST CORROSION

a. After welding, all inside and outside surfaces of the structure shall be blasted with steel grit to remove rust, mill scale, weld slag, etc. All weld spatter and surface roughness shall be removed by grinding. Immediately following the cleaning, Versapox single heavy inert coating shall be factory-applied to all inside and outside surfaces prior to shipment. This coating shall be Versapox Epoxy Resin especially formulated by Smith & Loveless for abrasion and corrosion resistance. The dry coating shall contain a minimum of 85% epoxy resin with the balance being pigments and thixotropic agents.

b. A touch-up kit shall be provided for repair of any mars or scratches occurring during installation. This kit shall contain detailed instructions for use and shall be a material which is compatible with the original coating.

310.1.04 PUMPS

a. Pumps shall be vertical close mounted, non-clog sewage pumps of heavy cast iron construction especially designed with double mechanical seals for filtered lubrication and vacuum priming.

b. Pump impeller and volutes shall be Meehanite or equal.

c. Motors shall be of current NEMA design B for 40 degree C temperature rise, vertical solid shaft close coupled pump motors with oversized one piece stainless steel shafts extending through the pump and motor.

d. Pump impeller shall be of enclosed type and balanced.

310.1.05 CONTROLS

a. Control equipment shall be mounted on a NEMA Type 1 steel enclosure with a removable access cover. The circuit breakers overload reset buttons and control switches shall be operable without removing the access cover.

b. Each panel will be lockable, dead front with intrusion detection alarms and swing-out internal panels for mounting of control operators and indicators. The enclosure motor panel will be fitted with a separate, external, weather proof, lockable housing for a convenience outlet and light switch. Panel exteriors will be painted bright white using UTEK SIKKENS Polyurethane paint specification number WA5111 in order to minimize component heat rise due to direct sunlight exposure. Enclosures will be Hoffman or approved equivalent. All exterior penetrations shall be gasketed and made rain tight, or in bottom of enclosures, or both.

c. Control operators and indicators mounted to the swing-out panel doors will be corrosion resistant and rated for heavy-duty industrial application. Operators will be 30MM Cutler-Hammer 10250T series or approved equivalent. Internal condensation and corrosion control will be accomplished by the inclusion (at a minimum) of a 200Watt/120VAC space heater (mounted in both the 24VDC and SCADA panels) and corrosion inhibitors (mounted in both the Motor and 24VDC panels).

d. All serial communication, analog and/or frequency signal wiring inside the control panel will be 18AWG UL508A twisted, shielded-pair cabling unless otherwise specified on the schematic diagram(s). All analog signal loops will be routed through centrally located terminal groups to allow for easy access and modification(s) as necessary. All discrete control wiring inside the control panel will be 16AWG MTW UL508A approved hook-up wire and sized according to NEC unless otherwise specified on the schematic diagram(s). Color-coding of panel wiring should be as follows:

AC Power (Unswitched)	Black
AC Neutral	White
AC Control (Switched)	Red
Ground	Green/Yellow
Foreign (External) Power	Yellow
DC Power	Blue
DC Common	Blue/White
DC Control	Blue

e. The operation of the control system will be field-configurable based around a Programmable Logic Controller (PLC) (model ELC-PA10AADR processor with ELC-EXO8NNDR expansion module) and Human Machine Interface (HMI) (model ELC-GPO4). The controller will operate a pair of 4860 VAC 3-phase 60Hz.appropriately sized motors in an alternating-duplex configuration. The operational mode of each pump will be field-selectable between "Hand", "Off" and "Auto" using a pair of illuminated H-O-A switches mounted on the swing-out panel door of the 24VDC panel. In "Auto" mode, the pumps will be field-selectable to operate as "Lead" pump, or "Lag" pump, and "Alternate" at the completion of each pumping cycle. In addition they will both run when a high float condition exists and can be individually selected through the SCADA system.

f. The pump motors will be protected against short-circuit by Cutler Hammer type HMCP circuit breakers sized appropriately for the HP rating of the motors with individual

disconnect mechanisms mounted through the swing-out panel door of the Motor Panel. The pump motors are also protected by a contactor/overload relay assembly

g. Cutler Hammer style IT type E04N (contactor) and E05N (O.L.) sized for motor HP with overload reset operators mounted on the swing-out panel door of the 24VDC panel.

h. Three-phase power, seal failure and thermal protection connections from the control system to the pump motors will be made using pin and sleeve type quick disconnect plugs and sockets. The current draw of each pump will be monitored by passing one leg of the 3-phase power output to the motor through a current transformer (CT) and will be continuously displayed locally by digital ammeters mounted on the swing-out panel of the 24VDC panel, and transmitted remotely via analog (4-20mA) signal to the SCADA unit mounted on the back of the control system. The operational run-time of each pump will be tracked by hour meters mounted on the swing-out panel of the 24VDC panel.

i. Control circuitry will be protected against short circuit by (at a minimum) the following small-frame circuit breakers: Panel Heater, 1P/5A/UL1077, Control Power Transformer (Primary) 2P/15A/UL489, Control Power Transformer (Secondary), 1P/15A/UL489, 24VDC/5A Power Supply, 1P/5A/UL1077, External Station Lighting, 1P/15A/UL1077, SCADA RTU, 1P1A/UL1077, Convenience Outlet, 1P/15A/UL489. In addition, the power circuitry in the system will be protected (at a minimum) by the following devices: Motor Saver / Phase Monitor, model MS-201-A and Transient Voltage Surge Suppressor Square D model SDSA3650.

j. Thermal magnetic air circuit breakers shall be provided for branch disconnect service and short circuit protection of all motor control and auxiliary circuits.

k. Magnetic across-the-line starters with undervoltage release and overload coils for each pump motor to give positive protection. Each auxiliary motor shall be equipped with an over-current protection device in addition to each branch circuit breaker, or shall be impedance protected. All switches shall be labeled and a color coded wiring diagram shall be provided.

l. To control the operation of the pumps with variations of sewage and level in the wetwell, and to provide an effective alarm system, five mercury displacement switches shall be provided for the station. A green running light and red alarm light shall be provided on the pump station panel for each pump. Float switches shall be 120 volt.

m. An automatic alternator with manual on-off switch shall be provided to change the sequence of operation of the pumps on the completion of an 8-hour cycle.

n. A 120 volt duplex service outlet shall be mounted on control panel.

o. An elapsed time meter shall be furnished for each pump to indicate total cumulative pump operating hours.

p. Provisions shall also be made for the pumps to operate in parallel should the level in the wetwell continue to rise above the starting level for the low level pump.

q. To provide a warning system for pump failure a pedestal mounted high water and low water light with reset push button shall be provided for each station. Light shall remain lit until problem causing alarm is repaired.

r. All push button, selector switches and trouble lights shall be industrial oil tight construction. No wobble stick switches will be allowed.

s. Each pump shall have an adjustable time delay relay for motor starting, adjustable from 0-60 seconds. Initial setting shall be at 20 seconds to allow time for closing of motorized valve.

t. Terminal test strip and test light. The manufacturer shall provide a terminal test strip and 120 volt neon test light within the control panel for the operator's use in determining a malfunction in the various control components. All test points shall be wired to the terminal test strip. A step by step troubleshooting guide shall be furnished to assist the operator in testing each component. This test system shall have the capability of testing at least the following components: control circuit breaker, HOA switches, alternator, float switches, electrode relays, vacuum pump relays, vacuum pumps, capacitors, resistors and diodes.

u. Instrumentation, Control, SCADA System and Radio Telemetry shall be provided as specified in other sections of this specification. Mount in Pedestal Mounted Panel.

310.1.06 VACUUM PRIMING SYSTEM

a. A separate and independent priming system shall be furnished for each pump, providing standby operation. Each priming system shall include a separate vacuum pump. Vacuum pumps shall have corrosion resistant internal components. They shall each be capable of priming the sewage pump and suction piping in not greater than 60 seconds, under rated static suction lift conditions of 20' at mean sea level.

b. Each priming system shall be complete with vacuum pump, vacuum control solenoid valve, prime level sensing probe, and a float operating check valve installed in the system ahead of the vacuum pump to prevent liquid from entering the vacuum pump. The float operated check valve shall have a transparent body for visual inspection of the liquid level and shall be automatically drained when the vacuum pump shuts off.

c. The priming system shall automatically provide positive lubrication of the mechanical seal each time the sewage pump is primed. To prevent excessive stoppage due to grease accumulation, no passageway in the priming system through which sewage must pass shall be smaller than the equivalent of a 2-1/2" opening.

310.1.07 ENVIRONMENTAL EQUIPMENT

A ventilating blower shall be provided, capable of delivering 250 cfm at 0.1" static water pressure, in order to remove the heat generated by continuous motor operation. The ventilating blower shall be turned on and off automatically by a pre-set thermostat. The ventilating blower shall be rigidly mounted from the station floor. The discharge outlet shall have a thick resilient gasket which will match with a louvered opening in the fiberglass cover to seal the discharge to the cover when the cover is closed. An electric heater controlled by a pre-set thermostat shall be furnished. The heater shall be rigidly mounted in the station to prevent removal.

310.1.08 SUCTION AND DISCHARGE PIPING

a. Suction piping shall be Schedule 80 steel of sufficient length to suit the wetwell and as detailed on Plans.

b. Discharge riser piping shall be Schedule 80 steel or PVC pipe, flanged for compression coupling connection to cast iron pipe on interior of pump station. Connection to force main line shall be made with cast iron piping and fittings as shown on the plans.

c. Discharge line from each pump shall be fitted with a swing type check valve and an eccentric full port plug valve. The check valve shall be of the spring-loaded type with external lever arm and a resilient seal to insure drip tight seating. Construction of station shall provide for all valving to be located above floor plate.

310.1.09 ALARM DIALER AND SCADA SYSTEM

a. An alarm dialer shall be furnished and installed by the pump station supplier.

b. Any alarm function from the pump station equipment controls, or motor control center shall actuate the alarm dialer.

c. The dialer shall dial predetermined telephone numbers on a telephone line provided for access to City Hall and page notifiers, or directly to plant operators by direction of the City.

d. Automatic alarm dialer shall be Model Chatterbox CB-4 as manufactured by Raco Manufacturing and Engineering Company or approved equal.

e. Automatic alarm system capable of dialing up to five numbers over a shared telephone line. The system will monitor normally open contacts from two independent sets of trouble or alarm sensing devices.

f. Upon closure of any one of the contacts, it will call a predetermined telephone number and transmit a voice recording stating the nature of the trouble. If the called number is busy, does not answer, or if an incorrect number is reached, the system will hang up and call the same number again, or up to four additional numbers. It will continue dialing the number(s) in succession until it is answered and acknowledged. Once the call is received, the person receiving it can acknowledge the call from his telephone with a touch-tone type telephone or a special adapter for a rotary dial type telephone. Upon being acknowledged, the dialer will then hang up and not place any more calls. If the other channel has been activated, the system will recycle on that channel until acknowledged.

g. The system will include an adjustable delay (0-90 seconds) to prevent dialing out on momentary alarm conditions.

h. Furnish one tape programmed, as specified by the Engineer, and one spare blank tape. The supplier shall provide the programming service in his plant and shall be capable of reprogramming a tape within 24 hours after receipt of same from the customer. The monitor shall connect to telephone services with a 8 pin telephone jack Model USOC#RJ-31-X. Supplier shall provide sufficient cord from the dialer to the telephone jack for connection.

i. The unit will also include a standby battery power system capable of operating the monitor for 6 hours running time upon failure of normal power. 120VAC, 60 Hz input power will be provided by others. If a touch-tone system is not in use, 3 remote reset devices will be furnished for the existing telephones.

j. SCADA RTU. The control system will include a Federal Signal Model # TERRA 3 SCADA RTU in the provided NEMA 4X enclosure mounted to the back of the 24VDC panel. The RTU shall include a 12V valve-regulated sealed lead acid (SLA) battery for power backup, sized to provide more than 12 hours of uninterrupted standby operation in the event of AC power loss. The SCADA system will be used to monitor the following control signals (at a minimum):

Analog (4-20mA):
Wastewater Sump Level AI-01),
Pump #1 Motor Current (AI-02),
Pump #2 Motor Current (AI-03)
Control Circuitry Cabinet Temperature (AI-04)
RTU Cabinet Temperature (AI-05)

Discrete:
RTUIntrusion Alarm (DI-01)
Motor Control Cabinet Intrusion Alarm (DI-02)
Control Circuitry Cabinet Intrusion Alarm (DI-02)
Pump #1 Run Status (DI-03)
Pump #2 Run Status (DI-04)
Pump #1 Seal Fail Alarm (DI-05)
Pump #2 Seal Fail Alarm(DI-06)
Pump #1 Over-Temperature Alarm (DI-07)
Pump #2 Over-Temperature Alarm (DI-08)
High Level Float (DI-09)
Low Level Float (DI-10)
3 Phase Power Loss (DI-11).

k. In addition, the SCADA system will be configured to provide remote Start/Stop control capability for each pump unit that is selected for "Auto" mode operation with the H-O-A switch mounted on the swing-out panel door of the 24VDC panel.

l. Prior to design approval a radio frequency (RF) survey is required to be completed at the site to assure that communications with the City's server are adequate. The survey report shall be submitted to the City for approval. The pump supplier shall coordinate with the city on integration of the SCADA System with the City's existing system.

m. RTU Communications Hardware. The RTU shall utilize a wireless licensed VHF transceiver, using the frequency provided by the City of Sisters, with modem and cables as required for a complete operating system. The transceiver shall be a Motorola CDM750. Each RTU shall utilize a properly grounded inline surge protector by Polyphaser, or approved equal, to guard against lightning intrusion. Each remote site shall utilize properly

grounded, high quality antenna cable, Time Microwave LMR-400 or approved equal, for data transmission to the antenna. Each remote site shall utilize a properly grounded, omni-directional, fiberglass antenna with a minimum gain of 3dB, installed on a corrosion-resistant mast at a minimum height of ten (10) feet. The antenna for SCADA shall be an Antenex FG1563 or approved equal. The antenna is to be mounted to the mast by a certified RF specialist. The antenna and communication hardware shall be adjusted by the RF Specialist in accordance with the manufacturer's recommendations to assure optimal communications with the base station. Optimization of the communication hardware is the responsibility of the Contractor and shall be coordinated through the City's Wastewater Department.

310.1.10 WIRING

a. Pump station shall be completely wired at factory except for the power feeder lines. All wiring in the pump station shall be color coded as indicated on the wiring diagram. Two sets of wiring diagrams matching the unit wiring shall be provided to Engineer prior to final acceptance of project.

b. A licensed and qualified electrician shall provide service and connection to this installation.

310.1.11 FACTORY TESTS

a. All components of the pump station shall be given an operational test of all equipment at the factory to check for excessive vibration, for leaks in all piping or seals, and for correct operation of control system and all auxiliary equipment.

b. The pump suction and discharge lines shall be coupled to a reservoir and the pump shall recirculate water under simulated service conditions.

310.1.12 SPARE PARTS

A complete replacement pump shaft seal assembly shall be furnished with each pump station. The spare seal shall be packed in a suitable container and shall include complete installation instructions. A spare volute gasket shall also be provided and a spare vacuum priming pump will be provided to Owner.

310.1.13 INSTALLATION OF OPERATING INSTRUCTIONS

Installation of the pump chamber shall be done in accordance with the written instructions provided by manufacturer. These instructions shall be securely attached to and readily visible on the outside of the main chamber of the pump station.

310.1.14 EXPERIENCE AND WORKMANSHIP

Pump station shall be the product of a manufacturer who shall have constructed at least one hundred similar automatic factory built sewage pumping stations and shall have a minimum of five (5) years experience with construction of similar pump stations. All workmanship and materials throughout shall be of the highest quality.

310.1.15 GUARANTEE OF PUMP STATION

a. Manufacturer of the lift station shall guarantee for one year from date of final station acceptance by the City of Sisters that structure and all equipment will be free from defects in design, material and workmanship.

b. Warranties and guarantees by the suppliers of various components in lieu of a single source responsibility by the manufacturer will not be accepted. Manufacturer shall be solely responsible for the guarantee of the station and all components.

c. In the event a component fails to perform as specified or has proven defective in service during the guarantee period, manufacturer shall provide a replacement part without cost to the Owner. He shall further, without cost, provide such labor as may be required to replace, repair, or modify major components such as station structure, pumps, pump motors, sewage piping manifold, etc.

d. The replacement or repair (including cost of parts and labor) of those items normally consumed in service, such as pump seals, oil, grease, etc., shall be considered as part of routine maintenance and station upkeep.

310.1.16 OPERATION AND MAINTENANCE BROCHURE

Contractor shall furnish Engineer, prior to final inspection and payment, six sets of maintenance brochures, including:

a. Operation and Maintenance Manual.
b. Periodic maintenance requirements.
c. Parts list with numbers.

310.1.17 SERVICE/METERING EQUIPMENT

a. Service/Metering Equipment. Contractor shall provide and install one (1) UL listed, pad-mounted circuit breaker/metering pedestal for the pump station installation. The enclosure shall be NEMA 3R, heavy gauge zinc coated steel, seam welded, with ASTM B17 durable light green finish. Enclosure shall measure 28" W x 20" D x 54" H and shall include a steel base which is to be mounted to a minimum 36"W x 30"D x 15" thick concrete pad. Equipment shall include isolated compartments for metering, line, and load sections. 8" x 8" plexiglass window for meter reading, hinged doors with padlocking provisions, bolt on frame main breaker, and provisions for SCADA and Radio Telemetry. Unit shall be factory wired to landing lugs in service pull section. Meter base shall be a safety socket type. Designed for 240/480 volt, 34w, service. Commercial Meter Pedestal, Catalog No. CMP 4924 MC with MB 2820 base as manufactured by Circle AW Products Company, or approved equal.

b. Operation and Maintenance Brochures. Operating and Maintenance Instructions shall be securely attached to and readily visible on the inside of the pump station. Six copies to be submitted to Engineer for distribution.

310.10.01 SAFETY

The Contractor shall comply with all City, County, State, and Federal construction safety and health Standards, Regulations, laws, and permits. Contractor shall be solely and completely responsible for trench and excavation safety.

310.10.02 TRENCHING, EXCAVATION, BEDDING and BACKFILL

Refer to Division I TRENCHES.

310.10.03 BEDDING

Bedding for Wet Well and Valve Vault shall be in accordance with the recommendations of the manufacturer and subject to review and approval by the City of Sisters Wastewater Engineering Manager and/or City Engineer. Bedding for structures shall be Class B backfill or as directed by the Engineer.

310.10.04 BACKFILL

The Contractor shall place granular backfill around Wet Well and Valve Vault above the concrete base or footings that will achieve compaction requirements without causing excessive pressures against fiberglass walls of the Wet Well or vault. Material shall be 1/2" -1/4" clean, graded, rounded particle rock fill or "pea gravel". The fill shall be placed for at least two feet outside of wall diameter.

At the location of the inlet sewer piping, the trench zone above the pipe bedding will be lined with a geotextile filter fabric to isolate the pea-gravel structure fill from the pipe zone fill. The pipe zone will be backfilled with Class B backfill, properly compacted in lifts, or other material as approved by the Engineer.

310.10.05 STATION ACCESS

Paved access shall be provided to the station at all times. The access shall allow a vehicle to park adjacent to the wet well without blocking any traffic lanes or pedestrian walkways. Access shall be as level as possible, but shaped to drain away from wet well. All paving shall be shown on construction plans and approved by the Engineering Division prior to construction. A 10 foot clear space shall be required between existing, proposed, or future equipment (including 12 foot by 20 foot designated generator area) within the fencing on all sides of the lift station.

310.10.06 FENCING

The lift station shall be enclosed with 6 foot high vinyl coated chain link fencing with the final coating color to be determined by the City. Two 6 foot swing gates in 12 foot clear opening shall provide access to the lift station. The fence and gates will be fitted with beige privacy fence slats set in a bottom locking slat. Fencing shall be at the tract property line. The entire area within the fenced enclosure shall be paved with asphalt and sloped to drain away from the wet well.

DIVISION IV - WATER FACILITIES

401 TRENCH EXCAVATION, BEDDING AND BACKFILL

401.1.00 DESCRIPTION

Minimum general standards for water facilities shall be as set forth in the current American *Water Works Association Standards (AWWA)* and *current Oregon Standard Specifications for Construction.* The following special provisions are the minimum construction standards for the City of Sisters and are intended as a supplement to the above standards.

401.2.00 TRENCH EXCAVATION, BEDDING, AND BACKFILL

See Division I - Trenches

401.3.00 CONSTRUCTION

The Contractor shall secure and comply with applicable State, County, or City street cutting permits. The Contractor shall comply with all City, County, State and Federal Highway Construction Safety and Health Standards. Prior to installing a water facility in an unimproved street, the street shall be brought to sub-grade to assure that adequate bury, depth of cover, and utility separation is acquired.

401.4.00 MEASUREMENT AND PAYMENT

Measurement and Payment shall conform to the requirements of Subsection 301.4.00.

402 WATER PIPE AND FITTINGS

402.1.00 DESCRIPTION

402.1.01 GENERAL

This section covers the work necessary for furnishing and installing water pipe and fittings normally used for water distribution systems.

402.1.02 CERTIFICATION

The Contractor shall furnish material certifications for pipe, fittings, and appurtenances incorporated in the work when requested by the City Engineer or City Representative.

402.1.03 CORROSION PROTECTION

The method of corrosion protection shall be as specified when required.

402.2.00 MATERIALS

Pipe used for water mains shall be C900 PVC meeting the requirements of Section 402.2.01 unless alternate pipe is approved by the City Engineer. Where more than one type of material is specified, the type required will be designated on the plans. Material used on pump stations, meter vaults, or control valve applications shall be approved by the City Engineer on a case by case basis. All appurtenances shall be of the same manufacture. Materials shall be manufactured or produced in the United States of America, or as permitted under NAFTA. Materials manufactured outside of the USA shall meet all applicable standards required per AWWA, ASTM, ANSI, NSF,UL, and shall be the product of manufacturing facilities having current ISO 9000 or QS9000 certifications. All fittings and materials coming in direct contact with drinking water must meet NSF-61 standards. At the discretion of the City, the contractor and/or material supplier shall provide certified manufacture date of pipe and fittings. Any pipe or fittings with visible cracking, discoloration or other defects or with age older than one year may be rejected.

402.2.01 C-900 PVC WATER PIPE

PVC water pipe shall only be used for repair of existing PVC lines and with approval of the City Engineer. PVC water pipe shall meet the requirements of ANSI/AWWA Standard C-900-97 or latest edition for PVC pressure pipe and fabricated fittings for water distribution. Joints (couplings) shall be fitted with elastomeric gaskets conforming to the requirements of ASTM F477. Assembled pipe (bell end joints or couplings) shall meet the performance requirements of ASTM D3139. Pipe shall have a minimum pressure class of 150 psi (DR 18).

At the sole discretion of the City, the contractor and/or material supplier shall provide certified manufacture date of any PVC pipe with visible cracking, discoloration and/or fading due to ultraviolet light exposure. Pipe which is one year or older may be rejected. The City also reserves the right to reject pipe material for cause regardless of age of pipe.

402.2.02 DUCTILE IRON PIPE

Ductile iron pipe shall be centrifugally cast in metal molds and cement mortar lined in accordance with ANSI/AWWA Standards C151/A21.51-02 and C104/A21.4. Tyton joint pipe shall be used except where conditions require mechanical type joints as shown and approved on plans. Care shall be taken in handling the pipe. No material shall be shipped inside coated pipe. Pipe shall as manufactured by U.S. Pipe, Pacific States Pipe, American Pipe, or Griffin Pipe and shall meet the following specifications:

1) 6" through 12" I.D., Class 52 Ductile Iron Pipe, ANSI/AWWA Standard C151/A21.51-02
2) 14" I.D. and larger, Class 50 Ductile Iron Pipe, ANSI/AWWA Standard C151/A21.51-02

402.2.03 CAST OR DUCTILE IRON PIPE FITTINGS

Cast or ductile iron pipe fittings for C900 or ductile iron pipe shall meet the requirements of AWWA C110 or C153 and shall have a minimum working pressure rating of 250 psi. Joints shall meet the requirements of AWWA C111. Fittings shall be cement mortar lined and seal coated, meeting the requirements of AWWA C104. Gaskets for flat faced or raised face flanges shall be 1/8 inch thick neoprene having a Durometer reading of 60, +/- 5 as approved for use with potable water. The type, material and identification marks for bolts and nuts shall be provided.

402.2.03 PIPE RESTRAINT

402.2.03A GENERAL

Refer to Section I.D.1.h of the Design Standards and Section 402.3.09E for joint restraint requirements.

402.2.03B PUSH ON PIPE JOINT RESTRAINT

Where required, push-on joints shall be restrained using Field-Lok gaskets for Tyton joint pipe, and Fast-grip gaskets for Fastite joint pipe, utilizing stainless steel locking segments vulcanized into the gaskets to prevent joint separation.

402.2.03C EXTERNAL MECHANICAL RESTRAINTS

Mechanical restraints shall be installed where shown on the plans, and as directed by the Engineer. Approved manufacturers are as follows: Ebba Iron 1100 Series "Mega-Lug", or Romac RomaGrip.

402.2.10 SERVICE PIPE

Service piping from the water main to the meter and 4 feet beyond meter assembly shall be as follows:

Size	Material
3/4"	Type K Soft Copper
1"	Type K Soft Copper
2"	Type K Hard Copper

402.2.11 SERVICE CONNECTION

Refer to latest version of City of Sisters, Water Service and Meter Installation Manual which supersedes these standards and specifications.

402.2.11A GENERAL

All brass fittings shall be manufactured in accordance with ANSI/AWWA Standard C-800-05, or latest edition, and meet the requirements of Standard Drawing 4-5.

402.2.11B 1½" - 2" SERVICE SADDLES

Service Saddles for 1½" and 2" services shall be stainless steel or cast double strap service clamp with iron pipe threads meeting ANSI/AWWA Standard C-800-05. Saddles shall be Mueller or approved equal. Brass or bronze nipple between saddle and valve is to be installed level; bolts to be torqued to manufacturer's specifications.

402.2.11C 3/4" to 1" SERVICE SADDLES

Direct taps are permitted on ductile iron pipe only. Where required, service saddles shall be stainless steel band service clamp with iron pipe threads as manufactured by Mueller, Romac, or approved equal.

402.2.11D SADDLE TAP

Bit size shall be as follows:

¾ " tap – 11/16" bit
1" tap – 15/16" bit.

All bits to be Mueller or equal, and be approved for tapping PVC, ductile iron, cast iron, galvanized and steel pipe. The tapping machine shall be a Mueller #E-5, #D-5 or equal. Equipment to be water tight and capable of boring a straight center hole.

402.2.11E DIRECT TAP

All bits to be Mueller AWWA taper thread combined drills and taps or equal, and must be approved for tapping cast iron and ductile iron water mains. The tapping machine shall be a

Mueller B-101 Drilling and Tapping Machine or equal.
Equipment to be water tight and capable of drilling a straight center hole.

402.2.11F CORPORATION STOPS Corporation Stops shall be manufactured by Mueller or Ford with part numbers matching the list provided in the latest version of the City of Sisters Water Service and Meter Installation Manual. Inlet threads shall be iron pipe if a saddle is used. Inlet threads for direct tapped ductile iron pipe shall be AWWA CC Taper Thread. Outlet threads shall be copper pack.

402.2.11G ANGLED METER STOPS
Angled meter stops shall be as shown on the Standard Drawings. Part number shall match those provided in the current version of the City of Sisters Water Service and Meter Installation Manual.

402.2.11H COUPLINGS and UNIONS
Couplings and unions, if required, shall be copper couplings and unions with part numbers matching those provided in the current version of the City of Sisters Water Service and Meter Installation Manual

402.2.11I SERVICE GATE VALVES
1½" and 2" service gate valves shall be AWWA approved resilient seated with 2" square operating nut.

402.2.11J DUPLEX SERVICES
Duplex Services shall not be installed.

402.2.11K METER BOXES
Water meter box and lid part numbers shall match those provided in the current version of the City of Sisters Water Service and Meter Installation Manual. Cast iron and steel lids are not allowed. Meter boxes shall be equipped with concrete polymer lid rated to 10,000 lbs in sidewalks and 20,000 lbs. in traffic areas.

402.2.11L METERS
Water Meters and Automated Meter Reading MXU's will be purchased by the City and installed at the request of the plumber/property owner as part of the Building Permit Process. Meters 3-inches and larger will be purchased and supplied by the City and installed by the Contractor/builder. Any adjustments required to the water service, meter box, or plumbing must be completed by the Contractor prior to meter installation.

402.2.15 PIPE FITTINGS

402.2.15A BURIED FITTINGS
Buried ductile or cast iron, long bodied fittings with mechanical joints or flanged, shall meet ASA specification 21.10, 250 psi working pressure, with glands, bolts and gaskets in accordance with ASA 21.11. Mechanical joints shall be so designed to completely accommodate star brace bolts, if required. A non-toxic vegetable soap lubricant shall be supplied in sufficient quantities for installing the pipe furnished. Lube must be approved by the City Engineer, or representative, prior to use.

402.2.15B ABOVE GROUND INSTALLATIONS

Above ground ductile iron fittings with threaded flanged joints shall meet ANSI/AWWA Standards C115/A21.15, latest edition, 250 psi working pressure, with stainless steel bolts and gaskets in accordance with ANSI/AWWA Standards.

402.2.15C COUPLINGS

Couplings 6" to 12" diameter must be ductile iron, long barrel couplings, Romac Style 501, Pacific States (Union Foundry) or U.S. Pipe M.J. ductile iron sleeve. Appurtenances shall be of same manufacture.

402.2.15D PLUGS and CAPS

Plugs shall be of Tyton joint type with internal set screws. Caps shall be of M.J. type.

402.2.16 SPECIAL COATINGS AND LININGS

For special conditions, other types of coating and linings may be available. Such special coatings and linings shall be approved by the City Engineer prior to the time of purchase.

402.2.17 PIPE INSULATION

Bridge crossing shall be ductile iron pipe, and shall be insulated with a urethane or fiberglass pipe wrap system specifically designed for pipe insulation purposes, minimum 2-inch thickness, CPR Upjohn-Trymer bun material, Mansville Micro-Lok, or equivalent, covered with an aluminum roll jacketing, 0.016-inch minimum thickness, Pabco Surefit Aluminum Jacketing, Mansville Micro-Lok, or equivalent. Insulation shall have a maximum conductivity ("K") of 0.40. Insulation at pipe supports shall be calcium silicate or other approved rigid insulation adequate to support the pipe. Jacketing joints shall be sealed within silicone caulk. Pipe supports and hangars shall be plated or hot dipped galvanized after fabrication.

402.2.18 TAPPING SLEEVE

The tapping sleeves shall be constructed of heavy welded steel. The outlet flange shall be AWWA 207, Class D, ANSI 150 lb. drilling, recessed for tapping sleeve. The body finish shall be a fusion-applied epoxy coating. Gasket shall have a resistance to water, oil and hydrocarbon fluids. Bolts shall be corrosion resistant, stainless steel 18-8 type 304. A :"test plug" shall be installed for testing prior to drilling pipe. A minimum service rating of 150 psi shall be required. Tapping sleeves shall be stainless steel sleeve, JCM 432, Romac SST III with stainless steel flanges, Mueller H304, Smith-Blair 665, or equal.

402.2.19 DETECTION WIRE

Detection wire shall be blue clad 16 gauge UF bury solid copper wire.

402.2.20 DETECTION TAPE

Detection tape shall be a 6" wide blue metallic tape manufactured by Allen System or an approved equal.

402.3.00 CONSTRUCTION

402.3.01 HANDLING AND STORAGE

All material shall be handled with care using straps to avoid damage to coatings and linings. Material shall not be dropped, bumped, or allowed to impact concrete, paved, or metal surfaces.The Contractor shall provide safe storage for material until it has been incorporated into the completed project. Storage shall be on skids, off the ground.

No more pipe shall be strung out on job than can be installed in one shift. The interior of all pipe, couplings, rings, fittings, and other accessories shall be kept free from dirt and other foreign matter at all times. Valves and hydrants shall be drained and stored in such a manner that will protect them from damage by freezing. Material that is supplied by the Contractor and rejected at the point of delivery because of defects or damage shall be removed from the project site and replaced by the Contractor. Material damaged subsequent to acceptance by the Engineer shall be removed from the work and replaced by the Contractor.

402.3.02 INSTALLATION, ALIGNMENT AND GRADE

Installation of C900 water mains and appurtenances shall generally conform to ANSI/AWWA Standard C600-99, or latest edition, and APWA Standard Specifications for Public Works Construction, latest edition.

All pipe shall be laid to and maintained at the lines and grades shown on the plans or directed by the Engineer. Fittings, valves, air release vents, and hydrants shall be installed at the designed locations with joints centered, spigots fully inserted, and valve and hydrant stems plumb. No deviation shall be made from the required line and grade without approval from the Engineer or City representative.

Pipe shall be laid on firm support made with pipe bedding and pipe zone material. Bedding shall be excavated for pipe bells to provide continuous support along length of pipe. The use of wood, concrete or stone blocking to support pipe is not allowed.

Pipe shall be plugged or capped to maintain a water-tight seal at the end of pipelines during construction at the end of the shift/day, or whenever the trench is to be left open for an extended period of time. The intent is to minimize the possibility of contamination from surface runoff or construction watering.

Each section of pipe shall be lowered into the trench by means of slings or straps of a type approved by the Engineer. The pipeline shall be assembled piece by piece with the pipe barrels bearing evenly along its length on the bottom of the trench. Where necessary to properly locate valves and fittings, pipe shall be neatly and squarely cut to length. Fittings shall be set in place to accurate line and grade and centered. In pipelines not encased in concrete, all fittings and bends 11-3 degree or more shall have thrust blocks. Restrained joint fittings may be used in lieu of thrust blocks where conflicts with other utilities or structures prevent proper thrust block placement or construction. Collars and rods or thrust blocks shall be used on all cast iron plugs and at the other locations as indicated on the drawings and as directed by the Engineer.

Minimum cover above water pipelines shall be 36". Where the street profile drawings indicate an uneven grade creating high points in the pipeline, the pipe shall be laid to a uniform slope. Hydrants are generally placed at high points in the pipeline.

402.3.02A PIPE ALIGNMENT

Pipe shall be laid accurately in conformity with the prescribed lines and grades. Gradual curvature, both horizontal and vertical, may be obtained by deflecting the pipe, but in no case shall such deflection exceed the manufacturer's stated allowable deflection angle. Pipe fittings shall be used for deflections in excess of that stated above. Bends shall have thrust blocks or joint restraint.

After each length of pipe has been laid to line and grade, there shall be no movement of the pipe to disturb its alignment.

402.3.02B GROUND WATER

Care should be taken to clean joints and to keep them free of water during construction. Whenever water is excluded from the interior of the pipe, adequate backfill shall be deposited on the pipe to prevent water excluded from the interior of the pipe, adequate backfill shall be deposited on the pipe to prevent floating. In the event of any flotation occurring, the pipe so affected shall be removed from the trench, replaced and relayed at the Contractor's expense.

Groundwater in the area may not be above the invert of the pipe. No pipe or fitting shall be lowered into a trench containing water. Water shall be pumped from wet trenches. The trenches shall be kept dry until the joints have been completed and the open ends of the main have been closed with watertight plugs or bulkheads. The plug or bulkhead shall not be removed unless the trench is dry. Every effort shall be made to keep the trench dry at all times.

402.3.02C PIPE CLEANING

Each section of the pipe and each fitting shall be thoroughly cleaned before it is lowered into the trench. Cleaning of each pipe or fitting shall be accomplished by swabbing out, brushing out, blowing out with compressed air and washing to remove all foreign matter.

402.3.02D CONSTRUCTION RECORDS & SERVICE CONNECTION LOCATION

A true and accurate record of the location of the lines, valves, services, connections and appurtenances shall be kept by the Contractor. Such record shall be furnished to the City upon completion of the work.

402.3.02E DETECTION TAPE & WIRE

Detection wire and tape shall be installed on all mainline and service lines. Detection wire shall be installed on all service lines two-inch and smaller. Detection tape shall be as manufactured by Allen Systems or an approved equal. One course of detection tape shall be installed twelve-inches above the pipe. Detection wire shall be a blue-clad 16 gauge UF bury solid copper wire located within six-inches of the top of the pipe. The wire shall be continuous in continuity and a lead shall be brought through to above the top of each valve stack. Where there is a splice, it shall be repaired with a King KWC 100 tan watertight connector or equivalent as approved by the Engineer. When installing ductile iron pipe, detection tape is required, detection wire is not.

402.3.03 FITTINGS, COUPLINGS, AND JOINTS

402.3.03A SETTING VALVES and FITTINGS

Valves, fittings, plugs, and caps shall be set and jointed in pipe in the manner prescribed by these specifications, or by the approval of the City Engineer, or City representative.

402.3.03B COUPLING PIPE

402.3.03B (1) RUBBER GASKET JOINT PIPE.

Pipe with rubber gasket type joints shall be laid and jointed in strict accordance with the manufacturer's recommendations and shall be in accordance with the requirements of these Specifications. Lubricant for the pipe gaskets shall be furnished by the pipe manufacturer. Rubber gaskets shall be new and cannot be reused.

MAXIMUM DEFLECTION OF RUBBER GASKET JOINT DUCTILE IRON PIPE
Based on 18-Foot Pipe Length

SIZE OF PIPE	BEND IN ONE JOINT ANGLE A	DEFLECTION IN INCHES D	APPROX. RADIUS IN FEET OF CURVE PRODUCED BY SECCESSION OF JOINTS
6" fire hydrant	2°00'	8"	450'
6" through 12"	4°00'	15"	258'
14" through 16"	3°00'	11"	343'
18" through 24"	2°00'	8"	450'

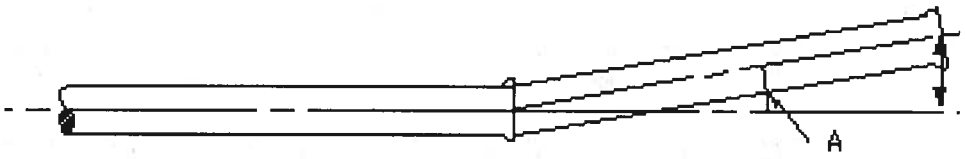


Fig. 1- Pipe Deflection

402.3.03B (2) DUCTILE IRON PIPE
Ductile Iron Water Pipe shall meet the requirements of ANSI/AWWA Standard C-151/A21.51-02, or latest edition. Joints shall be gasketed 'TYTON' type or mechanical type as shown on the plans. Gaskets shall conform to the requirements of ASTM F477 and ASTM D1869. Unless otherwise specified, pipe shall be minimum pressure Class 150. Minimum size for mainlines shall be 8". Hydrant lines may be reduced to 6" for runs under 400' in length

402.3.03B (3) SCREW JOINT PIPE
The threads of the screwed joints shall be thoroughly cleaned by wire-brushing, swabbing, or other approved method. Approved joint compound shall be applied to the threads prior to making the joint. Joints shall be water tight at test pressures before acceptance.

402.3.03C INSTALLATION of MECHANICAL and FLEXIBLE COUPLINGS
Mechanical and flexible couplings shall be provided where required for proper installation and as indicated on the plans, and shall be installed in accordance with the manufacturer's recommendations. Before couplings are installed, the end of the pipes shall be thoroughly cleaned of oil, scale, rust, and dirt for a distance of at least 8 inches back from the end to provide a seat for the coupling gaskets. Care shall be taken that the gaskets are wiped clean before they are installed. If necessary, they may be lubricated with pipe lubricant for installation on the pipe ends. Coupling bolts shall be tightened progressively, drawing up bolts on opposite sides a little at a time until all bolts have a uniform torque as recommended by the manufacturer.

Worker tightening bolts shall be equipped with torque-limiting wrenches or other approved

wrench capable of indicating the bolt torque. Mechanical and flexible couplings shall be tested with the pipeline. Couplings that do not pass the requirements of the leakage tests shall be removed and reassembled on the pipe, and the leakage test shall be repeated.

MAXIMUM DEFLECTION OF MECHANICAL JOINT PIPE
Safe Deflection for 150 PSI[1]
Based on 18-Foot Pipe Length
(See fig. 1)

SIZE OF PIPE	BEND IN ONE JOINT ANGLE A	DEFELCTION IN INCHES D	APPROX. RADIUS IN FEET OF CURVE PRODUCED BY SECCESSION OF JOINTS
8"	4° 21'	20"	195'
10"	4° 21'	20"	195'
12"	4° 21'	20"	195'
14"	3°35'	13.5"	285'
16"	3°35'	13.5"	285'
18"	2°00'	11"	340'
20"	2°00'	11"	340'
24"	2°23'	9"	450'
30"	2°23'	9"	450'
36"	2°05'	8"	500'
42"	2°00'	7.5"	510'
48"	2°00'	7.5"	510'

[1] For pressures above 150 PSI, reduce the tabulated deflection by 10% for each additional 150 PSI.

402.3.03D MECHANICAL JOINT VALVES, FITTINGS and APPURTENANCES
Mechanical joint valves, fittings, and appurtenances vary slightly with different manufacturers, and the particular fittings furnished shall be installed in accordance with the manufacturer's recommendations as approved by the Inspector. All appurtenances attached to fittings and/or valves shall be of the same manufacture and material.

The ends of the valves and fittings shall be thoroughly cleaned of all dirt, mud, and other foreign matter by washing with water and scrubbing vigorously with a wire brush. The gland and gasket shall be slipped on the plain end. If necessary, the gasket may be lubricated with approved pipe lubricant to facilitate sliding in place. The end of the pipe shall then be guided carefully into the bell of the fitting. The spigot shall be centered in the bell, the gasket placed in position, and the bolts inserted in the holes.

Torque ranges to be applied to cast iron bolts, shall be as follows:

Diameter of Bolt (in.)	Torque Range (Ft.-lbs.)	
5/8	40	60
3/4	60	90
1	70	100
1-1/4	90	120

When tightening bolts, the gland should be brought up to the flange evenly, maintaining approximately the same distance between the gland and the face of the flange at all points around the socket. This shall be done by partially tightening the bottom bolt first, then the top bolt, next the bolts at either side, and lastly, the remaining bolts. This cycle shall be repeated until all bolts are within the required recommended range of torques. If effective sealing is not attained at the maximum torque, the joint shall be disassembled thoroughly cleaned and checked for irregularities, and reassembled using the same procedure.

402.3.03D (1) FLANGED DUCTILE IRON PIPE and FITTINGS:
Flanged ductile iron pipe and cast iron fittings shall be furnished and installed as shown on the plans.

The flanges shall be thoroughly cleaned by washing or other approved method. The pipe shall be carefully aligned and faces brought together so that the bolt holes are lined up. The gaskets shall be inserted and bolts slipped in place. Bolts shall be drawn up gradually so that the tension is equal and the faces of the flanges are in close contact over the entire area.

Flanges, where required, shall be steel ring flanged, conforming to A.W.W.A. C207, Class D. Flanges shall be faced and drilled 125 pound or 250 pound U.S.A.S. as directed. Steel blind flanges for use on welded steel pipe shall be as shown.

402.3.03D (2) FLANGED JOINTING MATERIALS:
All nuts, bolts, and gaskets required for jointing the flanged pipe, fittings, and appurtenances shall meet the requirements of AWWA. C207. Gaskets shall be ring or full-cut with holes to pass the bolts, of rubber or neoprene composition,c inch thick.

Prior to joining flanged valves the flange faces shall be thoroughly cleaned. After cleaning, insert the gasket and tighten the nuts progressively and uniformly. If flanges leak under pressure, loosen the nuts, reset or replace the gasket, retighten the nuts, and retest the joint. Joints must be watertight at test pressures before acceptance.

402.3.03E RUBBER GASKET JOINT PIPE
Pipe with rubber gasket type joint shall be laid and jointed in strict accordance with the manufacturer's recommendations as approved by the Inspector and in accordance with the requirements of the Special Specifications (if applicable). The Contractor shall provide all special tools and devices such as special jacks, chokers, and similar items required for the installation. Lubricant for the pipe gaskets shall be of the type recommended by the pipe manufacturer, and no substitute will be permitted under any circumstances.

402.3.03F ELECTRICAL CONTINUITY
When so stated in the Specifications, the Contractor shall provide adequate means to permit an electric current to pass across all pipe joints without excessive voltage drop. The electrical connection shall be made by driving silicon-bronze wedges between the barrel of the pipe and the mouth of the bell where joints using rubber rings are employed.
Two such wedges shall be installed per joint on opposite sides of the pipe on the horizontal

centerline. The wedges shall be approximately one inch square and shall be tapered from c inch to 1/16 inch approximately. The wedges shall have serrated edges to provide good contact. The voltage drop at 500 amperes current flow shall not exceed 1.0 volt per joint.

402.3.03G TIE RODS

Tie rods and/or thrust blocks are required on all mechanical joint branch valves and fittings. Tie rods shall be of such a diameter and strength of material to prevent separation of valves or fittings from the mainline under test pressures. Tie rods shall be a minimum of two (2) 3/4 – inch diameter all-thread ASTM Grade 304 (18-8) stainless steel rods. On pipe sizes 10" diameter and larger, a minimum of 4 rods or more may be required as determined by the Engineer for the test pressures anticipated. Rods shall be of sufficient length to provide that all threads on any tightened nut are in contact and seated with rod threads. Additional mainline tie rods, or other restraint, may be required in certain instances at the direction of the City Engineer or City representative.

Note: Tie rods may be used in lieu of thrust blocks as an alternate means of restraint only with the Engineer's approval (See 402.3.08C). Tie rods may be required to supplement thrust blocking for proper installation. Tie rods shall be used in conjunction with ¾ -inch high strength low alloy steel eye bolts in conformance with AWWA C111-80. Use of Tie rods through MJ flange bolt holes is not permitted.

402.3.03H CUTTING PIPE

1) Ductile Iron, rubber-gasketed joint pipe shall be cut in the field as recommended by the pipe manufacturer. The pipe may be cut cold in the field using rolling pipe cutters or Carborundum cutting wheel. The cut end shall be reconditioned so that it may be used for the next joint. On rubber gasket joint pipe, the outside of the cut shall be tapered back, or dressed as recommended by the pipe manufacturer, and approved by the Inspector prior to installation.
2) PVC Pipe: All cuts on C900 pipe shall be made by proper pipe cutting tools designed specifically for that purpose. Cuts shall be made in accordance with the pipe manufacturer's recommendations.
3) Flame Cutting: Cutting pipe with an oxyacetylene torch or electric arc shall not be allowed.

402.3.04 HYDROSTATIC TESTING/LEAKAGE

402.3.04A HYDROSTATIC TESTS

Once the new pipe has been disinfected and all of the required number of bacteriological tests have come back negative a hydrostatic test shall be performed on buried pipe after the trench has been backfilled, and before permanent pavement is placed over the trench. Contractor shall be responsible for securing pipe and fittings during testing. Where any section of pipe is provided with concrete thrust blocking, the pressure test shall not be made until at least 5 days have elapsed after the concrete blocking is installed. If high-early cement is used for the concrete thrust blocking, the time may be cut to 2 days instead of the 5 previously specified.

Duration of the hydrostatic test shall be 1 hour with an allowable leakage not greater than that calculated from the formulas in Section 402.3.04B. All visible leaks shall be repaired and re-tested before the pipe trench is completely backfilled.

Any and all testing necessary for final acceptance shall be performed by a certified individual

under the supervision of the City of Sisters. This work shall conform to procedures specified by the City of Sisters (see 402.3.06 Leakage/Hydrostatic Testing & Disinfection Procedures).

402.3.04B LEAKAGE

Leakage is defined as the quantity of water necessary to restore the specified test pressure at the end of the test period. No pipe installation will be accepted until the leakage is less than the total gallons per hour allowed as determined by the formulas below. Should any hydrostatic test disclose leakage greater than that allowed, the Contractor shall locate and repair the defective joints or pipe, and repeat the hydrostatic test, at contractor's own expense, until the leakage is within the specified allowable amount. Piping or jointing having visual leakage will not be accepted, and shall be repaired or replaced and re-tested.

Ductile Iron: Allowable leakage shall be determined by the formula:

$$G = LD/P/133{,}200$$

Where:
- G=Allowable leakage (gal/hr)
- L= Length of pipe tested (feet)
- D=Nominal diameter of pipe (inches)
- P=Average test pressure (psi). Equal to two times the system pressure, but not less than 150 psi.

C900 PVC: Allowable leakage shall be determined by the formula:

$$G = ND/P/7400$$

Where:
- G = Allowable leakage (gal./hr.)
- N = Number of joints in the section tested (pipe and fittings). In 1000' of 18' lengths, there are 55.5 pipe joints. Each fitting has 2 joints.
- D = Nominal diameter of pipe (in.)
- P = Average test pressure (psi). Equal to two times the system pressure, but not less than 150 psi.

402.3.05 DISINFECTION

Disinfection of new lines shall be completed prior to connections with existing water distribution piping systems. Approval by City Engineer, or City Representative, must be acquired prior to this work. Disinfection shall be performed by a certified individual under the supervision of the City of Sisters. This work shall conform to the procedures specified by the City of Sisters Public Works Department.

402.3.06 LEAKAGE/HYDROSTATIC TESTING & DISINFECTION PROCEDURES

402.3.06A SCOPE

The testing of water lines for conformance with the requirements for the City of Sisters and the Oregon State Health Department shall be the responsibility of the Contractor. This testing includes hydrostatic pressure testing, chlorination, flushing, and bacteriological testing. The City approved laboratory, will perform all tests according to approved procedures. The City Representative will monitor and observe all testing procedures and collection of all water samples for bacteriological testing.

402.3.06B CERTIFICATION
The Contractor or Contractor's employee shall be not less than a State of Oregon Certified Water Distribution Systems Operator I. This person shall be present during and shall supervise all phases of these procedures.

The Contractor or Contractor's representative shall demonstrate knowledge of the steps required for chlorinating/flushing/testing; and conduct a field demonstration of technique.

402.3.06C MATERIALS
Equipment used for testing shall be kept clean and disinfected at all times. Tanks, hoses, pumps or any equipment directly in contact with any potable water piping or City of Sisters water facilities shall be dedicated for potable water use only. Equipment is subject to inspection and/or testing by the City at any time to prove compliance with these specifications.

The Contractor will supply all water and chemicals used for test procedures. The chlorine used will be approved by the City of Sisters prior to use. In some cases the City may be able to provide water. The method of chlorination will be by injection. Slug chlorination will not be allowed. The Contractor will also be responsible for the safe disposal of chlorinated water at the completion of the test.

402.3.06D PROCEDURES
Testing procedures shall be performed during normal City working hours, 7:00 AM to 4:00 PM, Monday through Friday. Pressure testing will be scheduled to allow completion of all tests within the normal working hours. Chlorination and pressure tests will not be performed when the temperature is expected to be less than 33° between the hours of 8 AM and 4 PM. Chlorine residual tests require a minimum of 24 hours.

The Contractor's personnel shall not operate any valve connected to the City water distribution system.

402.3.06E FLUSHING
The Contractor will be responsible for all flushing activity, including, but not limited to, flushing air from services and main lines at time of chlorination, flushing chlorinated water after all chlorination and re-chlorination, and as directed by the City's Representative prior to chlorination in case of dirty installation conditions.

The Contractor shall thoroughly flush all lines. Flushing velocity shall not be less than 3 fps. Flushing is considered completed when the system chlorine residual matches the background chlorine residual level of the City water distribution system at the source of water used for flushing.

402.3.06F CHLORINATION
The Contractor will be responsible for chlorine taps. Taps are required on all dead ends, and may be required on high points to vent trapped air. Taps will be coordinated and observed by the City of Sisters.

Before chlorination, the City Representative will witness all valves being opened in the system being chlorinated.

The City approved representative will sample chlorine residuals as follows:

After chlorination (beginning of test initial value).
Prior to the chlorination solution being flushed at the end of the 24 hour test period (finish value).
The system water after the system has been thoroughly flushed.

A maximum of 75.00 PPM and a minimum of 25.00 PPM of free residual chlorine are the acceptable limits for the initial test. Optimum free chlorine residual for the initial test is 50.00 PPM. Any residual above or below the acceptable initial limits shall be grounds for restarting the chlorination test. If the finish residual value after 24 hours varies from the starting value by 60% or more, the test will be deemed to have failed, and the pipeline shall be thoroughly flushed and re-chlorinated in accordance with the specified procedures.

If a passing residual level is not obtained after three chlorination treatments of the system, the pipeline will be deemed to be contaminated and will not be accepted. The Contractor shall remove the contaminated pipeline and replace all pipe at his own expense.

402.3.06G BACTERIOLOGICAL
When the chlorination test has passed and been accepted, the system shall be thoroughly flushed until the chlorine residual is equal to the chlorine residual at the source of the water used for flushing. Twenty-four (24) hours after completion of flushing, a City approved representative of the testing contractor, or approved testing laboratory representative, shall draw bacteriological samples from the closed system.

There will be a minimum 48 hour period between collecting the chlorination sample and the scheduling of the beginning of the pressure testing to permit an acceptable bacteriological test to be conducted. If the bacteriological test result is negative, pressure testing of the main can proceed. However, if the bacteriological test result is positive, re-chlorination of the system is required. When re-chlorination is required because of a failed sample, a companion sample set will be taken with the second primary sample set.

402.3.06H PRESSURE TESTING
Prior to pressure testing, all air will be flushed and expelled from the system. The City Representative will witness all valves checked to be open, and all service stops and hydrants securely closed.

Pressure testing should be done from the high end of the main, unless otherwise directed by the City of Sisters. The test pressure shall be two times (2X) the system pressure, but not less than 150 psi, for a period of not less than two hours.

The Contractor's pressure testing equipment (hoses from pump to metering device and from metering device to main) will be made up to connect thru a 3/4" meter. The City will approve the meter and gauge for pressure testing.

The length of the pressure test will be one hour. The allowable leakage shall be determined from the chart in the City of Sisters Water Specifications.

In-line valves in the test section shall be open during the 1-hour test. Once the line has passed, the in-line valve farthest from the pressure gauge shall be closed and the line pressure from that point on reduced to normal system operating pressure. Pressure shall be observed for 10 minutes. If there is no drop in pressure, close the next in-line valve towards the pressure gauge, reduce pressure beyond that valve, observe for 10 minutes and repeat until all in-line valves have been tested. If the pressure drops during any of the in-line valve

tests, repair as necessary and repeat the 1-hour test for the section of line with that valve at one end.

402.3.06I OTHER TESTS

The City Representative may require other tests, such as Volatile Organic Chemicals, Inorganic Chemicals, Synthetic Organic Chemicals, if he has reason to believe the line has been contaminated with such compounds. The costs for these tests may be substantial and shall be borne by the Contractor/Developer. Failure to pass such other tests will be grounds to reject the work, and may require that the pipe be replaced prior to further testing and acceptance.

402.3.06 J CLEAN-UP

Upon completion of the testing and acceptance of the tests by the City of Sisters, the Contractor shall clean the area and set valves to closed or open as directed by the City.

402.3.07 HOT TAPS

When shown on the plans, or as directed by the City Engineer, branches and large services may be connected to existing City of Sisters facilities by utilizing a tapping sleeve and tapping valve. The performance of this procedure shall be completed only by a City approved contractor. Approval shall be requested from the City Engineer, or City authorized representative, 48 hours in advance of performing the hot tap. No pipe shall be exposed without a City representative on-site.

Hot taps shall be scheduled only during the hours of 7:30AM to 3:30 PM, Monday through Friday. No hot taps shall be performed in cold weather until the air temperature is 35°F and rising, and no inclement weather is forecasted.

TAPPING SLEEVE REQUIREMENTS

Sleeve Types as Manufactured by JCM, Mueller, Romac, or Smith-Blair

1. Epoxy coated Fabricated Steel Sleeve; JCM 532 or equal.
2. Stainless Steel Sleeve: JCM 432; Romac SST III (with stainless steel flanges); Mueller H304; Smith-Blair 665, or equal.

Note: numbers in tables below correspond to accepted sleeve types.

FOR TAPS OTHER THAN SIZE- ON- SIZE

Type of Main being Tapped	Main 8" and under	Main 10" or 12" Tap 8" & under	12" Main 10" Tap	Main 14" & up Tap 8" & Under	Main 14" & up Tap 10" & 12"
C-900 Plastic	2	2	2	N/A	N/A
Steel Size Plastic	2	2	N/A	N/A	N/A
Ductile Iron	2	2	2	1	1
Transite	2	2	2	1	1
Steel	2	2	2	1	1

N/A = Not Applicable **N/R = Not Recommended**

402.3.08 SERVICES

1. Fittings for copper tubing shall be pack joint.
2. All services shall have minimum 30 inches of cover.
3. Approved bedding material shall be placed at least 4" below and at least 12" above all pipes. Material shall be hand tamped or water jetted to achieve 95% of maximum density.
4. Approved meter boxes with lids shall be installed at each meter location. The meter box shall be centered on the meter assembly and adjusted to existing ground level or proposed finished grade. All meter boxes shall be of the type as specified in the Water Service and Meter Installation Manual.
5. The main corporation stop shall be Copper Pack or approved equal.
6. Angled meter stops shall be Mueller or approved makes/models.
7. All services shall be blown free of all foreign objects before connecting the double check valve.
8. All services to be flushed and checked for flow.
9. Meter boxes shall be set directly behind the sidewalk or directly behind the curb where there is no sidewalk. Meter boxes are not to be located in sidewalks or driveways.
10. Where necessary, Meter boxes in traffic areas; e.g. streets, alleys, and parking lots shall be Armor, Armorcast, BES or Carson boxes fitted with concrete polymer lid rated to 10,000 lbs.
11. Commercial and industrial services, fire-lines, and all water services larger than 1" shall have an approved double check valve assembly installed on the service side of the meter.
12. Any service rising 30" or more above the top of the main shall have an approved double check valve assembly installed on the service side of the meter.
13. 3/4" Service runs shall not exceed 60 feet.
14. Service runs shall not contain fittings or unions unless approved by the City Engineer.
15. Service taps on C-900 shall be with a Ford S90 series tapping saddle or Romac 101S for ¾" and 1" taps or 202S for 1.5" and 2" taps.
16. Electrical continuity shall be provided as shown in the standard drawings on all services.
17. All new townhomes (separate tax lots) shall have separate meters and shut offs installed in individual conventional meter boxes. These shall be served by individual 3/4" or 1" copper service lines. Triplexes, four-plexes and other multi-family buildings will be master metered. Service size to be determined by Design Engineer and/or Building Official.
18. Pressure reducing valves may be required in areas of excess pressure, PRV's shall be placed on customer side of meter. PRV's will be maintained by property owner.
19. Water service meter boxes shall be set with a minimum separation of 18-inches between each water meter box to facilitate water meter maintenance. All water services shall have a minimum of 10 feet horizontal separation from power and other utilities in the public right-of-way.
20. All property that is the subject of a site plan, or any new construction that is being served by an inadequate water service as determined by the City Engineer, shall be required to upgrade the existing water service to current City Standards.
21. All existing water services that are being abandoned must be cut and capped at the water main. All costs for abandonment shall be borne by the Developer/property owner. Whenever possible, the water service to be abandoned shall be physically removed. When a service is abandoned and left in place, its location (horizontal and vertical) shall be noted on the Record Drawings.

402.3.09 THRUST BLOCKING

402.3.09A MATERIALS

Concrete for thrust blocking and hydrant support shall conform to ASTM C 94, Alternate 2 and shall be proportioned to obtain a 28-day compressive strength of 2,500 pounds per square inch. Mix design with current material certifications and compressive strength test results shall be submitted prior to placement of Concrete. "Sacrete" type products are not allowed.

402.3.09B ANCHORAGE

a) Limiting Pipe Diameter and Degree of Bend: On all pipe lines 4 inches in diameter or larger, all tees, plugs, caps, 113° or greater bends, and other locations where unbalanced force exist, shall be securely anchored by suitable thrust blocking or other restraint as shown on the Plans or hereinafter specified.

b) Thrust Blocking: Reaction or thrust blocking shall be placed as shown on the Plans and shall consist of concrete. Concrete blocking shall be placed between the undisturbed ground and the fitting to be anchored. The quantity of concrete and the area of bearing on the pipe shall be as shown on the Plans or as directed by the Inspector. The blocking shall be placed so it will not obstruct repairs to the joint, unless specifically shown otherwise on the Plans. The pipe and fitting joints shall be wrapped with plastic sheeting before placing concrete.

402.3.09C METAL HARNESS

Metal harness consisting of tie rods or clamps of adequate strength to prevent movement may be used instead of concrete blocking as an alternative means only with the Engineer's approval. Steel rods or clamps shall be stainless steel, galvanized, or otherwise rustproof treated as directed by the Inspector.

402.3.09D EXISTING THRUST BLOCKS

No existing thrust blocks shall be removed by the Contractor unless a City of Sisters representative is on-site for inspection and coordination.

402.3.09E JOINT RESTRAINT

On all pipelines 6 inches in diameter or larger, all tees, caps, plugs, and bends 11 ¼ degrees or greater, and other locations where unbalanced forces exist, shall be securely anchored by suitable mechanical restraints as specified on the plans or table below.

Joint restraint shall be installed on water pipelines and branches in accordance with the Joint Restraint Table below. Joint restraint shall be installed at all mechanical fittings and at pipe joints within the distance shown in the table.

JOINT RESTRAINT TABLE

FITTING	LENGTH –BRANCH (Feet)	LENGTH -RUN (Feet)
6" x 6" TEE	15	0
6" 90° BEND		15
6" 45° BEND		6
6" 22 ½° BEND		3
6" 11 ¼° BEND		1
8" x 6" TEE	9	0
8" x 8" TEE	26	0
8" x 4" REDUCER		33
8" x 6" REDUCER		19
8" 90° BEND		20
8" 45° BEND		8
8" 22 ½° BEND		4
8" 11 ¼° BEND		2
8" CAP		46
12" x 6" TEE	1	
12" x 8" TEE	15	
12" x 12" TEE	45	
12" x 6" REDUCER		47
12" x 8" REDUCER		34
12" x 10" REDUCER		32
12" 90° BEND		28
12" 45° BEND		11
12" 22 ½° BEND		5
12" 11 ¼° BEND		3
12" 45° BEND	ROTATED DOWN	27
12" 22 ½° BEND	ROTATED DOWN	13

Pipe Zone bedding shall be compacted to 95% of AASHTO T-99-74 Method C.
The restrained lengths are based on 150 PSI test pressure, and are the lengths required on each side of the bend or fitting.

402.3.10 DEADMAN TABLE

Deadman requirement: Able to withstand twice test pressure - 360 psi

THRUST (lbs)

Pipe (in.)	Plug	90°	45°	22-2°	11-3°
6	13,460	19,037	10,303	5,252	2,638
8	23,159	32,749	17,723	9,036	4,540
10	34,837	49,266	26,662	13,594	6,829
12	49,266	69,671	37,706	19,224	9,659
14	66,186	93,604	50,659	25,826	12,974
16	85,604	121,061	65,516	33,401	16,780

CONCRETE (cubic yards)

Pipe (in.)	Plug	90°	45°	22-2°	11-3°
6	3.3	4.7	2.5	1.3	0.7
8	5.7	8.1	4.4	2.2	1.1
10	8.6	12.2	6.6	3.4	1.7
12	12.2	17.2	9.3	4.7	2.4
14	16.3	23.1	12.5	6.4	3.2
16	21.1	29.9	16.2	8.2	4.1

402.4.00 MEASUREMENT AND PAYMENT

402.4.01 PIPE

Measurement and payment for water pipe will be made on a linear foot basis for the type and size of pipe installed. No reduction in length will be made for valves and fittings unless specified.

402.4.02 FITTINGS

Measurement and payment for fittings will be made on a per each basis for the type, kind, and size specified and installed. No separate or additional payment will be made for restrained couplings, joint lubricant, nuts and bolts, washers, and other fitting related hardware or supplies.

402.4.03 SERVICES

Measurement and payment for water services shall be on a per each basis for the type, kind and size specified. Measurement includes all valves, piping, fittings, jumpers, grounding strap, clamps, meter box, insulation, and backflow prevention devices required for a complete installation in accordance with the Water Service and Meter Installation Manual for the type and size indicated.

402.4.04 THRUST BLOCKS

Measurement and payment for thrust blocks will be made on a per each basis for each thrust block installed. No allowance will be made for additional concrete required for over-excavated areas.

402.4.05 INCIDENTAL BASIS

When neither specified nor listed in the proposal for separate payment, Pipe, Fittings, services, and Thrust Blocks shall be considered incidental work for which no separate payment will be made.

402.4.06 TESTING AND DISINFECTION
When neither specified nor listed in the proposal for separate payment, flushing, chlorination, and hydrostatic testing shall be considered incidental work for which no separate payment shall be made.

403 VALVES

403.1.00 DESCRIPTION

403.1.01 GENERAL
This section covers the work necessary for furnishing and installing valves and appurtenances.

403.2.00 MATERIALS

403.2.01 RESILIENT SEATED GATE VALVES

Buried epoxy coated, iron body gate valves shall meet AWWA standards (C-509 or C515), have non-rising stems, be rated at 200 lbs. working pressure and 350 lbs. hydrostatic pressure, open left with 2" square operating nuts, resilient seat, with brass fittings, "0" ring stem pressure seals, non-directional, mechanical joints with full body glands (AWWA C-110); as manufactured by Mueller, Kennedy and American Flow Control, and/or approved by the City Engineer, or representative. Special attention should be made of AWWA specification, Section 10-4-3.

Above ground or in-vault gate valves shall be equipped with hand wheels.

403.2.02 BUTTERFLY VALVES
Butterfly valves shall meet the strength and performance characteristics of AWWA C 504, latest edition, Class 150-B, mechanical joint etc., except worm gear operators are not permitted. Manufacturer shall be Mueller, Pratt Groundhog, American Flow Control, CLOW or approved equal. Butterfly valves shall be required on all water lines of 10" size and larger, or where 24" of cover over the operating nut cannot be obtained on smaller mains. Variance may be obtained for special valve installation from the City Engineer, or his representative. Above ground or in-vault butterfly valves shall be equipped with hand wheels.

403.2.03 VALVE BOXES
All valve boxes shall be a two piece grade adjustable box. The valve box shall have 5-inch I.D. with a slip top section without a dirt flange on the bottom. Valve boxes shall be Tyler Model 6855 or equal as shown in the Standard Drawings. The extension piece shall be of the proper length for depth of cover. The word "WATER" shall be cast into the top of the lid. Where valve boxes are located outside of pavement they shall be provided with a 6" thick concrete collar not less than 24" square. Valve clusters may be set in a single collar provided there is not less than 12" from the edge of the valve box to the edge of concrete.

403.2.04 CHECK VALVES

403.2.04A SWING CHECK TYPE
Swing check valves shall be bronze mounted with cast or ductile iron body with outside lever and spring unless otherwise specified.

403.2.04B SPRING LOADED PLUG or DISC TYPE
Spring loaded plug or disc type check valves shall be bronze mounted with bronze, cast, or ductile iron body, bronze plug or disc, stainless steel spring and resilient seal suitable for clear cold water service. The plug or disc of the check valve shall be easily removable and replaceable.

403.2.04C HYDRAULIC CUSHION TYPE
Hydraulic cushion type check valves shall be of bronze, cast or ductile iron with bronze disc and disc faces, seat rings, and pivot pins. The valve shall provide drop-tight sealing. The valve shall be provided with an adjustable speed, integrally mounted, oil dashpot mechanical snubber system.

403.3.00 CONSTRUCTION

403.3.01 VALVES

403.3.01A GENERAL
Before installation, valves shall be carefully cleaned of all dirt, debris, and foreign material and inspected in open-closed position. Valves shall be installed in accordance with the applicable portions of these Specifications. Unless otherwise indicated, gate valves shall be mounted with the stem vertical. Butterfly valves shall be mounted with the stem vertical and on the 'curb' side of the main. Horizontal valves shall be mounted in such a manner that adequate clearance is provided for operation. Installation practices shall conform to the manufacturer's recommendations.

403.3.01B VALVE BOXES
A metal valve box shall be provided for every valve which has no gearing or operating mechanism, or in which the gearing or operating mechanism is not fully protected with a cast iron grease case. The valve box shall not transmit shock or stress to the valve, and shall be centered and plumb over the operating nut of the valve. The box cover shall be flush with the surface of the finished pavement, concrete pad, or such level as may be directed by the Inspector.

Valve operating nuts that are deeper than 3' from finish grade shall have a valve operating nut extension installed prior to setting the valve box. The valve operating nut extension shall be installed with a set-screw to attach the extension to the valve operating nut.

403.4.00 MEASURE AND PAYMENT

403.4.01 VALVES
Measurement and payment for valves will be made on a per each basis for the type, kind, and size specified. Payment shall include all materials, labor, equipment, and incidentals required to furnish and install valves and valve boxes complete and operational.

403.4.02 BACK FLOW PREVENTION DEVICES
Measurement and payment for Backflow Prevention Devices will be made on a per each basis for the type, kind, and size specified.

403.4.03 INCIDENTAL BASIS
When neither specified nor listed in the proposal for separate payment, valves, valve boxes, and backflow prevention devices shall be considered incidental work for which no separate payment will be made.

404 FIRE HYDRANTS

404.1.00 DESCRIPTION

404.1.01 GENERAL
This section covers the work necessary for furnishing and installing fire hydrants.

404.1.02 CERTIFICATION
The Contractor shall furnish material certifications.

404.2.00 MATERIALS

404.2.01 HYDRANTS
Traffic model fire hydrants will meet AWWA specifications C-502 with dry top. Hydrants shall have a center stem compression, 53-inch valve opening, two 22-inch hose nozzles with National Standard Threads and one 5" Storz by 4 ½" NST Adapter with cap and cable, 6-inch mechanical joint inlet connection, open left (1) - 12-inch pentagon operating nut, and gaskets in nozzles. **The hydrants shall be painted with the City approved "safety red" paint.** To reduce the number of different hydrants in the system, the preferred models are Kennedy, M & H, or Mueller. Other hydrant makes/models shall be approved by the City Engineer. The barrel length will fit 4.5, 5, or 5.5 foot trench as required. A brass seating ring is required. Hydrants must be painted with proper color before acceptance of installed water system.

404.2.02 HYDRANT EXTENSIONS
Provide the appropriate hydrant height for the installation based on the construction drawings to avoid the need for hydrant extensions. If unavoidable, hydrant extensions shall be of same manufacture as hydrant and only one extension is permitted per hydrant.

404.2.03 GRAVEL FOR DRAINAGE
Gravel for drainage under fire hydrants shall be graded river gravel free of organic matter, sand, loam, clay and other small particles that will tend to restrict water flow through the gravel.

404.2.04 GEOTEXTILE

When required to protect the drain rock from contamination, geotextile fabric shall be placed against, and to 24-inches beyond gravel or soil at the limits of the excavation for drain rock to prevent fines from migrating into the drain rock. The geotextile shall be a commercial fabric designated for this application, and shall be approved by the Engineer's representative prior to incorporation in the work.

404.3.00 CONSTRUCTION

404.3.01 HYDRANTS

404.3.01A LOCATION

Hydrants shall be located as shown on the Plans or as directed by the Engineer. The final location of all hydrants will require approval from the City Engineer and the Fire Department prior to installation. All hydrants shall have two (2) reference points (swing ties) indicating the face of hydrant, top of curb, and face of curb.

Hydrants located in areas not protected by curb shall be protected by a 6' X 6' concrete pad and bollards as shown in Standard Drawing 4-14. Hydrants located adjacent to any vehicular traffic areas shall be protected on the side facing traffic by a minimum of two (2) bollards as shown in the Standard Drawings.

404.3.01B POSITION

No hydrant shall be set within 25 feet of a dry well unless specifically permitted by the City Engineer. No hydrant shall have more than a 6 foot bury. All hydrants shall stand plumb and shall have their nozzles parallel with or at right angles to the curb with the pumper nozzle facing the curb. Hydrants shall be set to the established grade with the bottom edge of break off flange no less than 3 inches, nor more than 6 inches, above the top of the concrete slab as shown on the plans or as directed by the Inspector. Hydrant pads shall be placed flush with sidewalks and curbs at a slope of 0.02/FT or as directed by the Inspector.

404.3.01C HYDRANT DRAINAGE

Unless otherwise specified in the Plans or Special Conditions, hydrant drainage shall be provided at the base of the hydrant by placing a geotextile mat against native earth, and graded river gravel from the bottom of the trench to at least 6 inches above the waste opening in the hydrant, and to a distance of one foot around the bowl. No drainage system shall be connected to a sewer. A concrete base of at least 12 inches square by 4 inches deep, shall be provided for all hydrants.

404.3.01D ANCHORAGE of HYDRANTS

The bowl of each hydrant shall be well braced against undisturbed earth at the end of the trench with concrete blocking, or it shall be tied to the water main pipe with suitable metal tie rods and clamps, or both if required, as shown on the plans or as directed by the Inspector.

404.3.01E PAINTING

Prior to final acceptance by the City all hydrants shall be re-painted with one (1) coat of rust preventive paint, at least 6 mils thick. Paint shall be applied with a brush. Color shall be City approved Safety Red. For a typical hydrant installation see Standard Drawings. Steel bollards shall be painted with one or more coats of 'Safety Red'.

404.4.00 MEASUREMENT AND PAYMENT
Measurement and payment will be made on per each basis for the type of hydrant specified and installed. Payment shall include all materials, labor, and equipment to furnish and install hydrant, bury and risers, drain rock, geotextile fabric, thrust blocking and tie-backs, concrete pad and bollards, and painting, complete and accepted by the Inspector.

When specified and listed in the proposal, payment shall include 6-inch hydrant valve and C900 PVC piping from the water main.

When neither specified nor listed in the proposal for separate payment, Hydrants shall be considered incidental work for which no separate payment will be made.
Buried epoxy coated, iron body gate valves shall meet AWWA standards (C-509 or C515), have non-rising stems, be rated at 200 lbs. working pressure and 350 lbs. hydrostatic pressure, open left with 2" square operating nuts, resilient seat, with brass fittings, "0" ring stem pressure seals, non-directional, mechanical joints with full body glands (AWWA C-110); as manufactured by Mueller, Kennedy and American Flow Control, and/or approved by the City Engineer, or representative. Special attention should be made of AWWA specification, Section 10-4-3.

Above ground or in-vault gate valves shall be equipped with hand wheels.

403.2.02 BUTTERFLY VALVES
Butterfly valves shall meet the strength and performance characteristics of AWWA C 504, latest edition, Class 150-B, mechanical joint etc., except worm gear operators are not permitted. Manufacturer shall be Mueller, Pratt Groundhog, American Flow Control, CLOW or approved equal. Butterfly valves shall be required on all water lines of 10" size and larger, or where 24" of cover over the operating nut cannot be obtained on smaller mains. Variance may be obtained for special valve installation from the City Engineer, or his representative. Above ground or in-vault butterfly valves shall be equipped with hand wheels.

403.2.03 VALVE BOXES
All valve boxes shall be a two piece grade adjustable box. The valve box shall have 5-inch I.D. with a slip top section without a dirt flange on the bottom. Valve boxes shall be Tyler Model 6855 or equal as shown in the Standard Drawings. The extension piece shall be of the proper length for depth of cover. The word "WATER" shall be cast into the top of the lid. Where valve boxes are located outside of pavement they shall be provided with a 6" thick concrete collar not less than 24" square. Valve clusters may be set in a single collar provided there is not less than 12" from the edge of the valve box to the edge of concrete.

403.2.04 CHECK VALVES

403.2.04A SWING CHECK TYPE
Swing check valves shall be bronze mounted with cast or ductile iron body with outside lever and spring unless otherwise specified.

403.2.04B SPRING LOADED PLUG or DISC TYPE
Spring loaded plug or disc type check valves shall be bronze mounted with bronze, cast, or ductile iron body, bronze plug or disc, stainless steel spring and resilient seal suitable for clear cold water service. The plug or disc of the check valve shall be easily removable and replaceable.

403.2.04C HYDRAULIC CUSHION TYPE

Hydraulic cushion type check valves shall be of bronze, cast or ductile iron with bronze disc and disc faces, seat rings, and pivot pins. The valve shall provide drop-tight sealing. The valve shall be provided with an adjustable speed, integrally mounted, oil dashpot mechanical snubber system.

403.3.00 CONSTRUCTION

403.3.01 VALVES

403.3.01A GENERAL

Before installation, valves shall be carefully cleaned of all dirt, debris, and foreign material and inspected in open-closed position. Valves shall be installed in accordance with the applicable portions of these Specifications. Unless otherwise indicated, gate valves shall be mounted with the stem vertical. Butterfly valves shall be mounted with the stem vertical and on the 'curb' side of the main. Horizontal valves shall be mounted in such a manner that adequate clearance is provided for operation. Installation practices shall conform to the manufacturer's recommendations.

403.3.01B VALVE BOXES

A metal valve box shall be provided for every valve which has no gearing or operating mechanism, or in which the gearing or operating mechanism is not fully protected with a cast iron grease case. The valve box shall not transmit shock or stress to the valve, and shall be centered and plumb over the operating nut of the valve. The box cover shall be flush with the surface of the finished pavement, concrete pad, or such level as may be directed by the Inspector.

Valve operating nuts that are deeper than 3' from finish grade shall have a valve operating nut extension installed prior to setting the valve box. The valve operating nut extension shall be installed with a set-screw to attach the extension to the valve operating nut.

403.4.00 MEASURE AND PAYMENT

403.4.01 VALVES

Measurement and payment for valves will be made on a per each basis for the type, kind, and size specified. Payment shall include all materials, labor, equipment, and incidentals required to furnish and install valves and valve boxes complete and operational.

403.4.02 BACK FLOW PREVENTION DEVICES

Measurement and payment for Back flow Prevention Devices will be made on a per each basis for the type, kind, and size specified.

403.4.03 INCIDENTAL BASIS

When neither specified nor listed in the proposal for separate payment, valves, valve boxes, and backflow prevention devices shall be considered incidental work for which no separate payment will be made.

DIVISION V - STRUCTURES

512 RAILING, FENCING, AND GATES

512.1.00 DESCRIPTION

512.1.01 GENERAL

This work consists of furnishing and installing fences, gates, and gateways of chain link fabric, woven wire fabric, barbed wire, or combinations thereof, in reasonably close conformity to the lines and grades shown or directed by the Engineer. Minimum general standards for fencing shall be as set forth in Section 01050 of the Oregon Standard Specifications for Construction, current edition.

All dimensions shown on the plans are horizontal and vertical measurement. Actual quantities required for the installation may be greater depending on the slope of the terrain. All fenced areas shall have at least one gate.

512.1.02 CERTIFICATION

The Contractor shall furnish material certifications for all fencing materials.

512.2.00 MATERIALS

512.2.01 POSTS, RAILINGS, BRACES, AND APPURTENANCES

Unless otherwise specified, all posts, railings, and similar structural elements shall be standard weight galvanized tubular steel posts conforming to the requirements for AASHTO M 181, having not less than 1.6 oz. galvanizing per SF. Posts and railings shall conform to the following schedule:

Railings and Gates	1.625.inch diameter (1-5/8")
Lind Posts	2.375 inch diameter (2 3/8")
Corner and End Posts	2.875 inch diameter (2 7/8")

Gate Posts

Gate swing 2/5' to 6.0'	3.00 inch diameter
Gate swing > 6.0'	4.00 inch diameter

Tubular posts shall be fitted with a snug-fitting, galvanized metal cap.

512.2.01A STEEL

Steel shall be galvanized in accordance with the requirements of ASTM A153, unless otherwise specified. Shapes, plates, and bars shall conform to the requirements of ASTM A36.

Tubing shall conform to the requirements of ASTM A500, Grade B, ASTM 501 or ASTM A53, Grade B, unless otherwise specified.

Posts shall conform to the requirements of ASTM A27, Grade 65-35, unless otherwise specified. Nuts, bolts, and washers shall conform to the requirements of ASTM A307, Grade A.

512.2.02 FENCING

512.2.02A CHAIN LINK

Chain link fabric, ties, and tension wire shall conform to the requirements of AASHTO M181 supplemented and modified as follows:

Fabric may be zinc-coated steel meeting Type 1, Class D coating requirement, aluminum-coated steel, or aluminum alloy. Use only one type on any Project.

Wire fabric ties, wire ties, and hog rings may be zinc-coated steel wire, aluminum coated steel, or aluminum alloy as elected, regardless of the type of wire fabric used.

Use ductile, zinc-coated steel meeting the coating requirements of ASTM A 641/A 641 M, Class 1 for wire fabric ties, wire ties, and hog rings. Aluminum coated steel wire fabric ties, wire ties, and hog rings shall be coated with at least 0.30 ounce per square foot.

512.2.02A(1) VINYL COATED CHAIN LINK

Vinyl clad chain link fabric shall conform to AASHTO M181, Type IV. The thickness of the coating shall not be included in the gauge rating of the fabric.

512.2.02A(2) SCREENED CHAIN LINK

In addition to the above requirements for fabric, the screening shall be "View Gard" or an approved equal. Fabric shall be 9 gauge galvanized wire woven in 3-1/2 inch by 5-1/2 inch diamond mesh. Top and bottom selvage shall be knuckle finished. The screening shall be vinyl slats, approximately 5/16" x 2-3/8", in an approved color. The slats shall be inserted vertically and shall be securely fastened to the wire fabric with stainless steel staples and a bottom locking slat.

512.2.02B BARBED WIRE

Barbed wire shall be two-strand and either 12-1/2 gauge or 15-1/2 gauge with 4-point barbs spaced a 5-inch intervals conforming to the requirements of AASHTO M 280 (ASTM A 121). Galvanizing shall be Class 3. All barbed wire installed on a Project shall be new or like new, and of the same gauge, unless otherwise approved by the Engineer.

512.2.02C BOTTOM TENSION WIRE

The bottom tensioning wire shall be 7 gauge spring wire with Class 2 coating, unless otherwise specified.

512.3.00 CONSTRUCTION

512.3.01 GENERAL
Materials removed under these provisions, including excess excavation, brush, stumps, and debris, shall be disposed of by the Contractor in a manner satisfactory to the Engineer.

512.3.02 FENCE
Fencing shall be 6 feet high, unless otherwise specified or shown on the plans.

The fence lines designated by the design engineer or City Engineer shall be cleared, grubbed, or otherwise prepared by the Contractor such that the grade shall not vary by more than 6 inches in any 15 foot run. All shrubs, brush, logs, down timber, snags, rocks and other obstacles, including trees up to 6-inches in diameter, which interfere with the fence within 36 inches of the line, shall be removed and disposed of as directed by the Engineer. Trees having diameters greater than 6 inches will normally be preserved by varying the fence alignment to pass by them. As much as possible, the fence shall be erected on natural ground, with the bottom of the fence fabric following the ground contours, with no less than one inch nor more than six inches clearance from the ground surface. Fill or excavate ground surface irregularities that interfere with maintaining the specified ground clearance. Grading shall leave a neat, natural appearance.

All posts shall be set firmly in the ground or in concrete footings as applicable. Excavate for concrete footings to reasonably neat lines, but not less than the specified dimensions and depths in soil, or not less than 18 inches deep in rock. When drilling into solid rock, the Contractor may shorten the post depth such that a minimum of 12 inches of the post is grouted into the rock. Prevent disturbance of original ground at the sides and bottom of the excavation. Footings shall have dimensions not less than dimensions shown on the standard plan, and shall fill the excavated areas and contact firm soil at the sides and bottom. Typically, posts will have a minimum 3 feet of set in excavated soil. Reasonable variation in depths will be permitted and posts may be appropriately shortened or left slightly high, as approved by the Engineer, to avoid unnecessary penetration or excavation in rock or to obtain desired grades along the fence. Concrete shall be cast – in-place and tamped around the posts and brace ends with the posts and braces firmly held in proper position. The surface of the concrete shall be struck off and sloped to a smooth surface at the ground level, and the concrete shall be allowed to cure for at least 5 days before the posts and braces are subjected to strain.

Line posts shall be set along the line of the fence, between end, corner, and gate posts, and typically at the spacing called for on the plans. In some cases, line posts may be set at greater spacing not exceeding 25% greater than called out, or at closer spacing if directed or approved by the Engineer. The intent of this provision is for the actual number of line posts installed to be equal to the number required for typical spacing. The height of the posts above the ground shall not exceed the design height of the fence by more than 3 inches.

Intermediate end posts shall be set in the line of new fence at each summit and at each valley in the grade of the fence where the algebraic difference in the grades of adjoining panels of fence exceeds 30%, and at other points located along the fence line to break the fence construction into approximately equal runs not exceeding the applicable length of runs shown. Corner posts shall be set at angle points in fence alignment where the alignment of adjoining panels of fence changes direction by 20 degrees or more.

Metal post braces shall be firmly attached to metal end posts, intermediate end posts, corner posts, and gate posts, and shall be set in concrete footings when indicated on the plans. Corner posts and intermediate end posts shall be provided with two braces, one each way from the post in the main lines of the fence. End posts and gate posts shall be provided with one brace in the line of the fence as called for on the plans.

Tensioning wire shall be attached to end, gate and corner posts by bands and clamps. Top tension wire shall be either threaded through line post loop caps or held in open slots therein in such a manner as to limit vertical movement. Bottom tension wire shall be tied or attached to line posts by ties or clamps to prevent vertical movement.

Expansion sleeves or couplings in longitudinal top and bottom rails shall be provided at spacing not exceeding 200 feet. Tension wires shall be provided with one turnbuckle or one ratchet take-up in each run of fence.

Place fabric and wire on the face of the post designated by the Engineer. On curved alignment, place the fabric and wire on the face of the post against which the normal pull of the fabric and wire will be exerted. Attach fence fabric and barbed wire to each post according to recognized standard practice for fence construction. Use care in stretching woven wire fabric so the pull is evenly distributed over the longitudinal wires and not more than one-half of the original depth of the tension curves is removed.

Fabric shall be fastened to end, gate, and corner posts, and to gate frames as indicated on the plans. Fabric shall be attached to line posts with wire ties at top and bottom and at intermediate spacing not exceeding 18 inches. Fabric shall be attached to top and bottom rails and to longitudinal tension wire with metal bands or tie wires spaced as detailed, but in no case greater than 24 inches apart.

Splices of fabric and splices of separate lines of wire between posts will be permitted provided that not more than two fabric or separate wire splices, spaced at least 50 feet apart, occur in any one run of fence. Fabric splices shall be with spiral pickets of specified chain link fabric material. Splices of tension wire and barbed wire shall be of the wrap or telephone type with each end wrapped around the other for not less than six complete turns.

In final position, the fabric and barbed wire shall be free from warp and sag, and appearance shall reflect first class workmanship in every detail.

512.3.03 GATES

Gate openings shall be cleared and graded to permit the swing gate to open in a horizontal plane for a minimum of 90 degrees in each direction. Roll gates shall be graded for smooth level operation.

Gates shall be constructed to reflect high quality workmanship. Wire splices shall develop the full strength of the wire, and the finished work shall provide a taught and well-aligned closure of the opening capable of being readily opened and closed by hand.

512.3.03A SWING GATES

Swing gates shall be hinged in a manner to prevent removal of the gate without proper tools. Firmly attach the fittings to the gates and posts. Set each single gate to swing freely inward and outward in a plane so it can be fastened securely in its latch holder, or in the case of double gates, in its latch holder and gate stops. Set double gates on their respective hinge pintles to provide a common horizontal plane in which each single gate swings.

512.3.03B ROLL GATES

Roll gates shall be installed in accordance with the plans and manufacturers details and recommendations.

512.3.04 REMOVING AND REBUILDING FENCE
Remove and rebuild existing fences as shown or directed. Construct fences to approximately the same condition as the original fence. Salvage the materials in existing fences to be removed and rebuilt and incorporate in the rebuilt fences. Replace fence materials damaged beyond reuse at no additional cost to the Owner. Firmly reset posts to the staked alignment. Post spacing and the number of wires to be strung shall be the same as the original fence. Furnish new staples or clips to fasten the wires to the posts.

512.4.00 MEASUREMENT AND PAYMENT
Payment for fencing, barbed wire, and gates shall be as listed in the Bid Schedule. The price bid shall include full compensation for furnishing all materials, equipment, tools, labor and incidentals necessary to construct fencing and gates complete and in-place.

512.4.01 FENCING
Measurement and payment for fencing shall be on a lineal foot basis, less gate openings, to the nearest foot, for the type and height of fence specified and constructed.

512.4.02 BARBED WIRE
Measurement and payment for barbed wire shall be on a lineal foot basis to the nearest foot measured along the fence line for the type of fence specified and constructed.

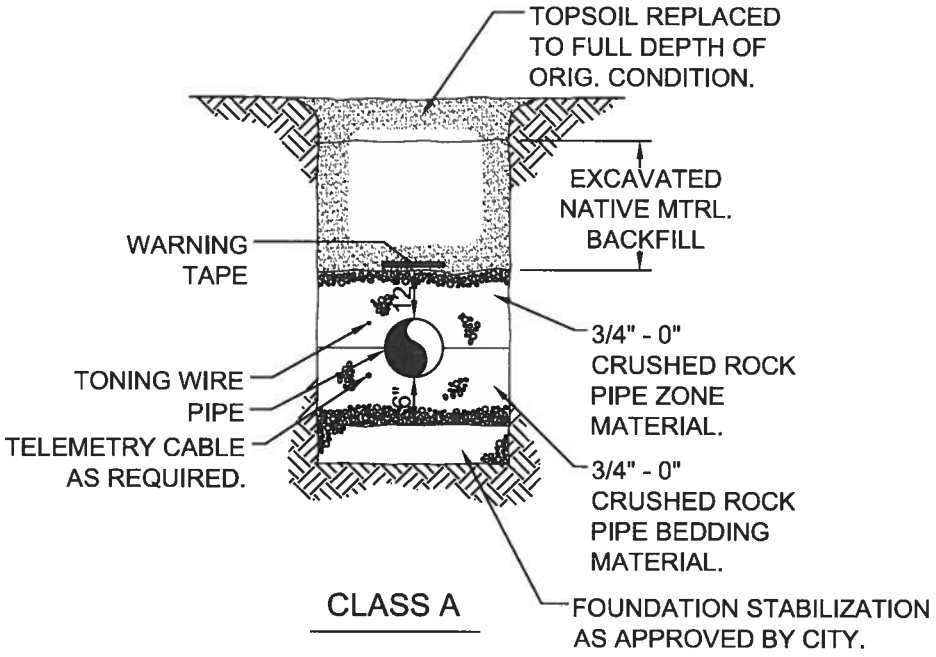
512.4.03 GATES
Measurement and payment for gates shall be on a per each basis for the type and length of gate specified and constructed. Barbed wire on gates shall be paid for under the Barbed Wire pay item.

512.4.04 REMOVING AND REBUILDING FENCE
When listed in the schedule of Bid Items, measurement and payment for rebuilding fence shall be on a lineal foot basis at the unit bid price. Payment shall be full compensation for all work, including any new materials necessary to complete the rebuilding of the fence.

512.4.04 LUMP SUM BASIS
When listed in the schedule of Bid Items as a Lump Sum Amount, payment for fencing, gates, and barbed wire shall be paid as a lump sum for the type and length of fence specified and installed. Payment shall be compensation for all materials, equipment, tools, labor, and incidentals required to construct fences.

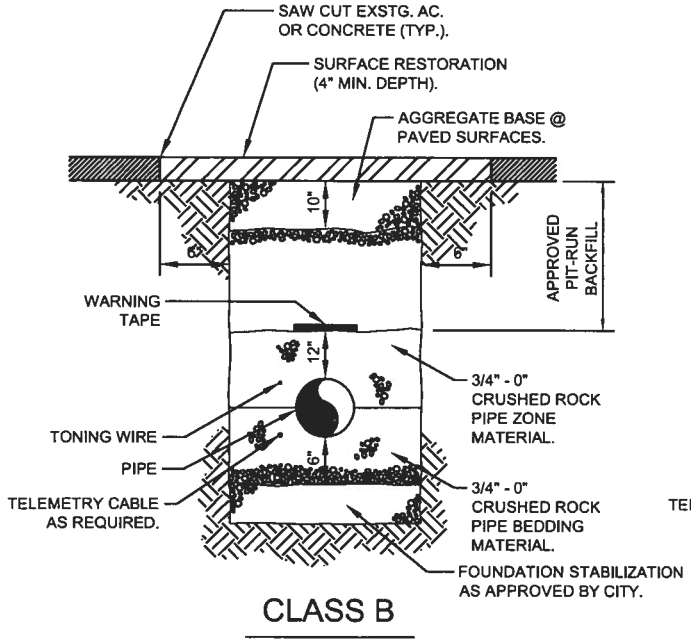
512.4.05 CLEARING AND GRUBBING
No separate payment shall be made for clearing and grubbing fence lines, gate openings, or areas necessary to install fencing. This work shall be considered incidental to fence construction.

512.4.06 INCIDENTAL BASIS
When not listed in the Schedule of Bid Items as a separate pay item, construction, removal, or replacement of fences, wire, gates, and related work shall be considered incidental to the completion of other work specified in the Contract.

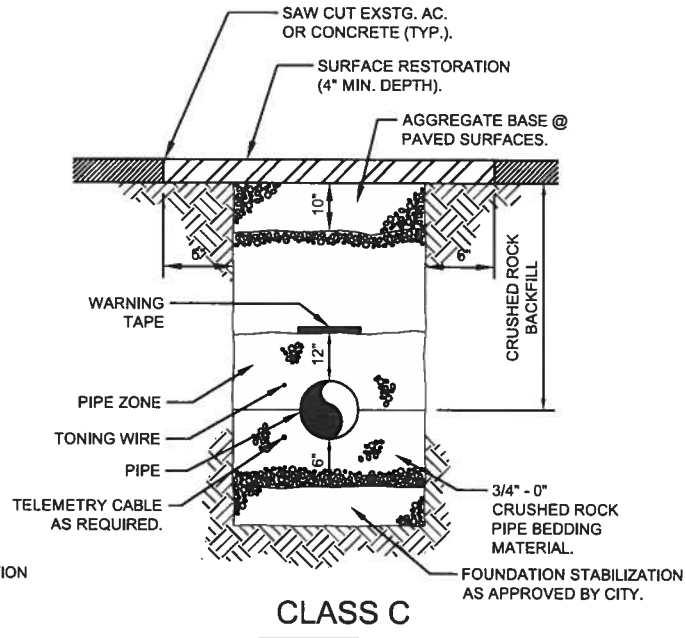


CLASS A

NOTE: WIDTH OF TRENCH TO BE I.D. OF PIPE PLUS 16" FOR PIPE UP TO 24" DIA. AND I.D. OF PIPE PLUS 24" FOR PIPE LARGER THAN 24"



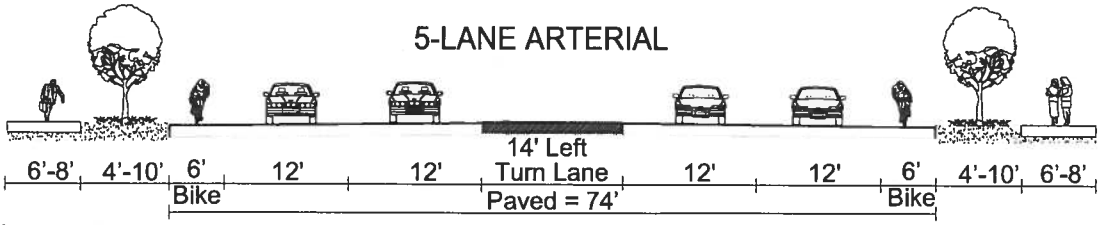
CLASS B



CLASS C

CITY OF SISTERS INCORPORATED 1946	**City of Sisters ◦ Standard Detail**	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	STANDARD TRENCHES	APPROVED BY: PB	1-1
		REVISION DATE: 12/03/2013	

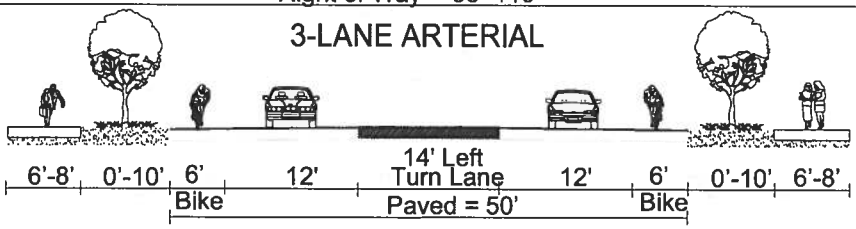
5-LANE ARTERIAL



STRUCTURAL DESIGN STANDARDS IN COMPLIANCE WITH CITY OF SISTERS PUBLIC WORKS CONSTRUCTION STANDARDS AND CURRENT OREGON DEPARTMENT OF TRANSPORTATION STANDARDS

Right of Way = 98'-110'

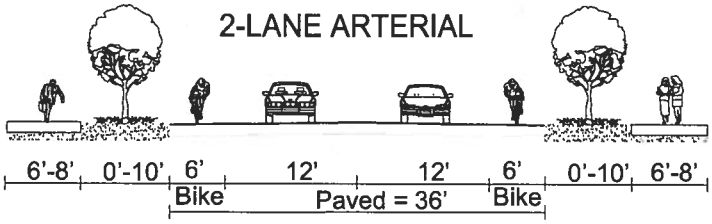
3-LANE ARTERIAL



STRUCTURAL DESIGN STANDARDS IN COMPLIANCE WITH CITY OF SISTERS PUBLIC WORKS CONSTRUCTION STANDARDS AND CURRENT OREGON DEPARTMENT OF TRANSPORTATION STANDARDS

Right of Way = 62'-86'

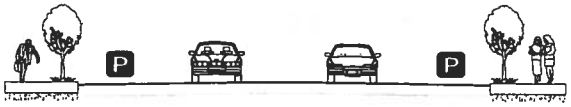
2-LANE ARTERIAL



STRUCTURAL DESIGN STANDARDS IN COMPLIANCE WITH CITY OF SISTERS PUBLIC WORKS CONSTRUCTION STANDARDS AND CURRENT OREGON DEPARTMENT OF TRANSPORTATION STANDARDS

Right of Way = 48'-72'

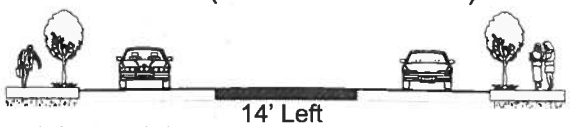
CASCADE AVE (STA - TYPICAL)



STRUCTURAL DESIGN STANDARDS IN COMPLIANCE WITH CITY OF SISTERS PUBLIC WORKS CONSTRUCTION STANDARDS AND CURRENT OREGON DEPARTMENT OF TRANSPORTATION STANDARDS

Right of Way = 60'

CASCADE AVE (STA - TURN LANE)



STRUCTURAL DESIGN STANDARDS IN COMPLIANCE WITH CITY OF SISTERS PUBLIC WORKS CONSTRUCTION STANDARDS AND CURRENT OREGON DEPARTMENT OF TRANSPORTATION STANDARDS

Right of Way = 60'

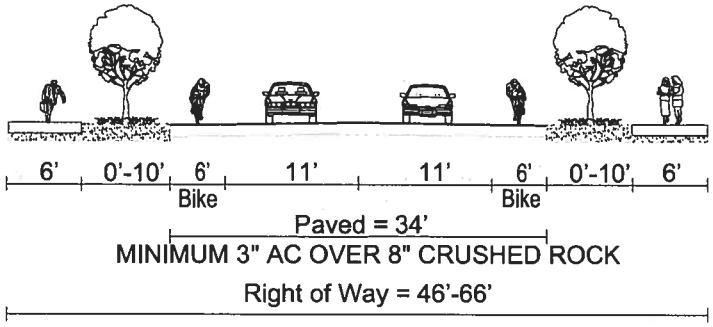
NOTES:

1. TURN LANE WARRANTS SHOULD BE REVIEWED USING HIGHWAY RESEARCH RECORD NO. 211, NCHRP REPORT NO. 279 OR OTHER UPDATED/SUPERSEDING REFERENCE.
2. ODOT "HIGHWAY DESIGN MANUAL" REQUIREMENTS SUPERCEDE CITY STANDARDS.
3. BIKE LANES MAY NOT BE REQUIRED IF A PARALLEL ALTERNATIVE ROUTE IS APPROVED BY THE CITY ENGINEER.
4. WHEN MULTI-USE PATHS ARE USED INSTEAD OF SIDEWALKS AND BIKE LANE, PATHS SHALL BE A MINIMUM OF 10 FEET (12 FEET IS DESIRED) WITH A MINIMUM 6-FOOT SEPARATION FROM THE ROADWAY.
5. CASCADE SECTIONS AS DEPICTED REQUIRE AN ODOT DESIGN EXCEPTION PRIOR TO CONSTRUCTING IMPROVEMENTS. WHERE ON-STREET PARKING IS ALLOWED, CURB-EXTENSIONS MAY BE CONSTRUCTED IN PLACE OF PARKING SPACES.

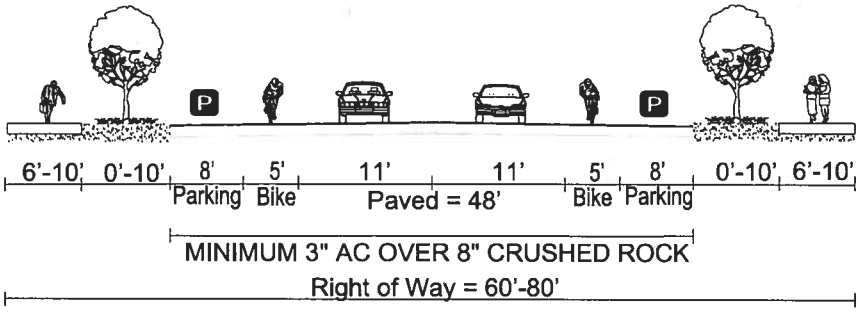
P On-street Parking Lane (except at intersections)

CITY OF SISTERS INCORPORATED 1946	**City of Sisters ◦ Standard Detail**	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	TYPICAL STREET SECTIONS	APPROVED BY: PB	2-1
		REVISION DATE: 12/03/2013	

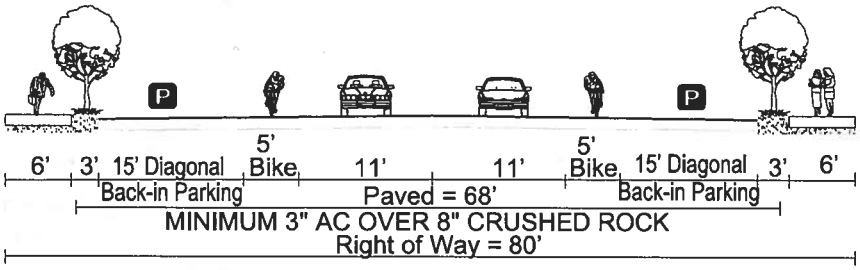
STANDARD COLLECTOR



COLLECTOR (COMMERCIAL DISTRICT - PARALLEL PARKING)



COLLECTOR (COMMERCIAL DISTRICT - DIAGONAL PARKING)



Note: 3' between parking and sidewalk would provide for landscaping/swale and parking overhang

NOTES:

1. WHEN MULTI-USE PATHS ARE USED INSTEAD OF SIDEWALKS/PEDESTRIAN PATHS AND BIKE LANE, PATHS SHALL BE A MINIMUM OF 8 FEET WIDE (10 FEET IS DESIRED) WITH A MINIMUM 6-FOOT SEPARATION FROM THE ROADWAY.
2. BIKE LANES MAY NOT BE REQUIRED IF A PARALLEL ALTERNATIVE ROUTE IS APPROVED BY THE CITY ENGINEER.

P On-street Parking Lane (except at intersections)

	City of Sisters ◦ Standard Detail	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	TYPICAL STREET SECTIONS	APPROVED BY: PB	2-2
		REVISION DATE: 12/03/2013	

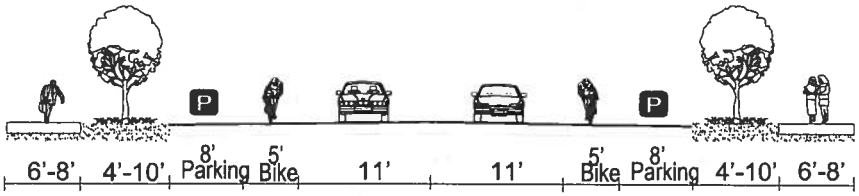
NEIGHBORHOOD ROUTE

Paved = 38'

MINIMUM 3" AC OVER 8" CRUSHED ROCK

Right of Way = 60'-80'

NEIGHBORHOOD ROUTE WITH BIKE LANES

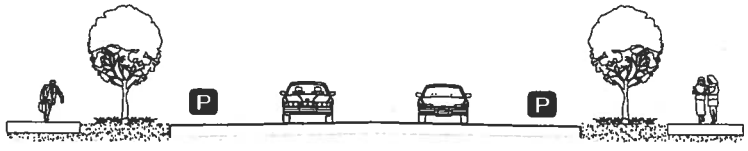


Paved = 48'

MINIMUM 3" AC OVER 8" CRUSHED ROCK

Right of Way = 60'-80'

STANDARD LOCAL STREET (COMMERCIAL/INDUSTRIAL)



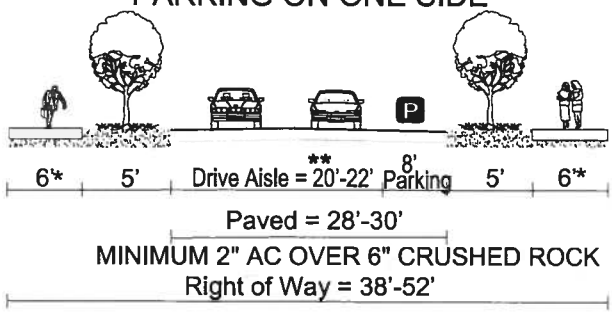
Paved = 26'-42'

MINIMUM 2" AC OVER 8" CRUSHED ROCK

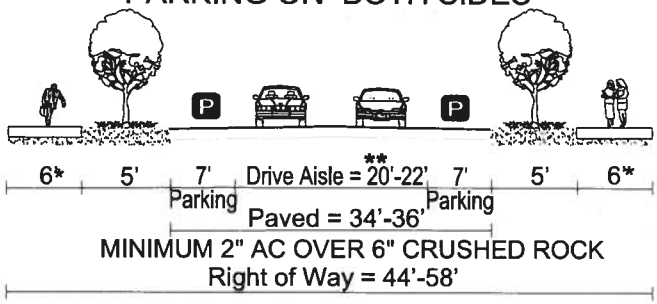
Right of Way = 46'-70'

CITY OF SISTERS INCORPORATED 1946	**City of Sisters ∘ Standard Detail**	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	TYPICAL STREET SECTIONS	APPROVED BY: PB	2-3
		REVISION DATE: 12/03/2013	

RESIDENTIAL LOCAL STREET WITH PARKING ON ONE SIDE



RESIDENTIAL LOCAL STREET WITH PARKING ON BOTH SIDES



NOTES FOR RESIDENTIAL LOCAL STREET WITH PARKING ON ONE SIDE:

1. STREETS THAT ALLOW PARKING ON ONE SIDE MAY ONLY BE USED IN LIMITED SITUATIONS, SUCH AS (1) ADJACENT TO A SCHOOL OR OTHER PUBLIC USE WHERE PARKING ON ONE SIDE IS INFEASIBLE OR UNDESIRABLE, OR (2) FOR LIMITED-LENGTH SPANS OF ONE BLOCK OR LESS ALONG ZONE BOUNDARIES (RESIDENTIAL/COMMERCIAL, RESIDENTIAL/INDUSTRIAL, RESIDENTIAL/PUBLIC FACILITY ZONES) IN SITUATIONS WHERE PARKING ON BOTH SIDES IS INFEASIBLE OR UNDESIRABLE.
2. IN ANY EVENT, STREETS THAT INCORPORATE PARKING LIMITED TO ONE SIDE OF THE STREET SHALL NOT HOWEVER BE USED IN PLACE OF STREETS THAT PROVIDE PARKING ON BOTH SIDES EXCEPT WHERE SUBSTANTIAL OFF-STREET PARKING IS AVAILABLE, AND AT THE DISCRETION OF THE PLANNING COMMISSION.

GENERAL NOTES:

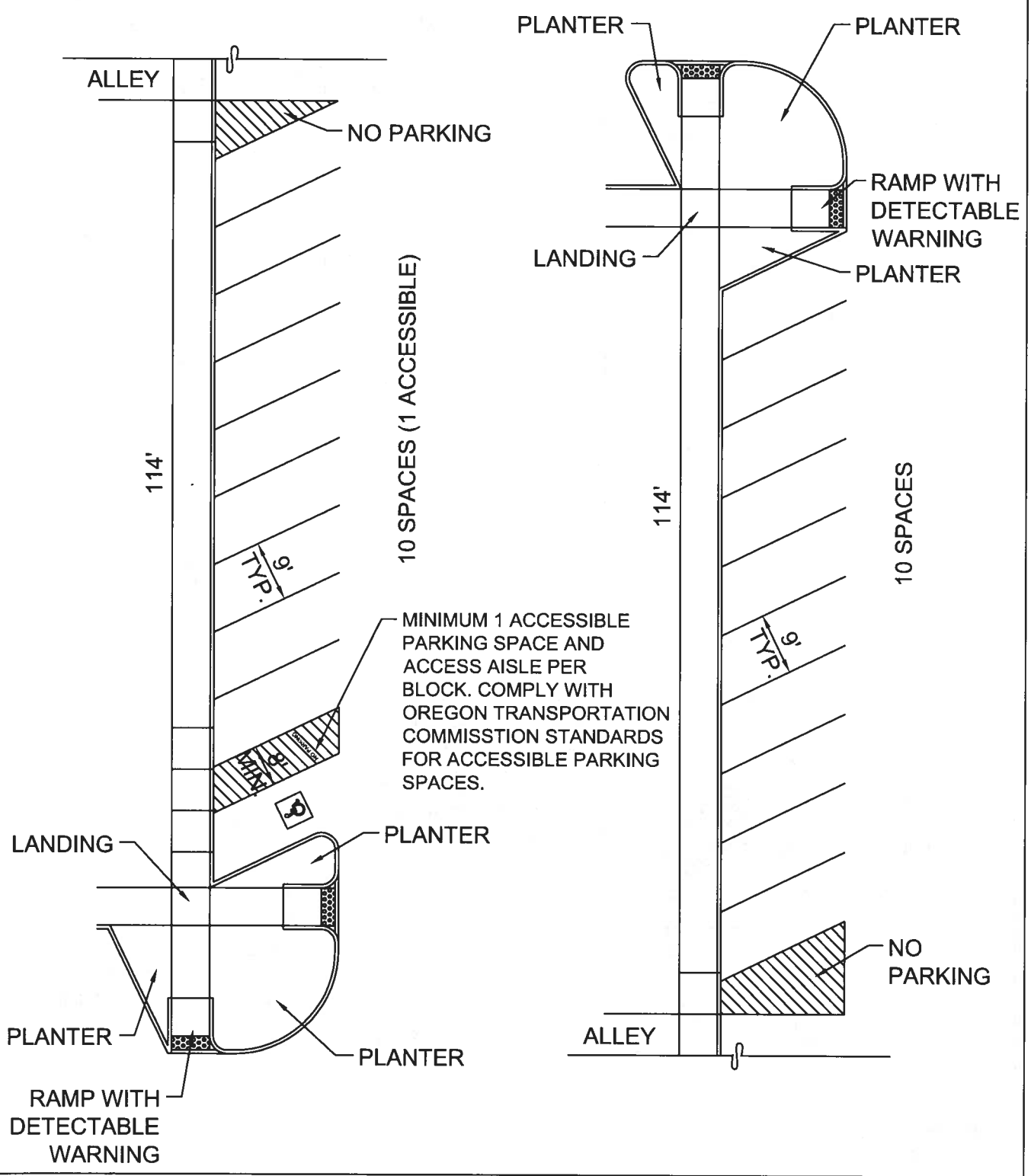
1. WHEN MULTI-USE PATHS ARE USED INSTEAD OF SIDEWALKS/PEDESTRIAN PATHS AND BIKE LANE, PATHS SHALL BE A MINIMUM OF 8 FEET WIDE (10 FEET IS DESIRED) WITH A MINIMUM 4-FOOT SEPARATION FROM THE ROADWAY.
2. BIKE LANES MAY BE REQUIRED ON NEIGHBORHOOD ROUTES, AS INDICATED BY THE BICYCLE MASTER PLAN.

* SIDEWALKS/PEDESTRIAN PATHS ON RESIDENTIAL LOCAL STREETS MAY BE LOCATED ON PRIVATE PROPERTY IN A "SIDEWALK PEDESTRIAN ACCESS EASEMENT."

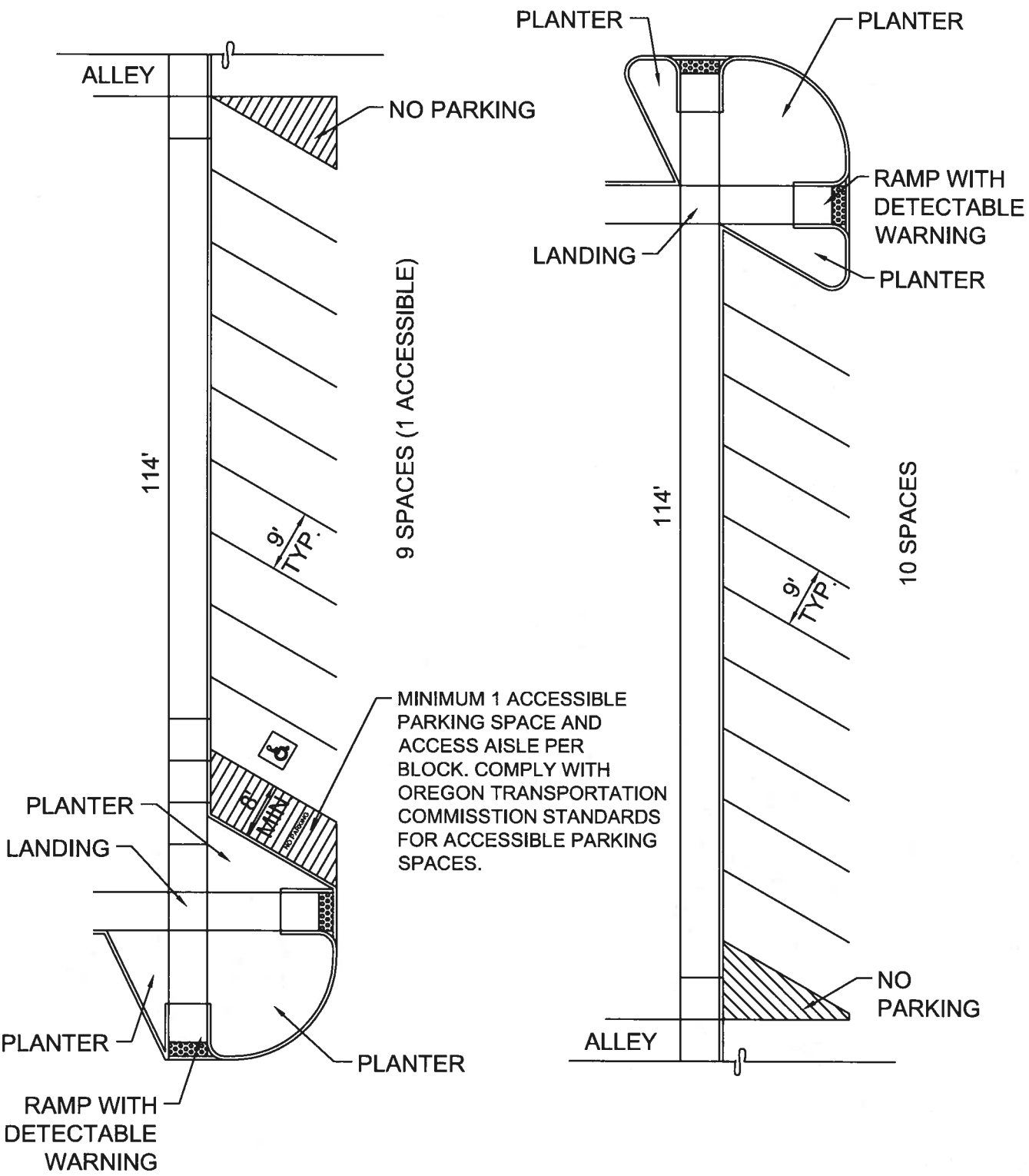
** ROADS LESS-THAN 1,000 FEET

P - On-street Parking Lane (except at intersections)

CITY OF SISTERS INCORPORATED 1946	**City of Sisters ◦ Standard Detail**	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	TYPICAL STREET SECTIONS	APPROVED BY: PB	2-4
		REVISION DATE: 12/03/2013	



	City of Sisters ◦ Standard Detail	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	DIAGONAL PARKING BLOCK LAYOUT	APPROVED BY: PB	2-5
		REVISION DATE: 12/03/2013	

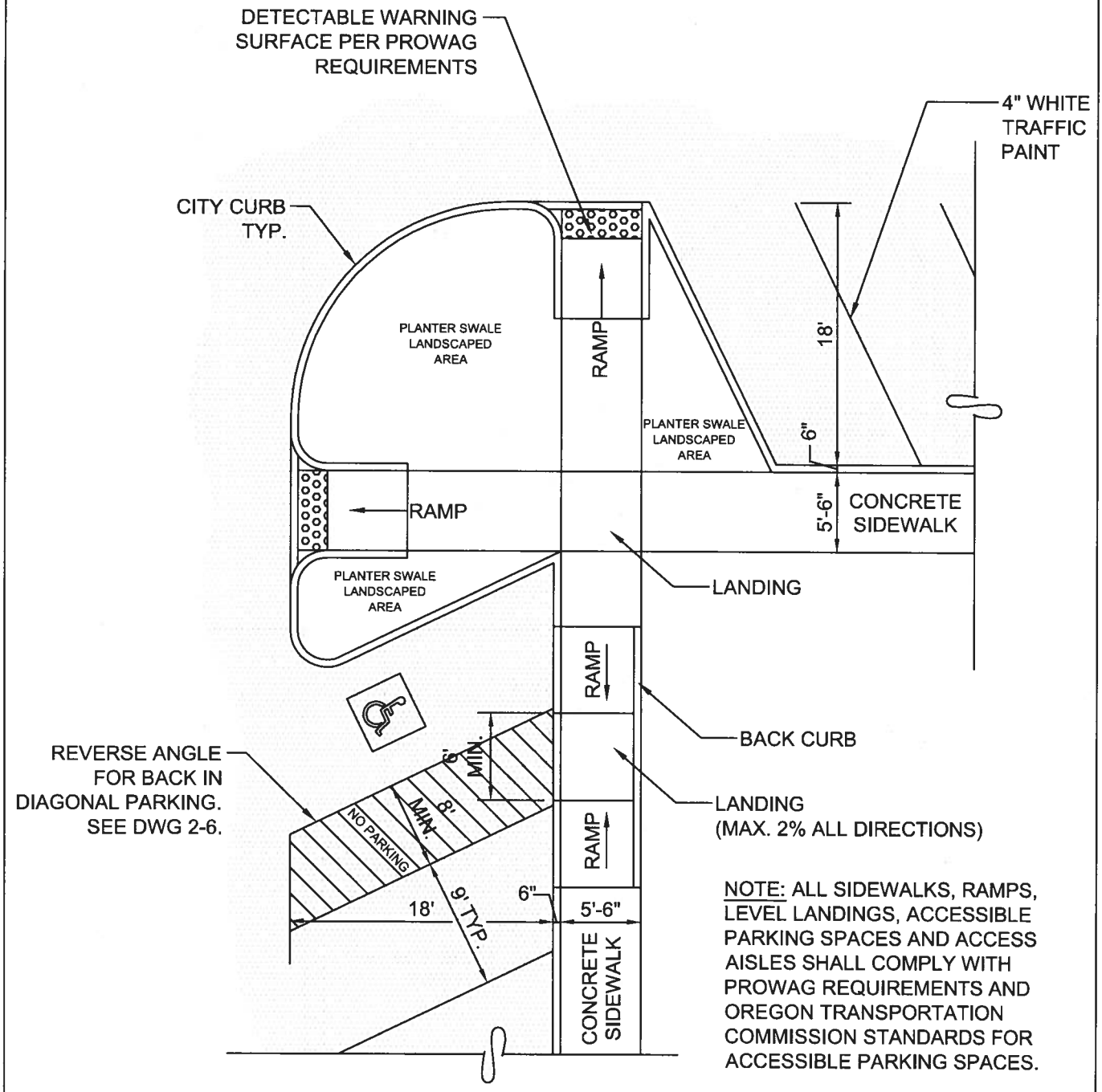


City of Sisters ◦ Standard Detail

BACK IN DIAGONAL PARKING
BLOCK LAYOUT

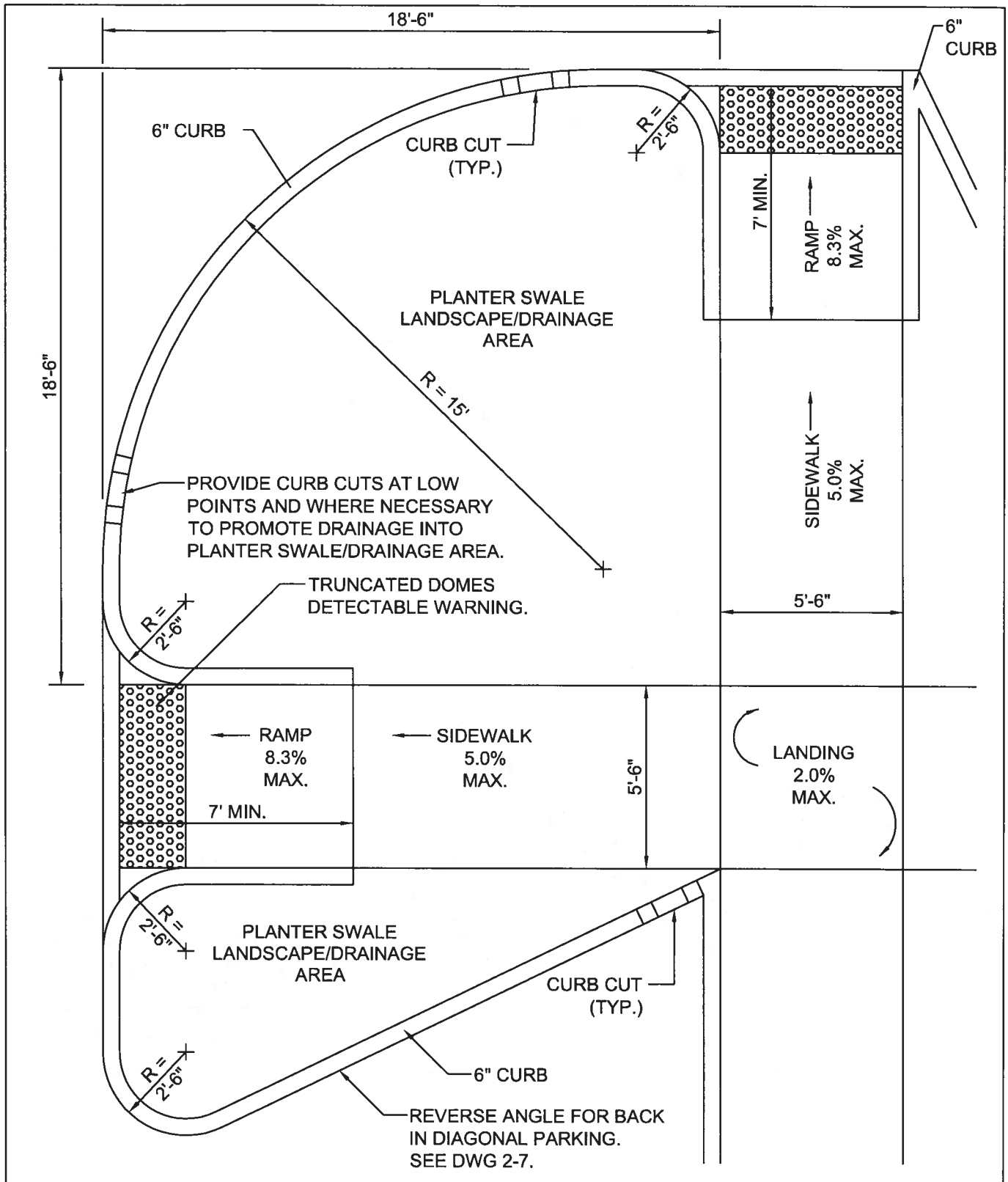
SCALE:	NONE
DRAWN BY:	EH
APPROVED BY:	PB
REVISION DATE:	12/03/2013

DRAWING NO. 2-6



NOTE: ALL SIDEWALKS, RAMPS, LEVEL LANDINGS, ACCESSIBLE PARKING SPACES AND ACCESS AISLES SHALL COMPLY WITH PROWAG REQUIREMENTS AND OREGON TRANSPORTATION COMMISSION STANDARDS FOR ACCESSIBLE PARKING SPACES.

City of Sisters ◦ Standard Detail	SCALE: NONE	DRAWING NO. 2-7
	DRAWN BY: EH	
DIAGONAL PARKING CORNER LAYOUT	APPROVED BY: PB	
	REVISION DATE: 12/03/2013	

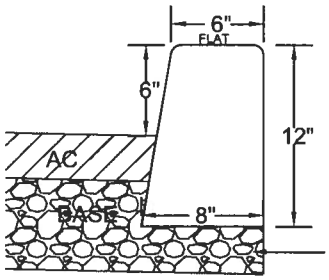


City of Sisters ◦ Standard Detail

DIAGONAL PARKING
CORNER DETAIL

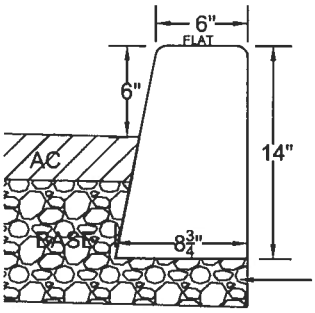
SCALE:	NONE
DRAWN BY:	EH
APPROVED BY:	PB
REVISION DATE:	12/03/2013

DRAWING NO. 2-8



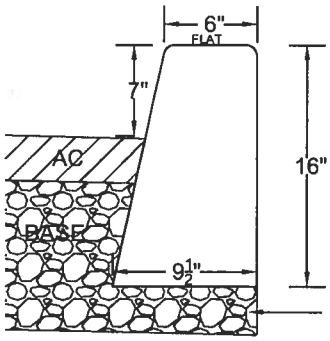
MINIMUM 2" OF BASE UNDER CURB

12" - TYPE I
LOCAL STREETS



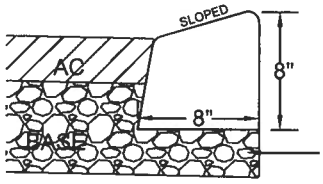
MINIMUM 2" OF BASE UNDER CURB

14" - TYPE II
NEIGHBORHOOD ROUTE AND COLLECTOR STREETS



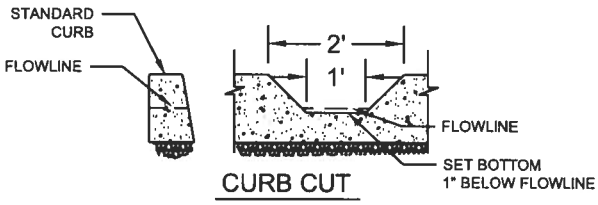
MINIMUM 2" OF BASE UNDER CURB

16" - TYPE III
ARTERIAL STREETS



MINIMUM 2" OF BASE UNDER CURB

ROLLED CURB
USED ONLY WITH CITY ENGINEER APPROVAL



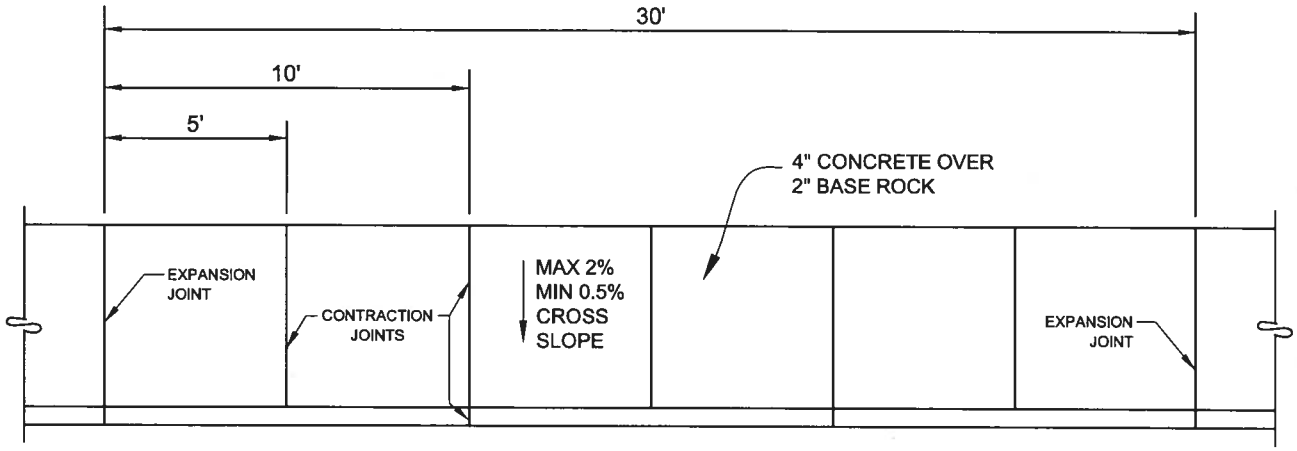
CURB CUT

CITY STANDARD CURBS

NOTES:

1. CONCRETE SHALL BE CLASS 4000.
2. ROLLED CURBS USED ONLY AT CITY ENGINEERS DISCRETION.
3. EXPANSION JOINTS ARE REQUIRED AT:
   - A. A MAXIMUM SPACING OF 30 FEET.
   - B. AT EACH POINT OF TANGENCY.
   - C. AT THE TOP OF ALL ADA AND DRIVEWAY APRON FLARES.
   - D. AROUND ALL POLES, POSTS, BOXES AND OTHER FIXTURES THAT PROTRUDE THROUGH OR AGAINST THE CURB.
4. CONTROL JOINTS ARE TO BE CUT INTO THE WET CONCRETE A MINIMUM 1/3 OF THE DEPTH AND PLACED AT A MAXIMUM OF 10' APART.
5. BASE ROCK UNDER CURB SHALL BE A MINIMUM OF TWO INCHES DEEP OR DEEPER AS REQUIRED TO MATCH STREET SECTION.
6. DRIVEWAY APRON LIPS SHALL BE MINIMUM OF 1" TO A MAXIMUM OF 1 1/2" HEIGHT ABOVE ASPHALT AT GUTTER.
7. ADA LIPS SHALL BE FLUSH WITH ASPHALT PAVEMENT AT GUTTER.
8. ALL VISIBLE EDGES OF CURB SHALL HAVE A MAXIMUM 3/4" RADIUS FINISHED EDGE.
9. ALL VISIBLE SURFACES SHALL HAVE A LIGHT BROOM FINISH, PARALLEL WITH CURB.
10. WHERE CURB AND GUTTER IS CALLED OUT ON THE PLANS, BUT NO DETAIL IS PROVIDED, USE ODOT STANDARD DRAWING RD-700 WITH 18" GUTTER PAN SLOPED AT 4° AND 6" CURB EXPOSURE. FOR REPLACEMENT, MATCH EXISTING CURB AND GUTTER DIMENSION AND SLOPE.
11. ALL WATER AND SEWER SERVICE LOCATIONS SHALL BE MARKED ON THE SURFACE OF CURB USING A STAMPED IMPRESSION OF "W" OR "S".
12. CURB HEIGHTS SHALL BE AS FOLLOWS:
    - A. LOCAL STREETS - 12" - TYPE I
    - B. NEIGHBORHOOD ROUTE, COLLECTOR STREETS AND INDUSTRIAL ZONE - 14" - TYPE II
    - C. ARTERIAL STREETS - 16" - TYPE III

City of Sisters ◦ Standard Detail	SCALE: NONE	DRAWING NO.
	DRAWN BY: EH	
STANDARD PCC CURB AND GUTTER SECTION	APPROVED BY: PB	2-9
	REVISION DATE: 12/03/2013	



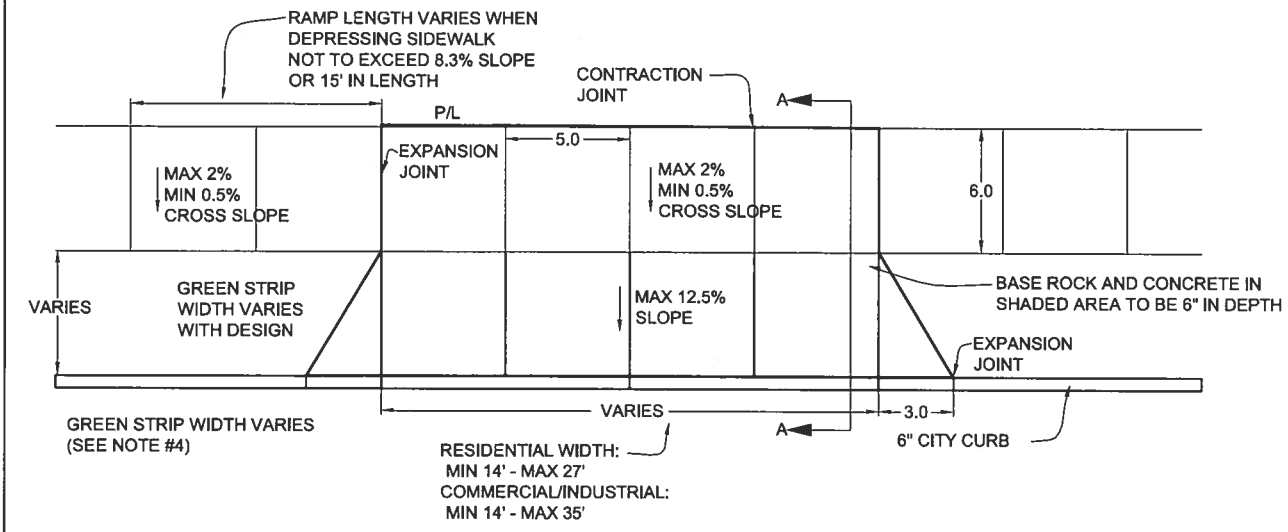
SIDEWALK: EXPANSION JOINTS AT 30'
CONTRACTION JOINTS AT 5'

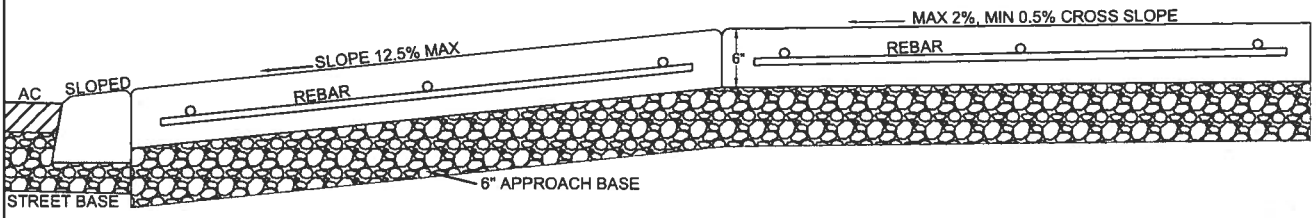
CURB: EXPANSION JOINTS AT 30'
CONTRACTION JOINTS AT 5'

CURB & SIDEWALK NOTES

1. CONCRETE FOR CURB AND SIDEWALK SHALL BE CLASS 4000 PSI.
2. SIDEWALK EXPANSION JOINTS ARE REQUIRED AT:
   A. A MAXIMUM SPACING OF 30 FEET.
   B. AROUND ALL POLES, POSTS, BOXES AND OTHER FIXTURES THAT PROTRUDE THROUGH OR AGAINST THE SIDEWALK.
3. CURB EXPANSION JOINTS ARE REQUIRED AT:
   A. A MAXIMUM SPACING OF 30 FEET.
   B. AT EACH POINT OF TANGENCY.
   C. AT THE TOP OF ALL ADA AND DRIVEWAY APRON FLARES.
   D. AROUND ALL POLES, POSTS, BOXES AND OTHER FIXTURES THAT PROTRUDE THROUGH OR AGAINST THE CURB.
4. CONCRETE SIDEWALK SHALL BE A MINIMUM OF FOUR INCHES DEEP.
5. BASE ROCK BENEATH SIDEWALK SHALL BE A MINIMUM OF TWO INCHES DEEP.
6. SIDEWALK CROSS SLOPE SHALL BE MAXIMUM OF 2% AND A MINIMUM OF 0.5%
7. BASE ROCK UNDER THE SIDEWALK SHALL BE COMPACTED TO 95% OF AASHTO T-99.
8. BASE ROCK UNDER THE CURB SHALL BE COMPACTED TO 95% OF AASHTO T-99.
9. ALL VISIBLE EDGES SHALL HAVE A MAXIMUM 3/4" RADIUS FINISHED EDGE.
10. THE SIDEWALK SURFACE SHALL HAVE A LIGHT BROOM FINISH PERPENDICULAR TO CURB.

CITY OF SISTERS INCORPORATED 1946	**City of Sisters ◦ Standard Detail**	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	EXPANSION AND CONTRACTION JOINT DETAIL	APPROVED BY: PB	2-10
		REVISION DATE: 12/03/2013	





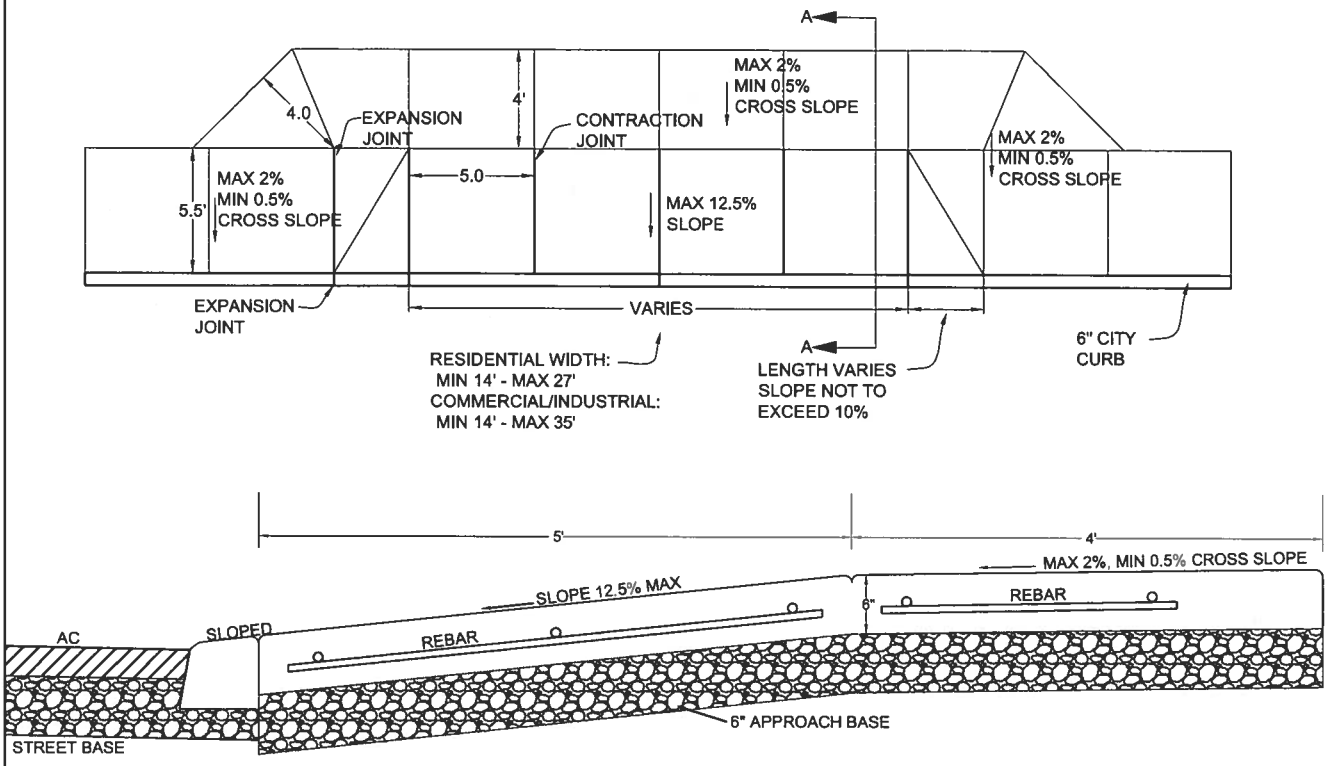
CROSS SECTION A-A

STANDARD DRIVEWAY APPROACH

NOTES:

1. CONCRETE SHALL BE CLASS 4000 PSI.
2. CONCRETE SHALL BE A MINIMUM OF SIX INCHES DEEP IN THE APPROACH AND THAT PORTION OF THE SIDEWALK ADJACENT TO THE APPROACH.
3. EXPANSION JOINTS ARE REQUIRED ON BOTH SIDES OF DRIVEWAY APPROACH WHERE THE TOP OF THE FLARE/WING MEETS THE SIDEWALK.
4. WHEN THE GREEN STRIP IS 2 FEET OR LESS IN WIDTH, DEPRESS THE SIDEWALK TO MAINTAIN APPROACH AT 12.5% SLOPE OR LESS. PROVIDE SIDEWALK RAMPS AT A SLOPE NOT TO EXCEED 8.3%.
5. THE FLARE/WINGS ARE A MINIMUM LENGTH OF 3' AT CURB.
6. THE BASE ROCK UNDER A DRIVEWAY APPROACH SHALL BE A MINIMUM OF SIX INCHES DEEP.
7. BASE ROCK SHALL BE COMPACTED TO 95% OF AASHTO T-99.
8. #4 REBAR SHALL BE USED IN ALL COMMERCIAL, INDUSTRIAL, ALLEY, AND MULTI-FAMILY DRIVEWAY APPROACHES. LONGITUDINAL AND TRANSVERSE BARS SHALL BE PLACED TWO FEET ON CENTER, TWO INCHES FROM BOTTOM AND THREE INCHES IN FROM EDGES.
9. DRIVEWAY APRON LIPS SHALL BE A MINIMUM OF ONE INCH TO A MAXIMUM ONE AND ONE HALF INCH IN HEIGHT ABOVE ASPHALT AT GUTTER.
10. ALL VISIBLE EDGES SHALL HAVE A MAXIMUM $\frac{3}{4}$" RADIUS FINISHED EDGE.
11. APPROACH SURFACES SHALL HAVE A MEDIUM BROOM FINISH PERPENDICULAR TO THE CURB.
12. CONTRACTION JOINTS SHALL BE PLACED AT A MAXIMUM OF FIVE FEET APART.

CITY OF SISTERS INCORPORATED 1946	**City of Sisters ○ Standard Detail**	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	TYPICAL CONCRETE DRIVEWAY APPROACH	APPROVED BY: PB	2-11
		REVISION DATE: 12/03/2013	



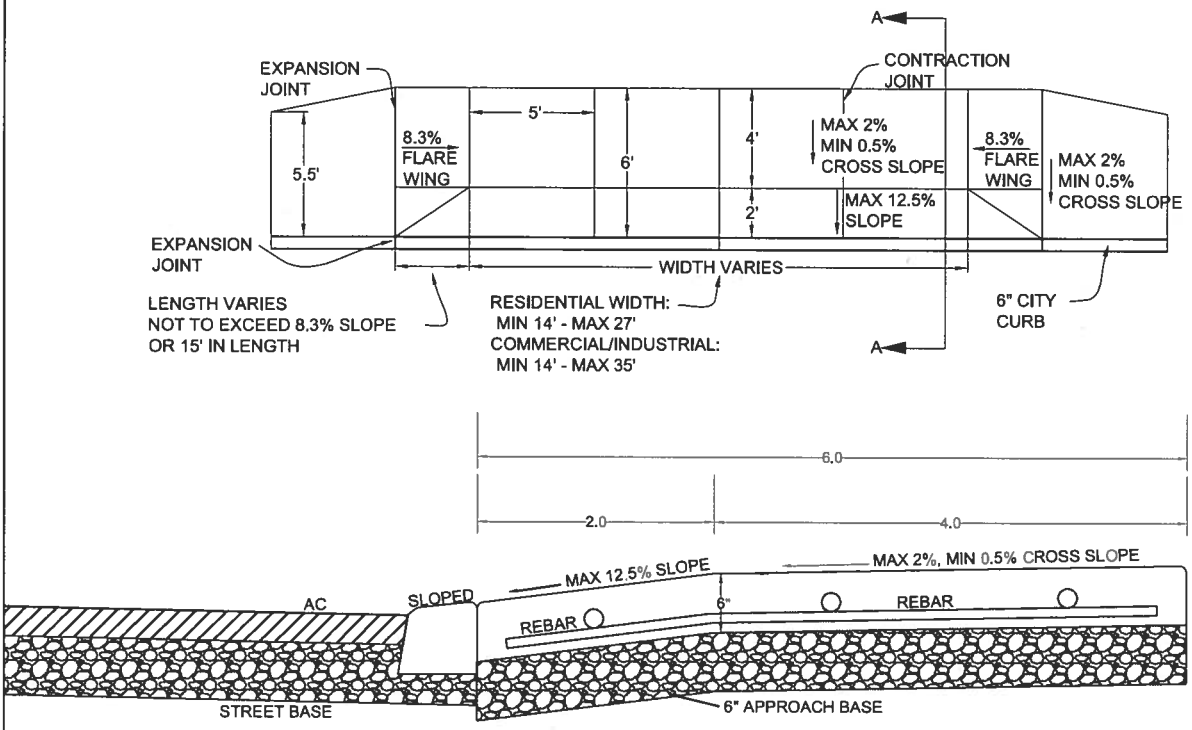
CROSS SECTION A-A

DRIVEWAY APPROACH OPTION A

NOTES:

1. CONCRETE SHALL BE CLASS 4000 PSI.
2. CONCRETE SHALL BE A MINIMUM OF SIX INCHES DEEP.
3. EXPANSION JOINTS ARE REQUIRED ON BOTH SIDES OF DRIVEWAY APPROACH WHERE THE TOP OF THE FLARE/WING MEETS THE SIDEWALK.
4. THE FLARE/WINGS SHALL NOT EXCEED 10% SLOPE.
5. THE ADA ACCESSIBILITY PATH PLACED BEHIND APPROACH RAMP SHALL BE 4 FEET IN WIDTH AND THE CROSS SLOPE SHALL NOT EXCEED 2%. THIS ADA ACCESSIBILTY PATH SHALL EXTEND BEYOND EITHER SIDE OF THE APPROACH TO INSURE THAT THE 2% CROSS SLOPE IS MAINTAINED THROUGHOUT.
6. THE BASE ROCK UNDER A DRIVEWAY APPROACH SHALL BE A MINIMUM OF SIX INCHES DEEP.
7. BASE ROCK SHALL BE COMPACTED TO 95% OF AASHTO T-99.
8. #4 REBAR SHALL BE USED IN ALL COMMERCIAL, INDUSTRIAL, ALLEY, AND MULTI-FAMILY DRIVEWAY APPROACHES. LONGITUDINAL AND TRANSVERSE BARS SHALL BE PLACED TWO FEET ON CENTER, TWO INCHES FROM BOTTOM AND THREE INCHES IN FROM EDGES.
9. DRIVEWAY APRON LIPS SHALL BE A MINIMUM OF ONE INCH TO A MAXIMUM ONE AND ONE HALF INCH IN HEIGHT ABOVE ASPHALT AT GUTTER.
10. ALL VISIBLE EDGES SHALL HAVE A MAXIMUM $\frac{3}{4}$" RADIUS FINISHED EDGE.
11. APPROACH SURFACES SHALL HAVE A MEDIUM BROOM FINISH PERPENDICULAR TO THE CURB.
12. CONTRACTION JOINTS SHALL BE PLACED AT A MAXIMUM OF FIVE FEET APART.

CITY OF SISTERS INCORPORATED 1946	**City of Sisters ◦ Standard Detail**	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	TYPICAL CONCRETE DRIVEWAY APPROACH OPTION A	APPROVED BY: PB	2-12
		REVISION DATE: 12/03/2013	



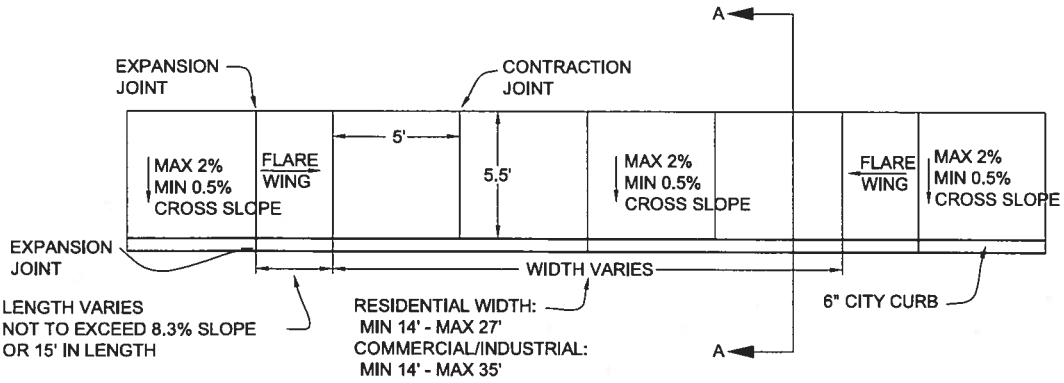
CROSS SECTION A-A

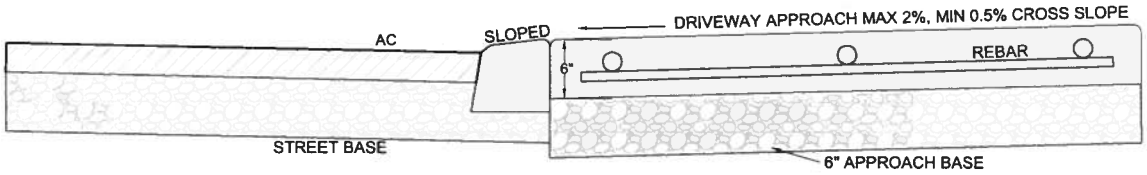
DRIVEWAY APPROACH OPTION B

NOTES:

1. CONCRETE SHALL BE CLASS 4000 PSI .
2. CONCRETE SHALL BE A MINIMUM OF SIX INCHES DEEP.
3. EXPANSION JOINTS ARE REQUIRED ON BOTH SIDES OF DRIVEWAY APPROACH WHERE THE TOP OF THE FLARE/WING MEETS THE SIDEWALK.
4. A MAXIMUM OF 12.5% SLOPE ON THE FIRST 2 FEET OF THE APPROACH.
5. A MAXIMUM OF 2% CROSS SLOPE ON THE BACK 4 FEET OF THE APPROACH.
6. THE FLARE/WINGS SHALL NOT EXCEED 8.3% IN RUNNING SLOPE. WHERE 8.3% SLOPE CAN NOT BE ACHEIVED BECAUSE OF STREET GRADE THEN THE RUNNING SLOPE WILL NOT EXCEED 15' IN LENGTH.
7. THE BASE ROCK UNDER A DRIVEWAY APPROACH SHALL BE A MINIMUM OF SIX INCHES DEEP.
8. BASE ROCK SHALL BE COMPACTED TO 95% OF AASHTO T-99.
9. #4 REBAR SHALL BE USED IN ALL COMMERCIAL, INDUSTRIAL, ALLEY, AND MULTI-FAMILY DRIVEWAY APPROACHES. LONGITUDINAL AND TRANSVERSE BARS SHALL BE PLACED TWO FEET ON CENTER, TWO INCHES FROM BOTTOM AND THREE INCHES IN FROM EDGES.
10. DRIVEWAY APRON LIPS SHALL BE A MINIMUM OF ONE INCH TO A MAXIMUM ONE AND ONE HALF INCH IN HEIGHT ABOVE ASPHALT AT GUTTER.
11. ALL VISIBLE EDGES SHALL HAVE A MAXIMUM $\frac{3}{4}$" RADIUS FINISHED EDGE.
12. APPROACH SURFACES SHALL HAVE A MEDIUM BROOM FINISH PERPENDICULAR TO THE CURB.
13. CONTROL JOINTS SHALL BE PLACED AT A MAXIMUM OF FIVE FEET APART.

CITY OF SISTERS INCORPORATED 1946	**City of Sisters ◦ Standard Detail**	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	TYPICAL CONCRETE DRIVEWAY APPROACH OPTION B	APPROVED BY: PB	2-13
		REVISION DATE: 12/03/2013	





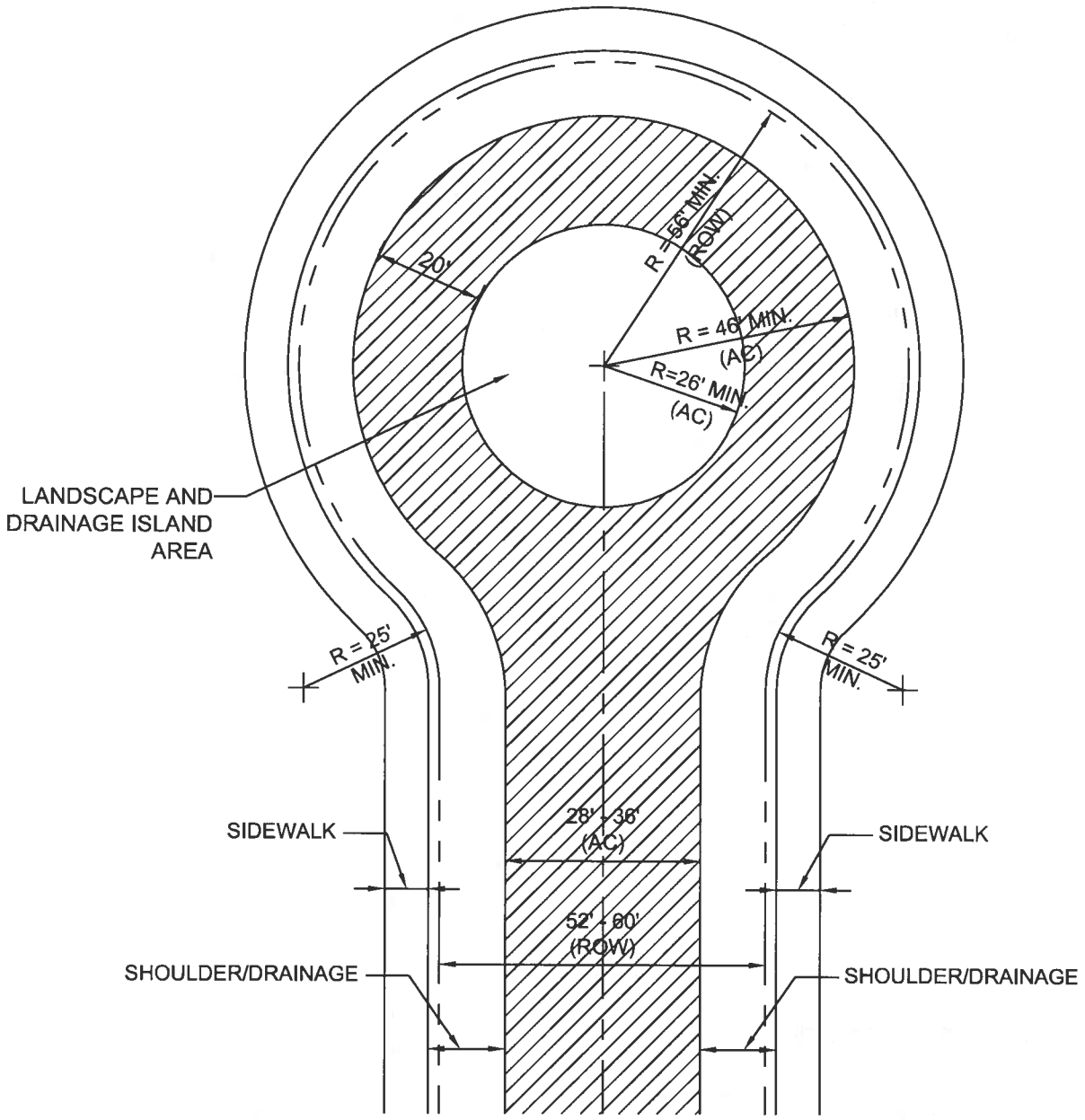
CROSS SECTION A-A

DRIVEWAY APPROACH OPTION C

NOTES:

1. CONCRETE SHALL BE CLASS 4000 PSI.
2. CONCRETE SHALL BE A MINIMUM OF SIX INCHES DEEP.
3. EXPANSION JOINTS ARE REQUIRED ON BOTH SIDES OF DRIVEWAY APPROACH WHERE THE TOP OF THE FLARE/WING MEETS THE SIDEWALK.
4. THE FLARE/WINGS SHALL NOT EXCEED 8.3% IN RUNNING SLOPE. WHERE 8.3% SLOPE CAN NOT BE ACHEIVED BECAUSE OF STREET GRADE THEN THE RUNNING SLOPE WILL NOT EXCEED 15' IN LENGTH.
5. THE BASE ROCK UNDER A DRIVEWAY APPROACH SHALL BE A MINIMUM OF SIX INCHES DEEP.
6. BASE ROCK SHALL BE COMPACTED TO 95% OF AASHTO T-99.
7. #4 REBAR SHALL BE USED IN ALL COMMERCIAL, INDUSTRIAL, ALLEY, AND MULTI-FAMILY DRIVEWAY APPROACHES. LONGITUDINAL AND TRANSVERSE BARS SHALL BE PLACED TWO FEET ON CENTER, TWO INCHES FROM BOTTOM AND THREE INCHES IN FROM EDGES.
8. DRIVEWAY APRON LIPS SHALL BE A MINIMUM OF ONE INCH TO A MAXIMUM ONE AND ONE HALF INCH IN HEIGHT ABOVE ASPHALT AT GUTTER.
9. ALL VISIBLE EDGES SHALL HAVE A MAXIMUM $\frac{3}{4}$" RADIUS FINISHED EDGE.
10. APPROACH SURFACES SHALL HAVE A MEDIUM BROOM FINISH PERPENDICULAR TO THE CURB.
11. CONTROL JOINTS SHALL BE PLACED AT A MAXIMUM OF FIVE FEET APART.

CITY OF SISTERS INCORPORATED 1946	**City of Sisters ◦ Standard Detail**	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	TYPICAL CONCRETE DRIVEWAY APPROACH OPTION C	APPROVED BY: PB	2-14
		REVISION DATE: 12/03/2013	

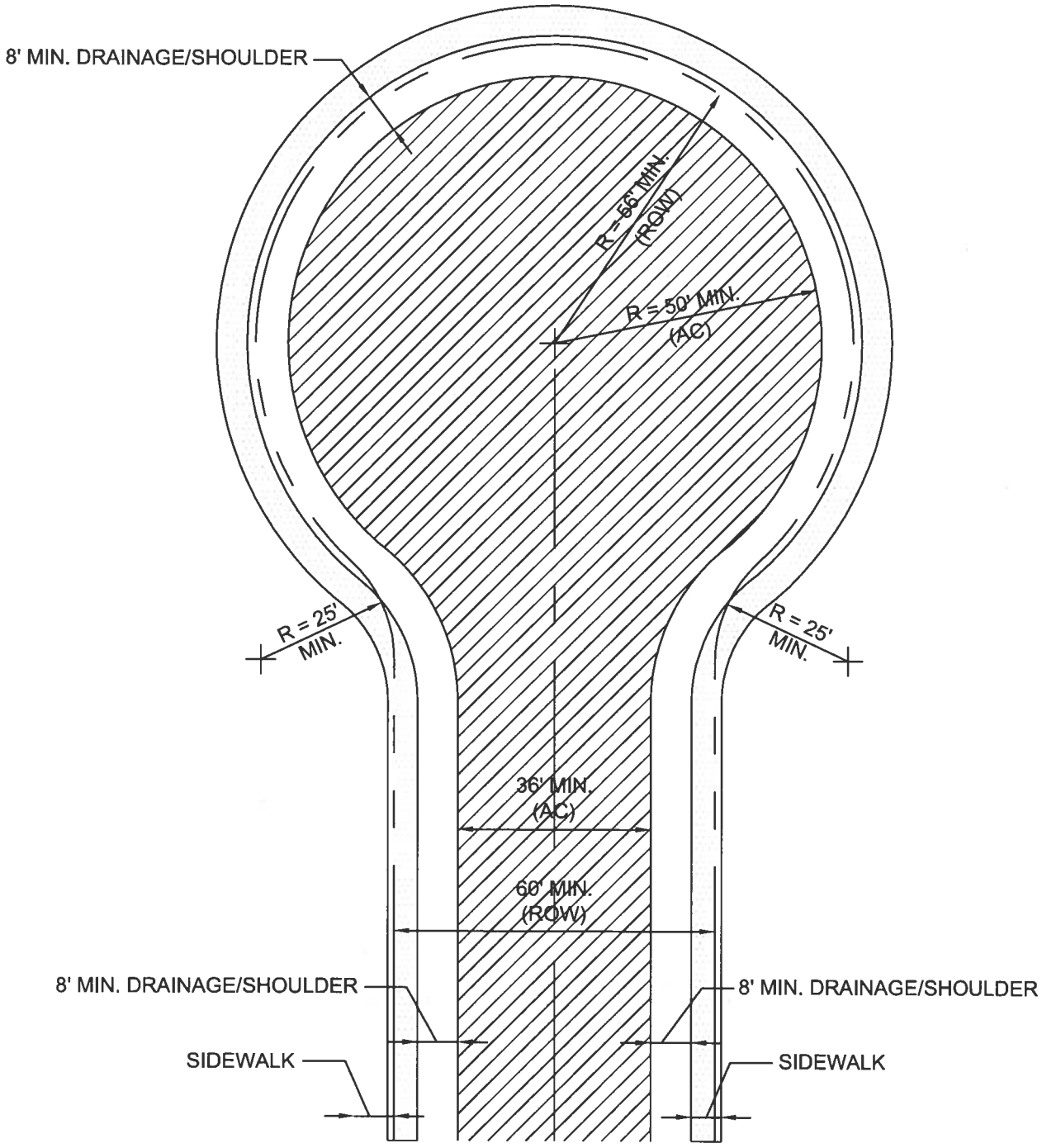


City of Sisters ◦ Standard Detail

RESIDENTIAL
CUL-DE-SAC

SCALE:	NONE
DRAWN BY:	EH
APPROVED BY:	PB
REVISION DATE:	12/03/2013

DRAWING NO. 2-15



	City of Sisters ◦ Standard Detail	SCALE: NONE	DRAWING NO.
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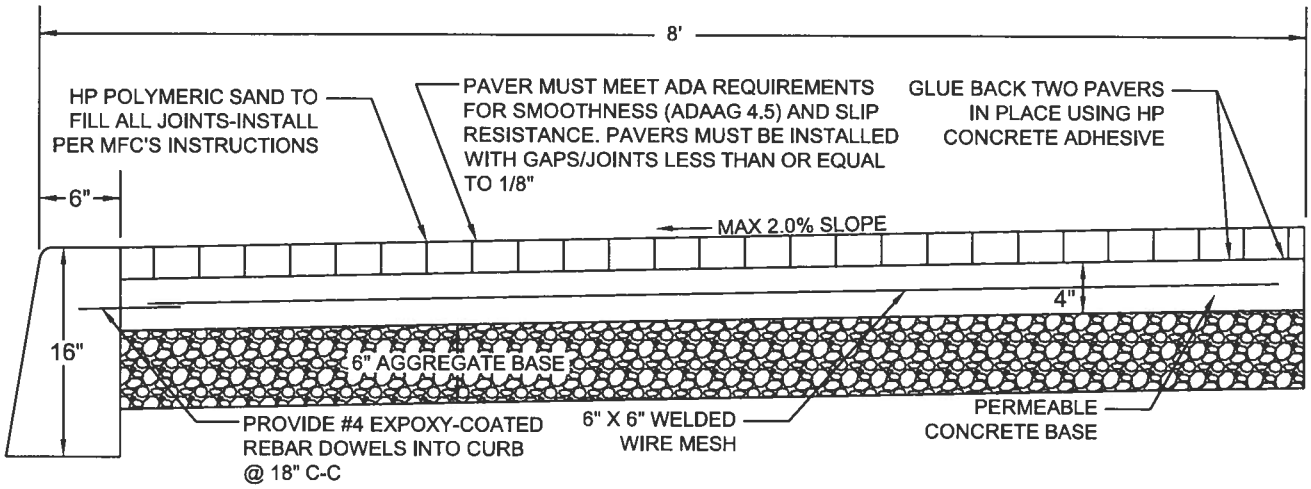
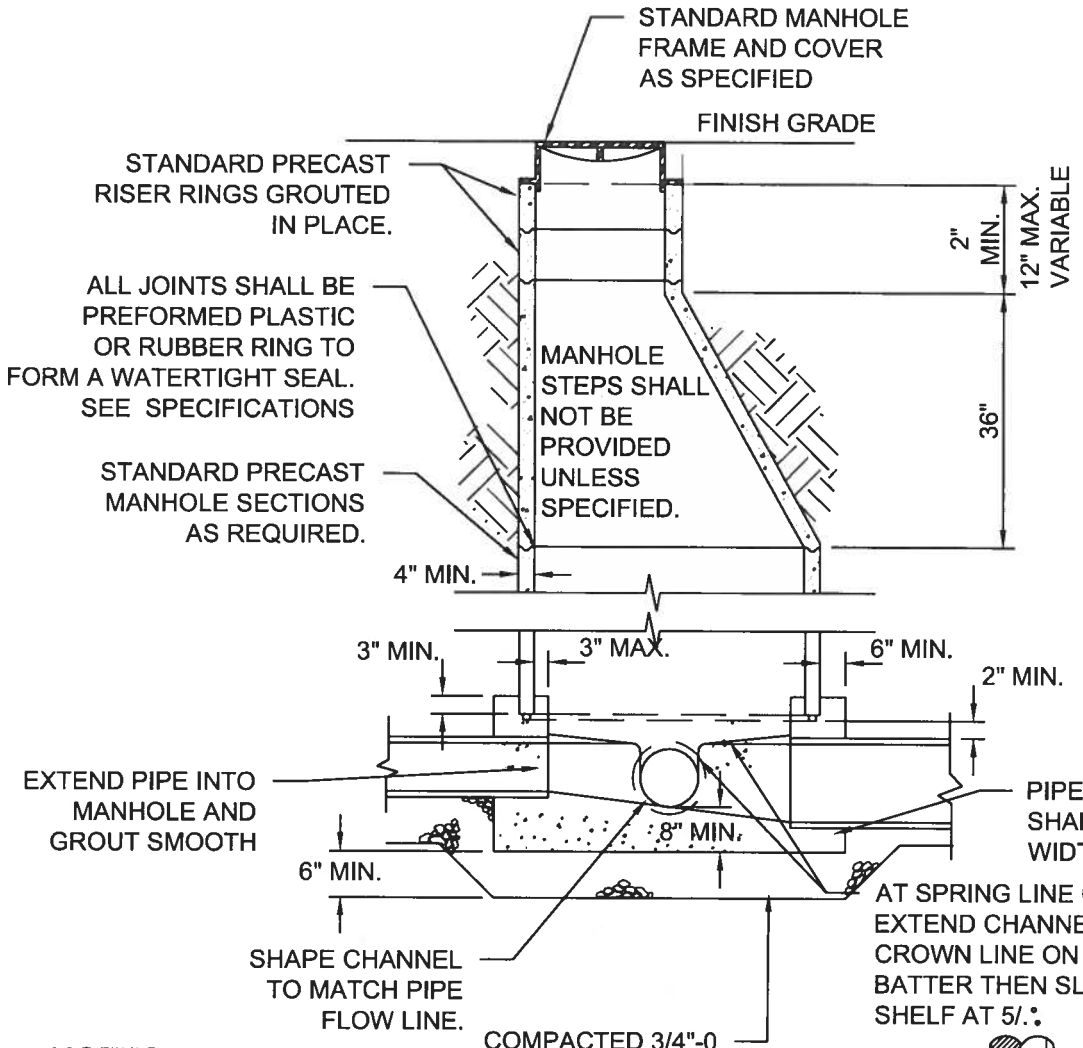
	COMMERCIAL/INDUSTRIAL	APPROVED BY: PB	2-16
	CUL-DE-SAC	REVISION DATE: 12/03/2013	

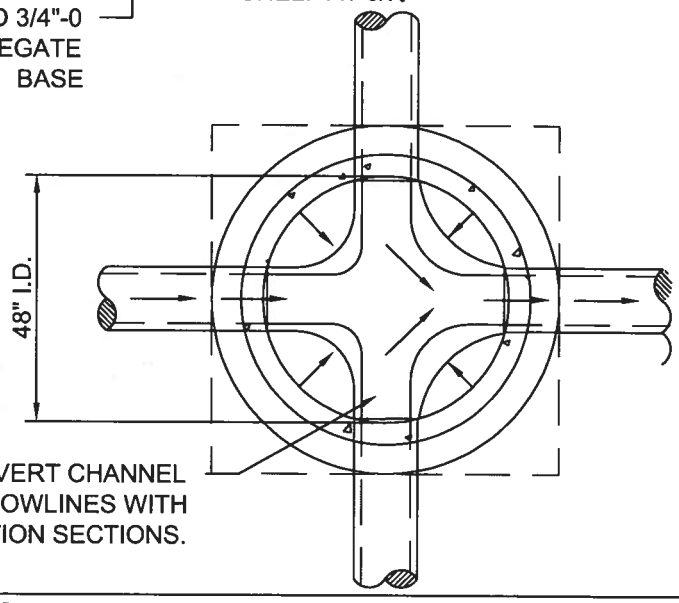


	City of Sisters ◦ Standard Detail	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	INTERLOCKING PAVER SIDEWALKS	APPROVED BY: PB	2-17
		REVISION DATE: 12/03/2013	

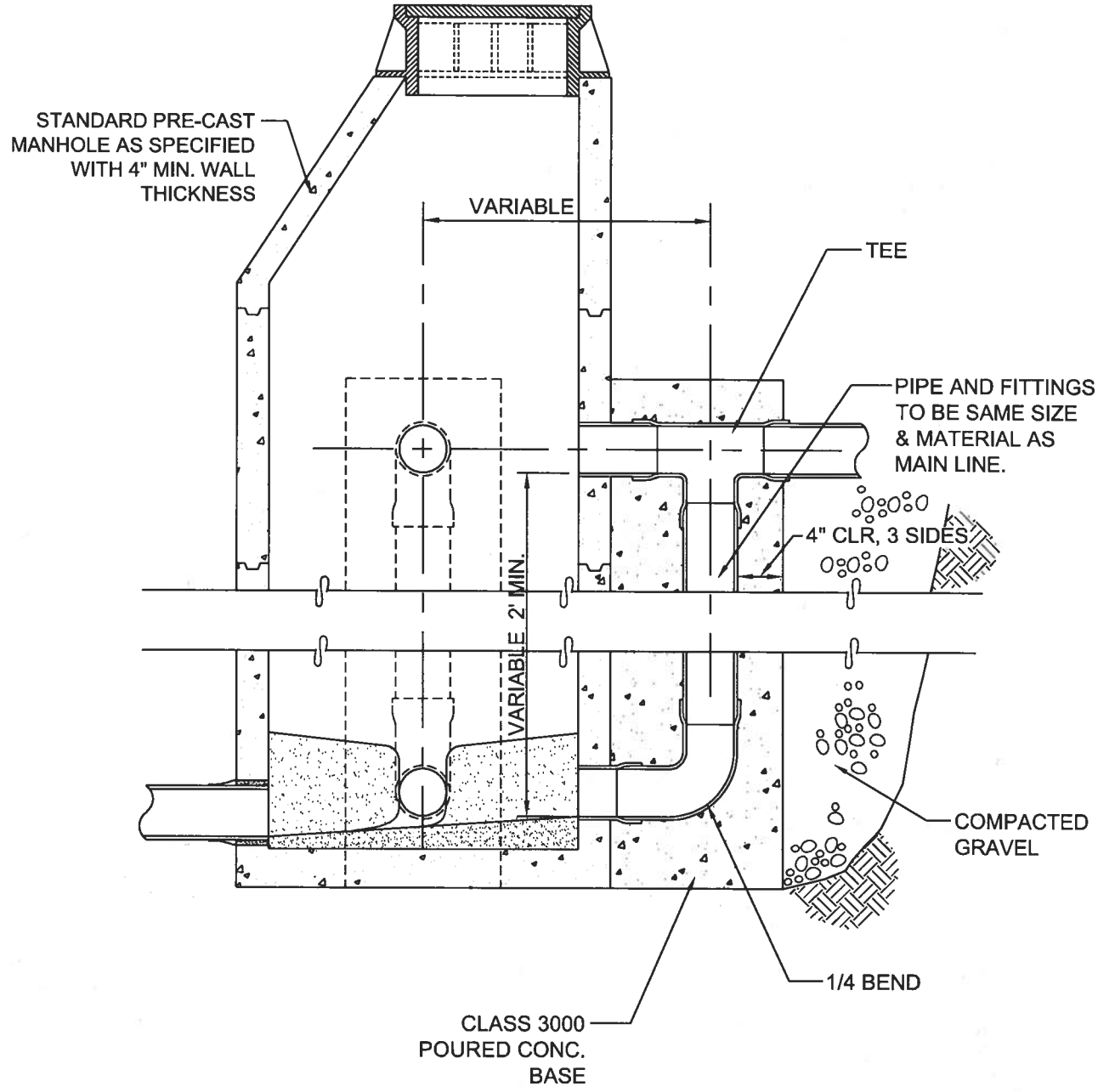


NOTES:

1. USE ECCENTRIC PRECAST CONE FOR ALL MANHOLES.
2. PIPE CONNECTIONS SHALL CONFORM WITH PUBLIC WORKS STANDARDS.
3. CONCRETE SHALL BE CLASS 3000.
4. CHANNELS SHALL BE CONSTRUCTED TO PROVIDE SMOOTH SLOPES AND RADII TO OUTLET PIPE.



	City of Sisters ◦ Standard Detail	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	STANDARD MANHOLE	APPROVED BY: PB	3-1
		REVISION DATE: 12/03/2013	

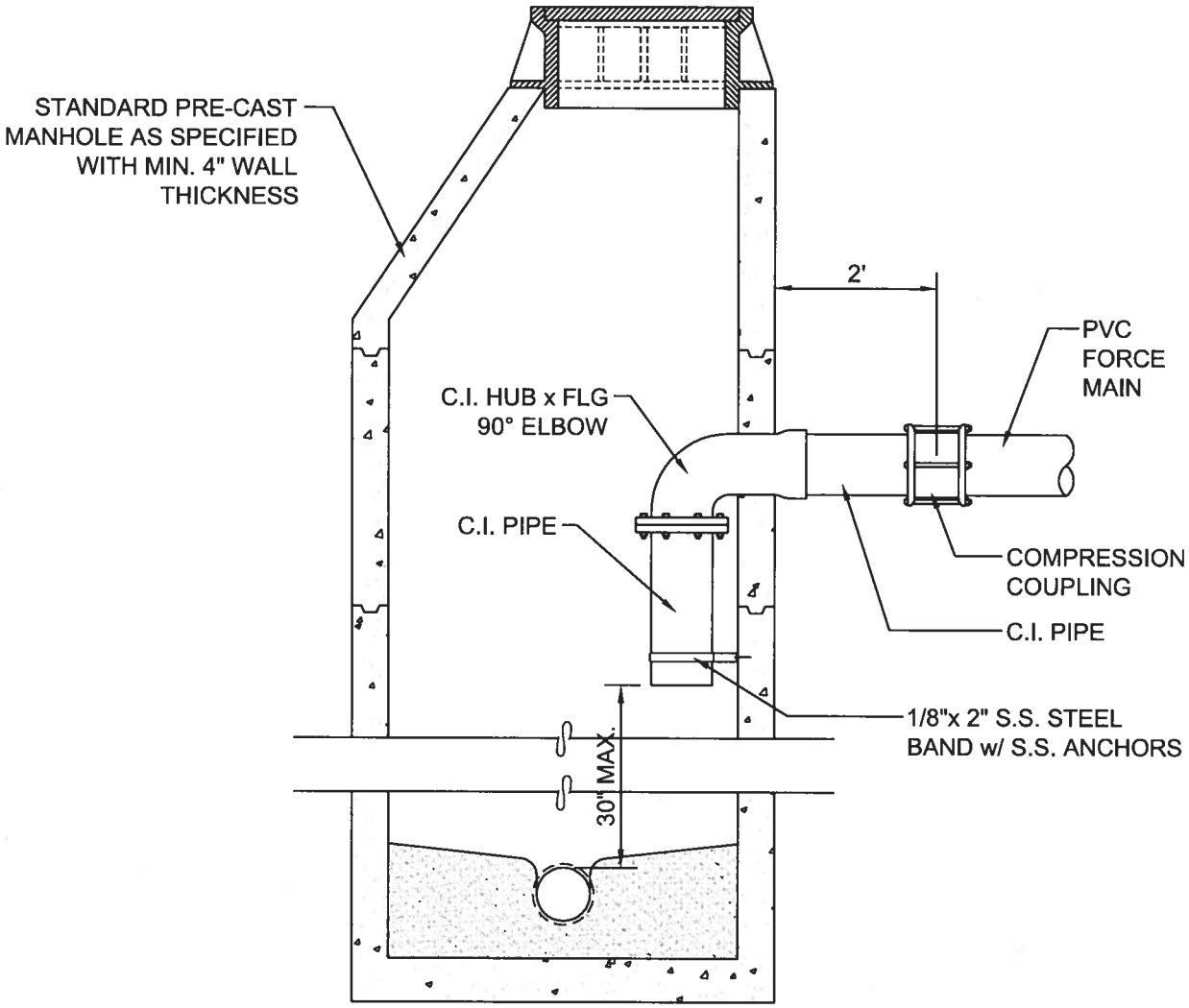


City of Sisters ◦ Standard Detail

DROP MANHOLE

SCALE:	NONE
DRAWN BY:	EH
APPROVED BY:	PB
REVISION DATE:	12/03/2013

DRAWING NO. 3-2

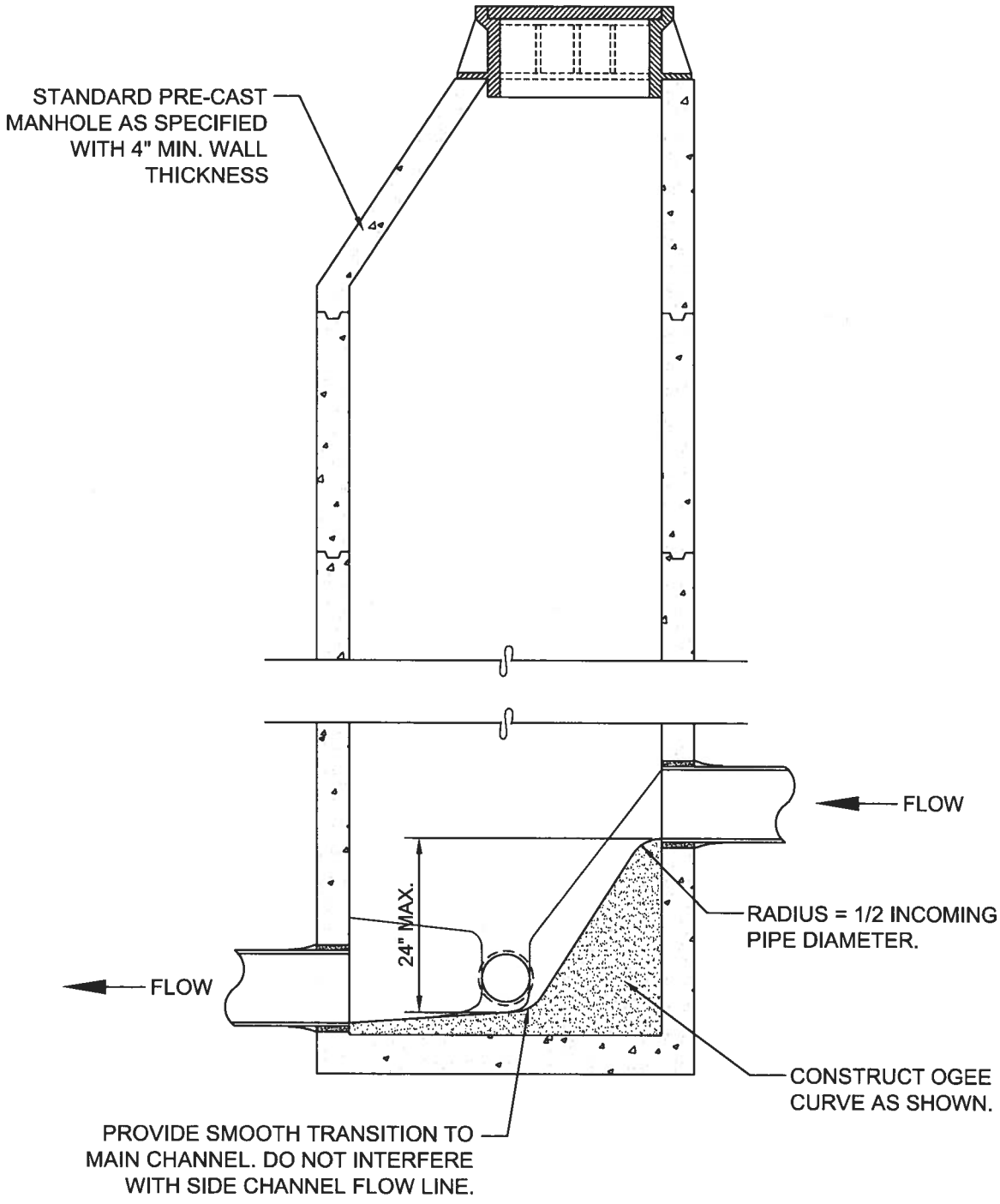


City of Sisters ◦ Standard Detail

SPECIAL DROP MANHOLE

SCALE:	NONE
DRAWN BY:	EH
APPROVED BY:	PB
REVISION DATE:	12/03/2013

DRAWING NO. 3-3

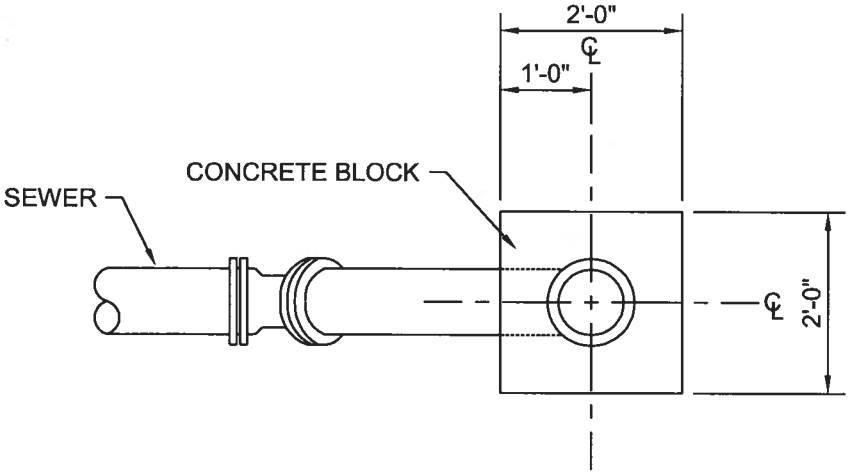


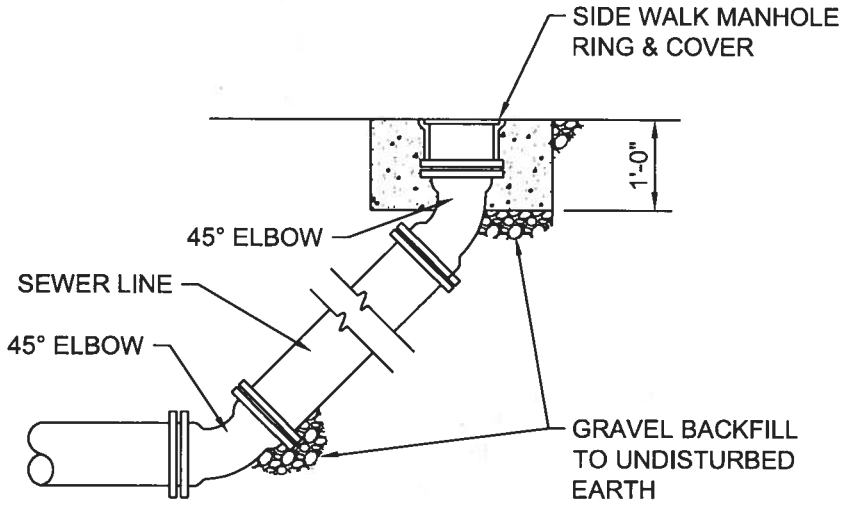
City of Sisters ◦ Standard Detail

INSIDE DROP MANHOLE

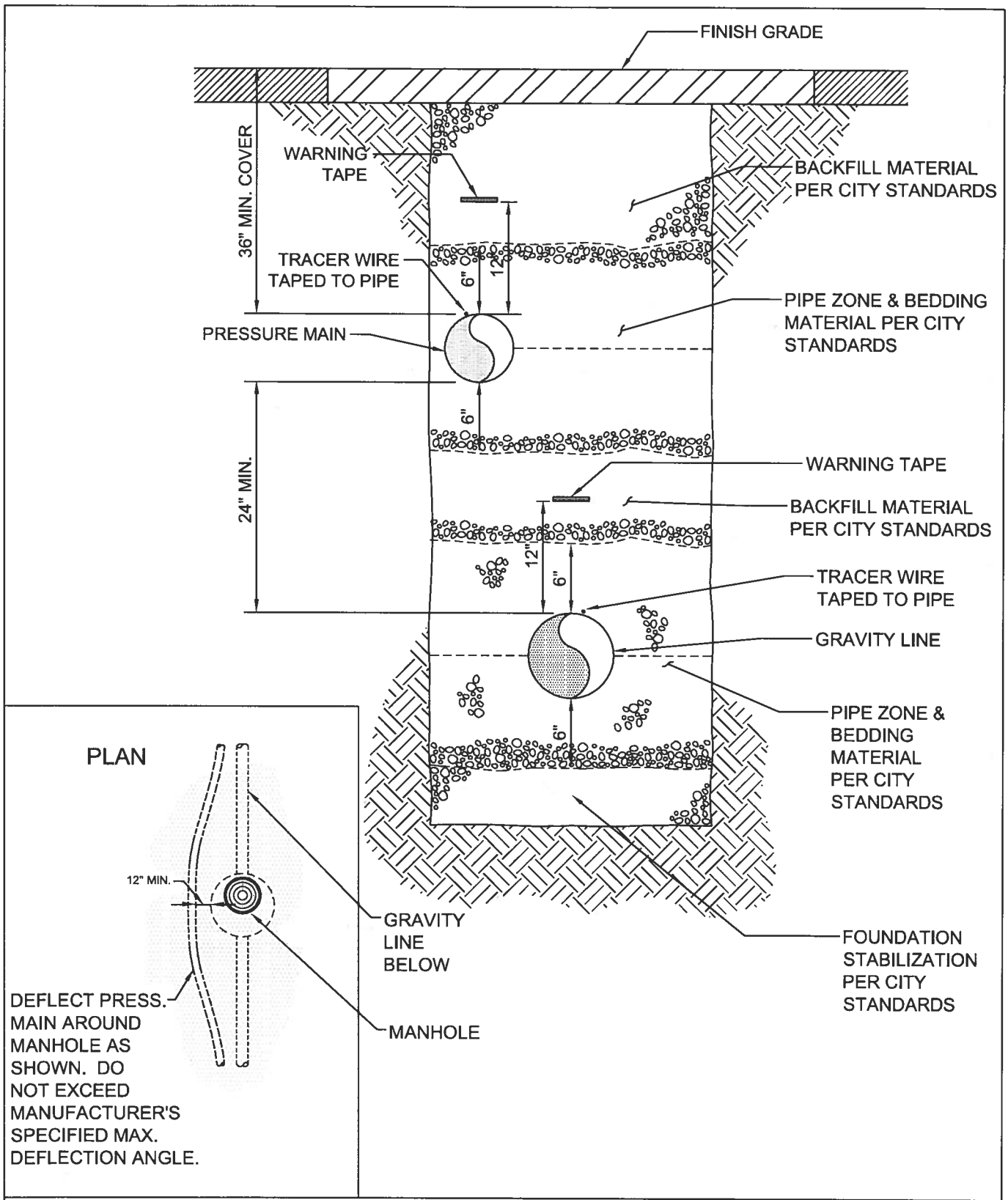
SCALE:	NONE
DRAWN BY:	EH
APPROVED BY:	PB
REVISION DATE:	12/03/2013

DRAWING NO. 3-4

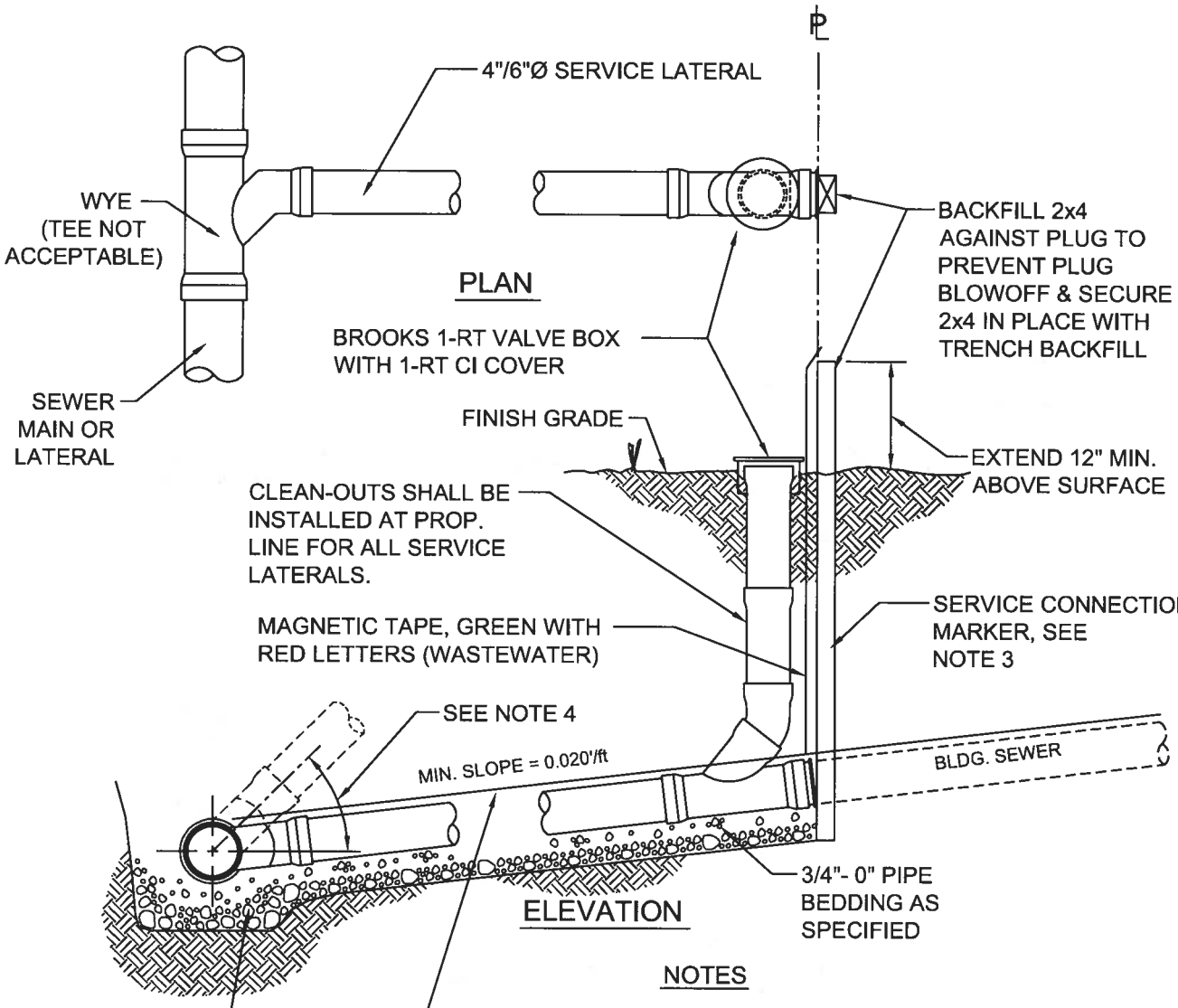




	City of Sisters ◦ Standard Detail	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	MAIN LINE	APPROVED BY: PB	3-5
	CLEANOUT	REVISION DATE: 12/03/2013	



	City of Sisters ◦ Standard Detail	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	COMMON SEWER LINE TRENCH	APPROVED BY: PB	3-6
		REVISION DATE: 12/03/2013	



NOTES

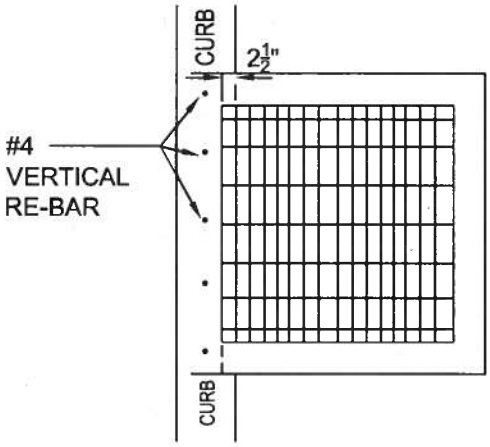
1.) PIPE AND FITTINGS SHALL BE COMPATIBLE. ONLY MANUFACTURED FITTINGS SHALL BE USED.

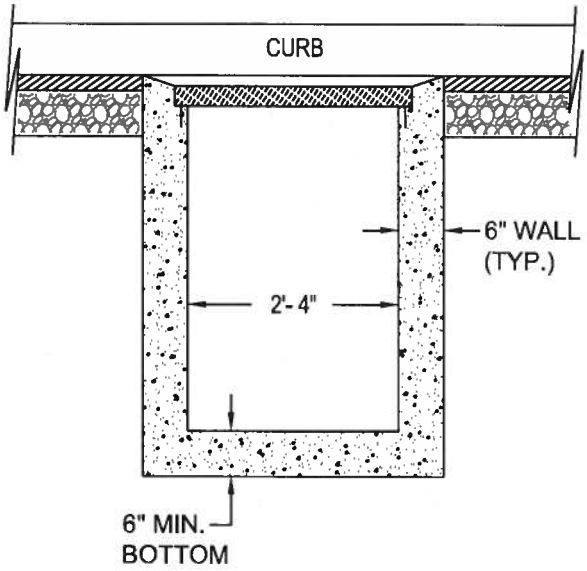
2.) MINIMUM DEPTH AT RIGHT-OF-WAY OR EASEMENT LINE SHALL BE 3 FEET.

3.) MARKER POSTS AND BLOCKING SHALL BE TREATED WOOD. P.T. D.F. 2"x 4" POST TO EXTEND 12" MIN. ABOVE FINISH GRADE AND EXPOSED AREA SHALL BE PAINTED WHITE.

4.) LAY SERVICE LATERAL AT MAX. 45° FROM HORIZONTAL TO ACHIEVE REQUIRED DEPTH AT PROPERTY LINE WHEN MINIMUM SLOPE RESULTS IN EXCESSIVE DEPTH.

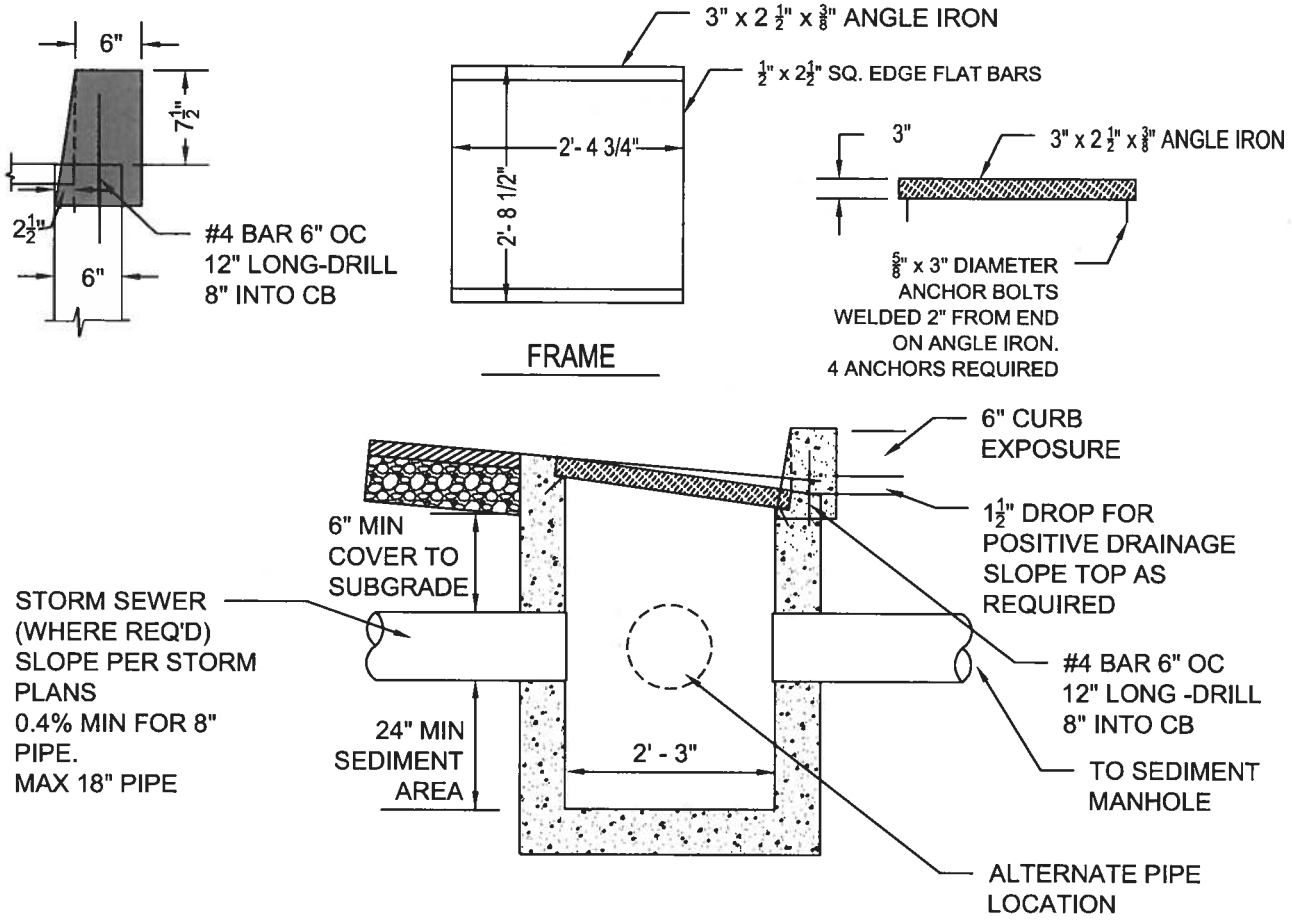
City of Sisters ◦ Standard Detail	SCALE: NONE	DRAWING NO.
	DRAWN BY: EH	
SERVICE LATERAL	APPROVED BY: pb	3-7
	REVISION DATE: 12/03/2013	





DETAIL SHOWING GRATE
ORIENTATION TO CURB LINE

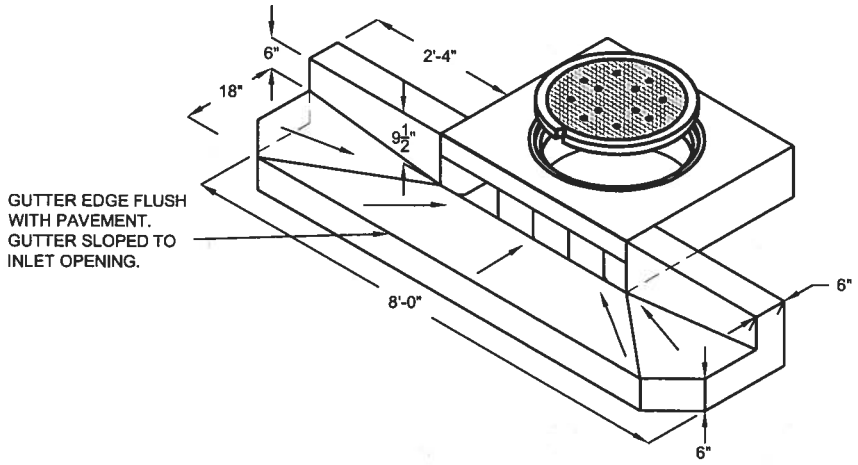
City of Sisters ◦ Standard Detail	SCALE: NONE	DRAWING NO. 3-8
	DRAWN BY: EH	
STANDARD CATCH BASIN DOUBLE & SINGLE	APPROVED BY: PB	
	REVISION DATE: 12/03/2013	

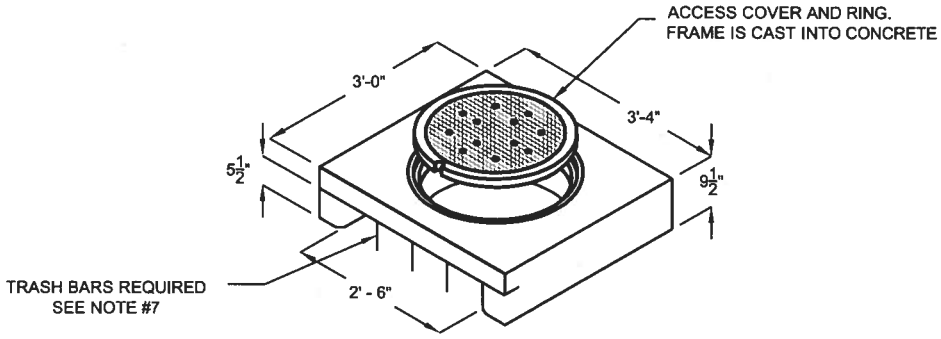


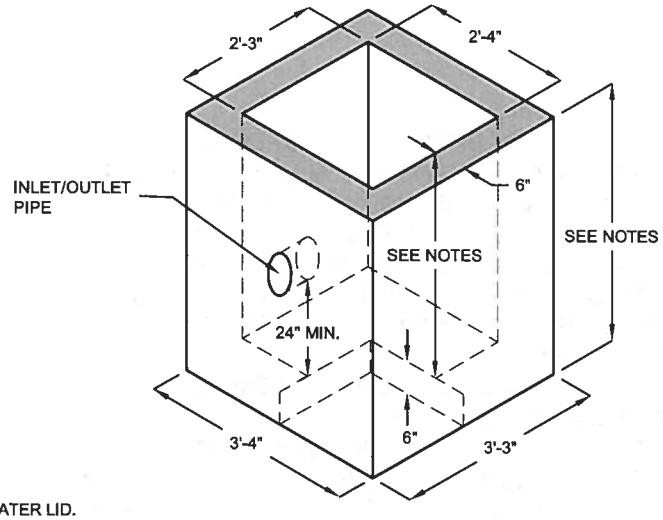
NOTES:

1. PRECAST CATCH BASNS ARE PREFERED. CAST IN-PLACE CATCH BASINS ARE ALLOWED WITH CITY ENGINEER APPROVAL ONLY. AS A CONDITION OF EXCEPTION TO THE PRE-CAST STANDARDS, INTERIOR AND EXTERIOR FORMS ARE REQUIRED TO ENSURE CATCH BASIN WALLS ARE UNIFORM 6" THICK WALLS.
2. BACKFILL TO BE COMPACTED TO 95% OF OPTIMUM AASHTO T-99.
3. WATER JETTING OF BACKFILL MATERIAL AROUND CATCH BASIN IS REQUIRED.
4. DURING CONSTRUCTION, FILTER MATERIAL, PLANKING, OR OTHER ACCEPTABLE MEANS SHALL BE USED TO COVER CATCH BASINS UNTIL PROJECT IS ACCEPTED.
5. CATCH BASIN FRAME AND GRATE TO BE RECESSED INTO CURB AS SHOWN.
6. GROUT ALL PIPES INSIDE AND OUTSIDE OF STRUCTURE.
7. INLET / OUTLET PIPE SHALL NOT PROTRUDE MORE THAN 1" INTO CATCHBASIN.

City of Sisters ◦ Standard Detail	SCALE: NONE	DRAWING NO. 3-9
	DRAWN BY: EH	
STANDARD CATCH BASIN DOUBLE & SINGLE	APPROVED BY: PB	
	REVISION DATE: 12/03/2013	



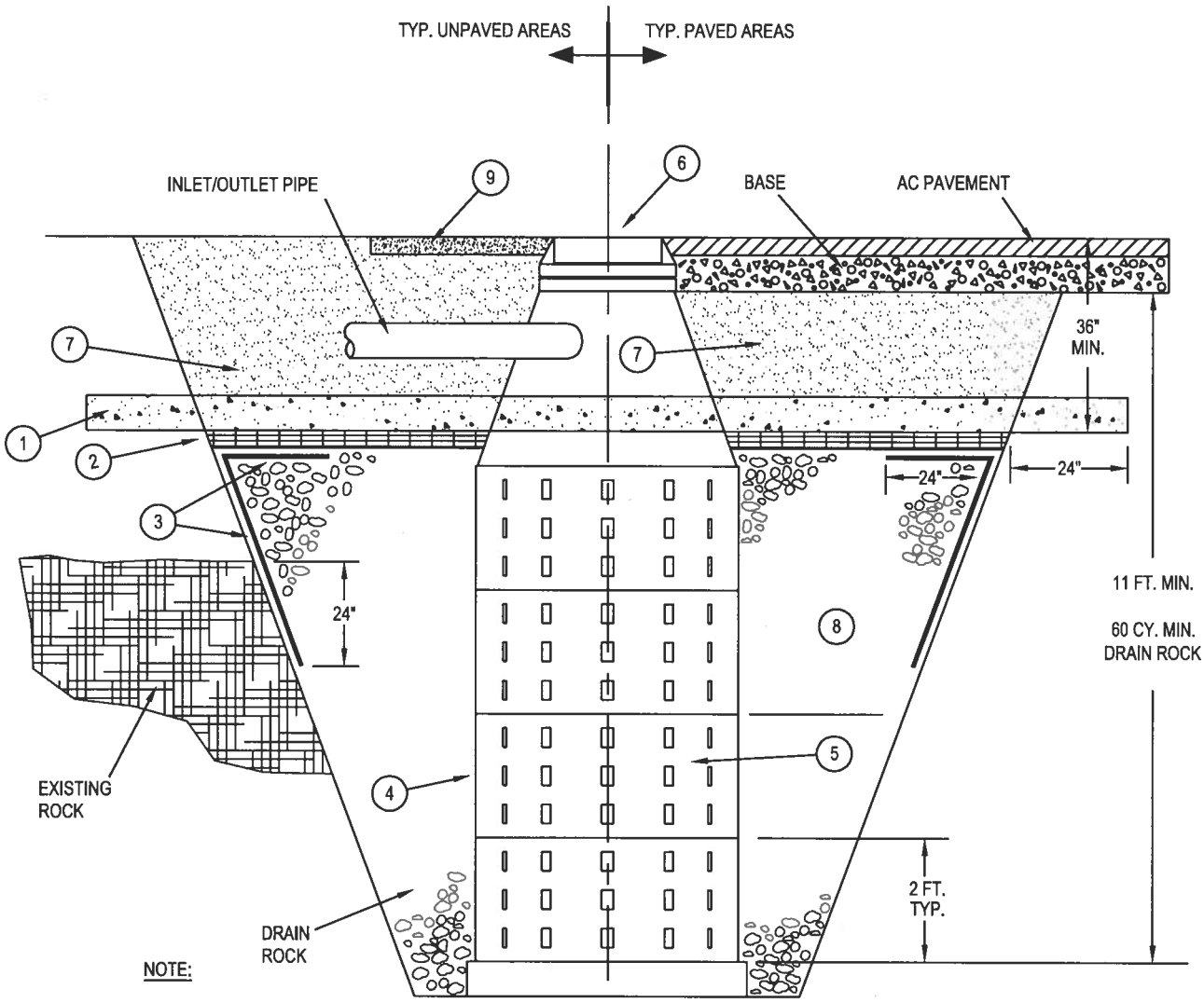




NOTES:

1. CURB INLET TOP IS PRECAST WITH STANDARD STORM WATER LID.
2. CURB INLET BASE PRECAST IS PREFERED. CAST-IN-PLACE ARE ALLOWED WITH CITY ENGINEER APPROVAL ONLY. AS A CONDITION OF EXCEPTION TO THE PRE-CAST STANDARDS, INTERIOR AND EXTERIOR FORMS ARE REQUIRED TOENSURE CATCH BASIN WALLS ARE UNIFORM 6" THICK WALLS.
3. CONCRETE SHALL BE CLASS 3000.
4. DEPTH OF VAULT IS 30" + PIPE DIAMETER + PAVING SECTION
5. DEPTH OF SUMP IS MINIMUM OF 24" MEASURED FROM INVERT OF PIPE.
6. INLET AND OUTLET PIPE OPENINGS TO BE GROUT SEALED
7. TRASH BARS MIN. 3/8" DIAMETER HOT DIPPED GALVANIZED STEEL.

CITY OF SISTERS INCORPORATED 1946	**City of Sisters ◦ Standard Detail**	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	CURB INLET CATCH BASIN	APPROVED BY: PB	3-10
		REVISION DATE: 12/03/2013	

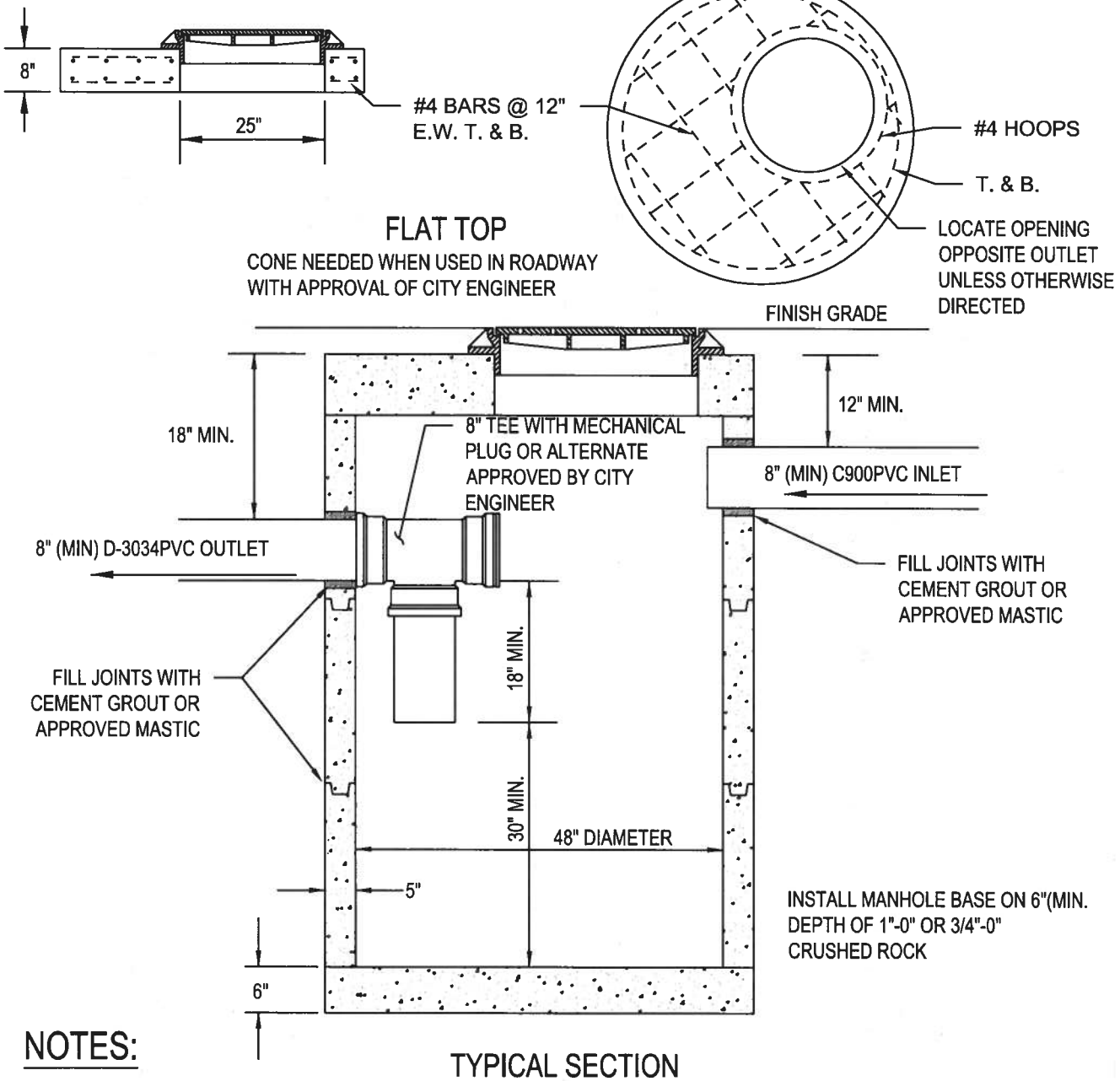


NOTE:

SEE ALSO THE CENTRAL OREGON STORMWATER MANUAL FOR DESIGN CRITERIA.

1. 6" CONCRETE CAP CL 3000, REQUIRED TO 24" BEYOND EXCAVATION.
2. MOISTURE BARRIER - 2 LAYERS OF 4 MIL. POLYETHYLENE ON ALL INSTALLATIONS.
3. GEOTEXTILE FILTER FABRIC ON ALL EARTH OR GRAVEL EXCAVATION TO 24" INTO ROCK. OVER LAP 24" WITH MOISTURE BARRIER.
4. LINE INSIDE OF PERFORATED BARREL WITH HEAVY WEIGHT VINYL SCREEN, SUCH AS "FULLFLOW VINYL SCREEN (a0706)". TOP AND BOTTOM OF SCREEN SHALL BE ATTACHED TO BARREL WALL. INLET PIPE SHALL BE EXTENDED THROUGH THE SCREEN.
5. PRECAST SECTIONS SHALL CONFORM TO THE REQUIREMENTS OF ASTM C-478. CONCRETE SHALL BE CL - 3300, AIR ENTRAINED CONCRETE.
6. CLASS "B" BACKFILL (1"-0 OR 3/4" - 0 CRUSHED ROCK) COMPACTED TO 95% OF AASHTO T-99.
7. DRAIN ROCK SHALL CONSIST OF CLEAN 6" - 2" HARD CINDER, RIVER ROCK, CRUSHED OR PIT RUN AGGREGATE CONTAINING LITTLE OR NO FINES.
8. WHEN DRYWELL IS LOCATED OUTSIDE OF PAVED AREAS, PROVIDE A 6" THICK CONCRETE PAD, 5' SQUARE CENTERED ON THE MANHOLE LID.
10. AN ADJUSTMENT SYSTEM SUCH AS EAST JORDAN IRON WORKS INFRA-RISER, OR APPROVED EQUAL, SHALL BE USED TO ADJUST MANHOLE FRAME AND COVER TO FINISH GRADE.
11. INLET / OUTLET PIPE SHALL NOT EXTEND INTO DRYWELL MORE THAN 2".

	City of Sisters ◦ Standard Detail	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	STANDARD	APPROVED BY: PB	3-11
	PRE-CAST DRYWELL	REVISION DATE: 12/03/2013	

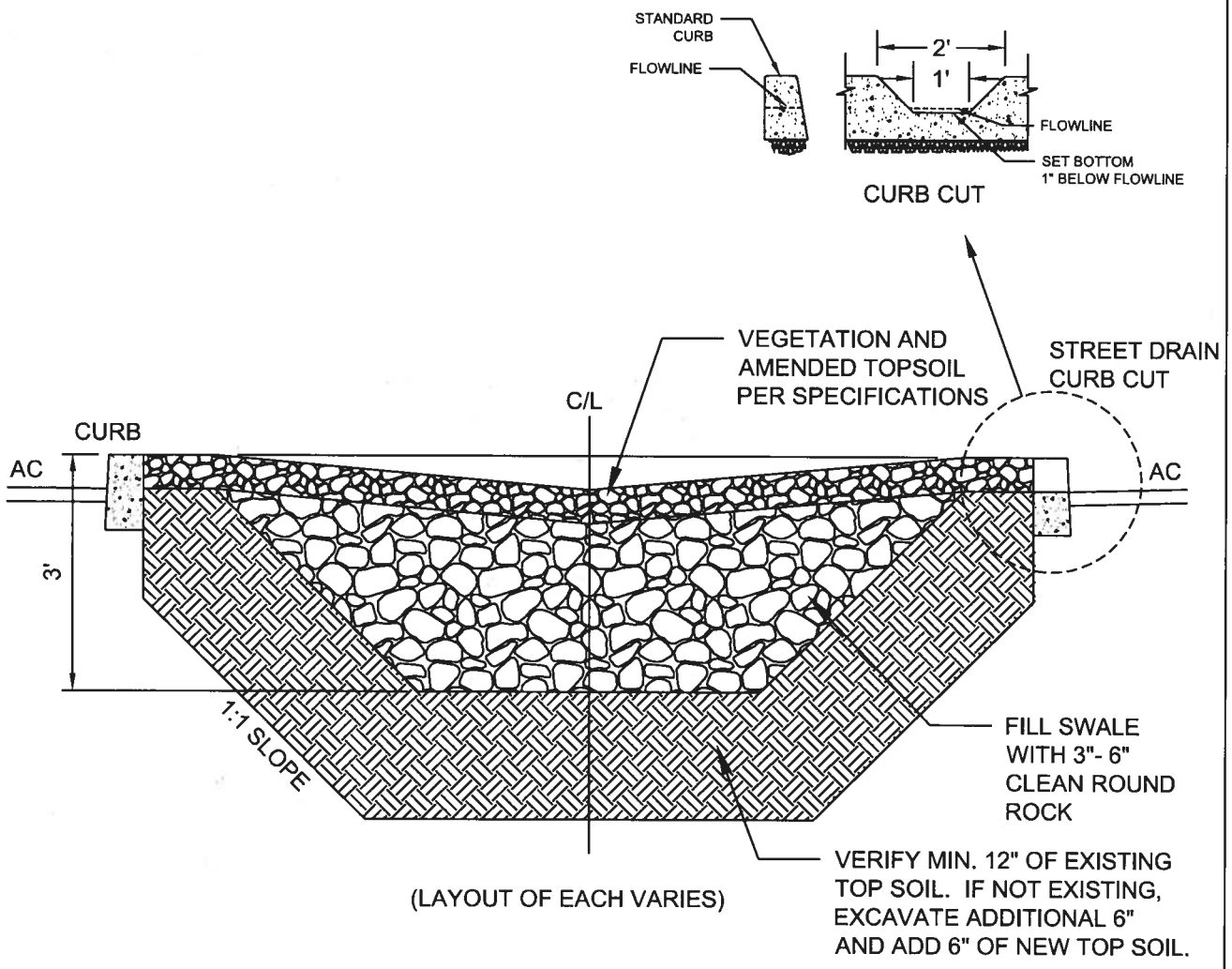


TYPICAL SECTION

NOTES:

1. ALL MANHOLES OUSIDE OF PAVED AREAS SHALL HAVE A 6" THICK CONCRETE PAD, 5' SQUARE CENTERED ON THE MANHOLE LID.
2. ALL PRECAST SECTIONS SHALL CONFORM TO REQUIREMENTS OF ASTM C-478.
3. ALL CONNECTING PIPE SHALL HAVE A FLEXIBLE JOINT WITHIN 18" OF THE MANHOLE WALL
4. ALL LADDER RUNG HOLES SHALL BE GROUT FILLED.
5. AN ADJUSTMENT SYSTEM SUCH AS EAST JORDAN IRON WORKS INFRA-RISER, OR APPROVED EQUAL, SHALL BE USED TO ADJUST MANHOLE FRAME AND COVER TO FINISH GRADE.

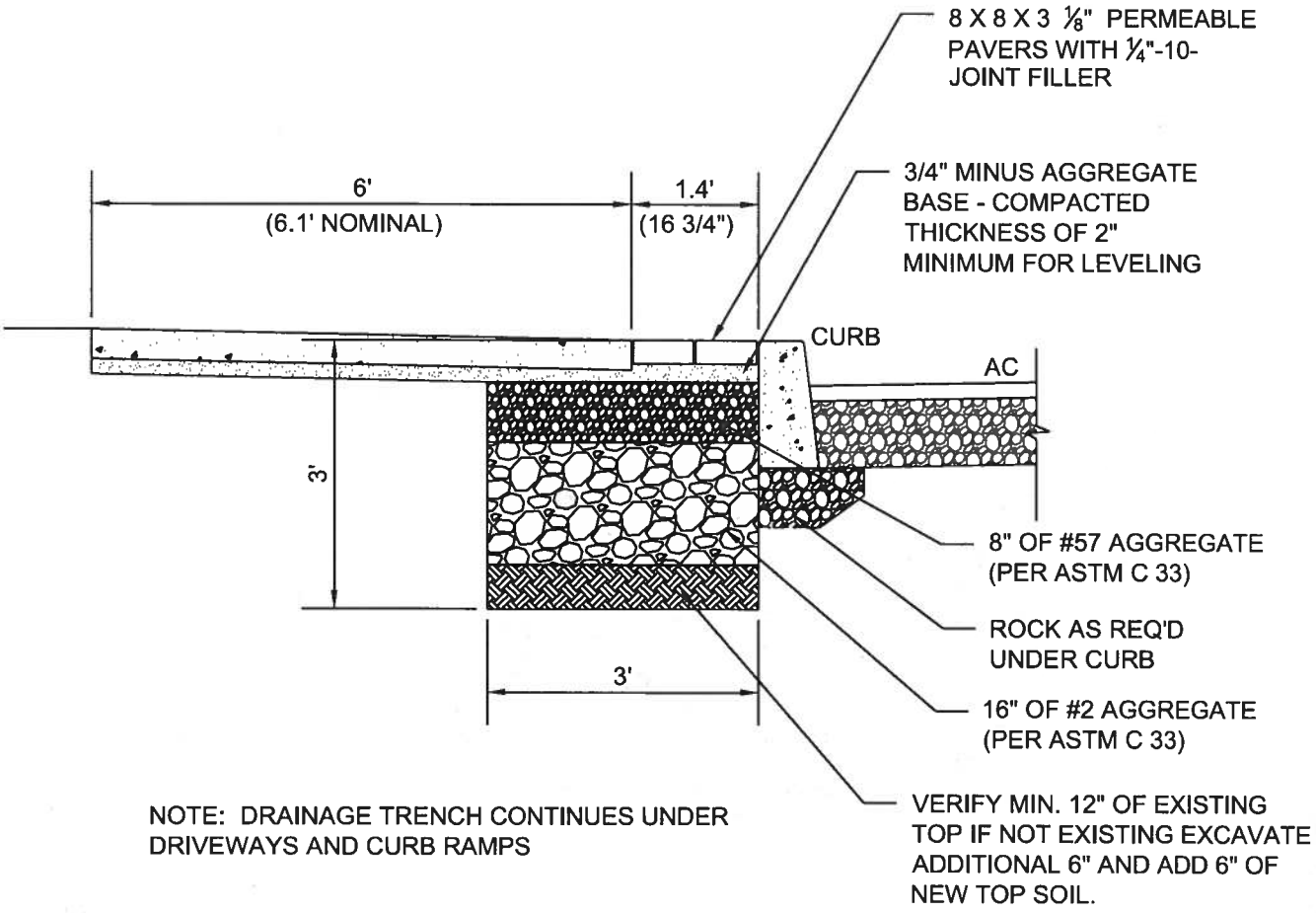
	City of Sisters ◦ Standard Detail	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	SEDIMENTATION MANHOLE	APPROVED BY: PB	3-12
		REVISION DATE: 12/03/2013	



NOTES

1.) PROVIDE DESIGN FOR SIZING AND TREATMENT BASED ON CENTRAL OREGON STORMWATER MANUAL AND PUBLIC WORKS CONSTRUCTION STANDARDS

CITY OF SISTERS INCORPORATED 1946	**City of Sisters ◦ Standard Detail**	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	INFILTRATION SWALE SECTION	APPROVED BY: PB	3-13
		REVISION DATE: 12/03/2013	



NOTE: DRAINAGE TRENCH CONTINUES UNDER DRIVEWAYS AND CURB RAMPS

City of Sisters ◦ Standard Detail	SCALE: NONE	DRAWING NO. 3-14
	DRAWN BY: EH	
SIDEWALK INFILTRATION SWALE	APPROVED BY: PB	
	REVISION DATE: 12/03/2013	

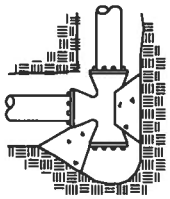
(HORIZONTAL)

BEARING AREA OF THRUST BLOCKS IN SQ. FT.

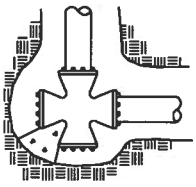
FITTING SIZE (IN.)	TEES, LATERAL WYES DEAD ENDS	STRADDLE BLOCK	90° BEND PLUGGED CROSS; TEE PLUGGED ON RUN	45° BEND	22 1/2° BEND	11 1/4° BEND
2	0.2	0.2	0.3	0.2	0.1	0.05
3	0.5	0.9	0.8	0.4	0.2	0.1
4	0.9	1.4	1.3	0.7	0.4	0.2
6	2.1	2.8	3.0	1.6	0.8	0.4
8	3.8	4.8	5.3	2.9	1.5	0.7
10	5.9	7.3	8.3	4.5	2.3	1.2
12	8.5	10.3	12.0	6.5	3.3	1.7
14	11.5	13.8	16.3	8.8	4.5	2.3
16	15.1	17.8	21.3	11.5	5.9	3.0
18	19.1	22.4	27.0	14.6	7.4	3.7
20	23.6	27.5	33.3	18.0	9.2	4.6
24	33.9	39.2	48.0	26.0	13.2	6.7

VOLUME OF THRUST BLOCK IN CU. YDS. (VERTICAL)

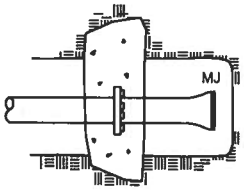
FITTING SIZE (IN.)	BEND ANGLE			
	90°	45°	22.5°	11.25°
2	0.2	0.1	0.0	0.0
3	0.4	0.2	0.1	0.1
4	0.7	0.4	0.2	0.1
6	1.5	0.8	0.4	0.2
8	2.7	1.5	0.8	0.4
10	4.3	2.3	1.2	0.6
12	6.1	3.3	1.7	0.8
14	8.3	4.5	2.3	1.2
16	10.9	5.9	3.0	1.5
18	13.8	7.5	3.8	1.9
20	17.0	9.2	4.7	2.4
24	24.5	13.3	6.8	3.4



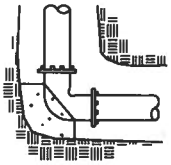
90° BEND



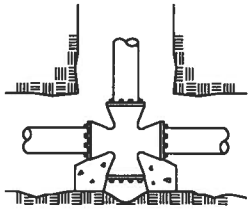
90° BEND



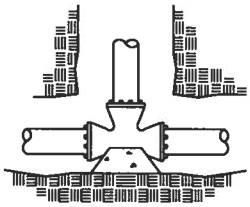
STRADDLE BLOCK



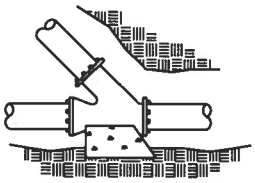
BEND



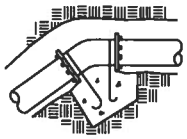
TEE



TEE



LATERAL WYE



VERTICAL BEND

FITTING SIZE	ROD SIZE	EMBEDMENT
12" AND LESS	#6	30"
14"-16"	#8	36"

NOTES:

1) CONCRETE BLOCKING TO BE POURED AGAINST UNDISTURBED EARTH.
2) ALL CONCRETE TO BE CLASS 2500.
3) INSTALL ISOLATION MATERIAL BETWEEN PIPE AND/OR FITTINGS BEFORE POURING BLOCKING.
4) CONCRETE SHALL BE KEPT CLEAR OF ALL JOINTS AND ACCESSORIES.
5) SEE TYPICAL HYDRANT SETTING DETAILS FOR BLOCKING LOCATIONS.

BEARING AREA OF REDUCERS SHALL BE THE DIFFERENCE BETWEEN VALUES FOR DEAD ENDS FOR EACH END SIZE (IE. 6x8: 3.8-2.1 = 1.7 SQ. FT.)

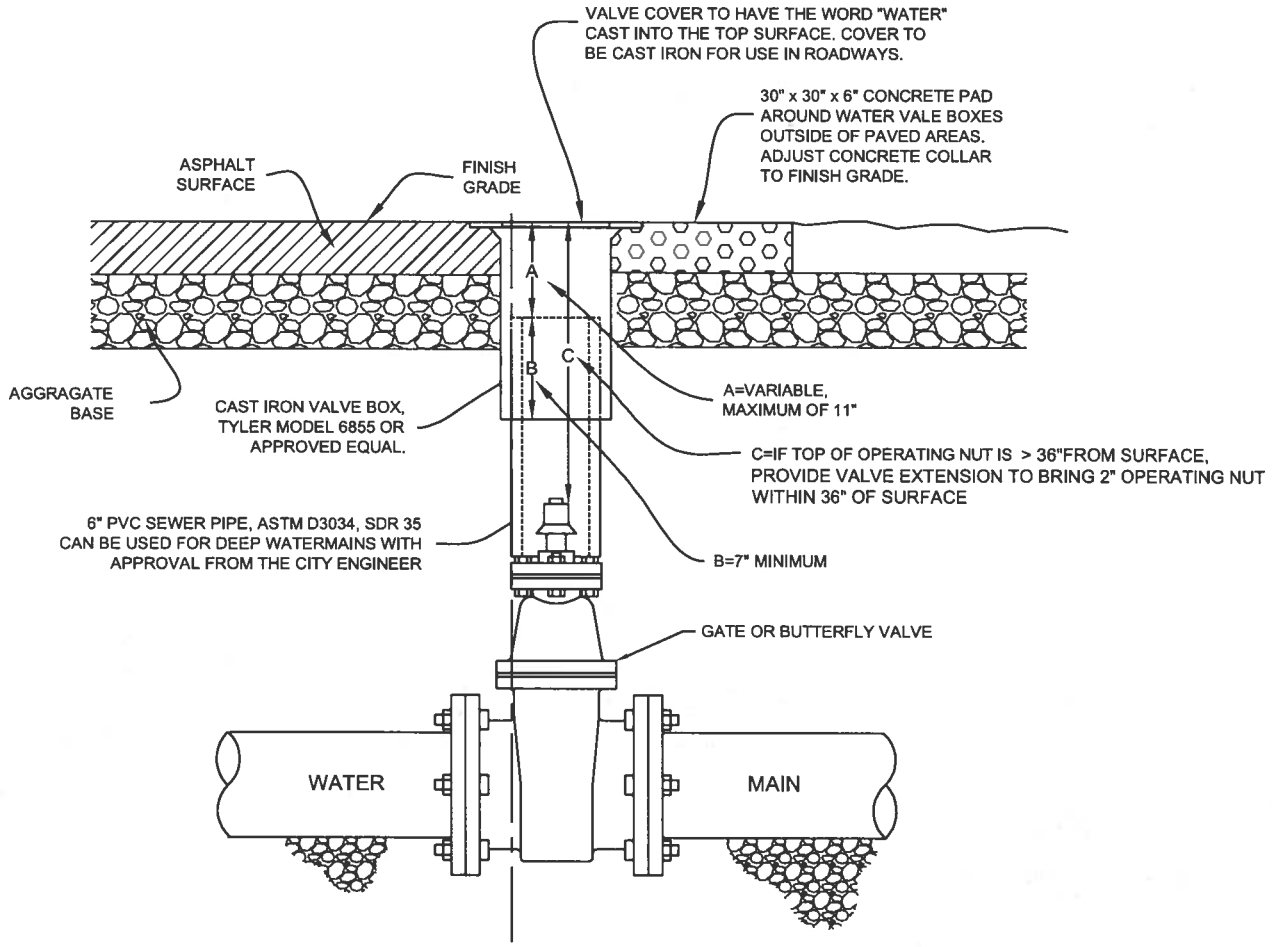
VALUES BASED ON 150 PSI WATER PRESSURE AND 2000 PSF SOIL BEARING CAPACITY.

City of Sisters ◦ Standard Detail

STANDARD
THRUST BLOCKING

SCALE:	NONE
DRAWN BY:	EH
APPROVED BY:	PB
REVISION DATE:	12/03/2013

DRAWING NO. 4-1

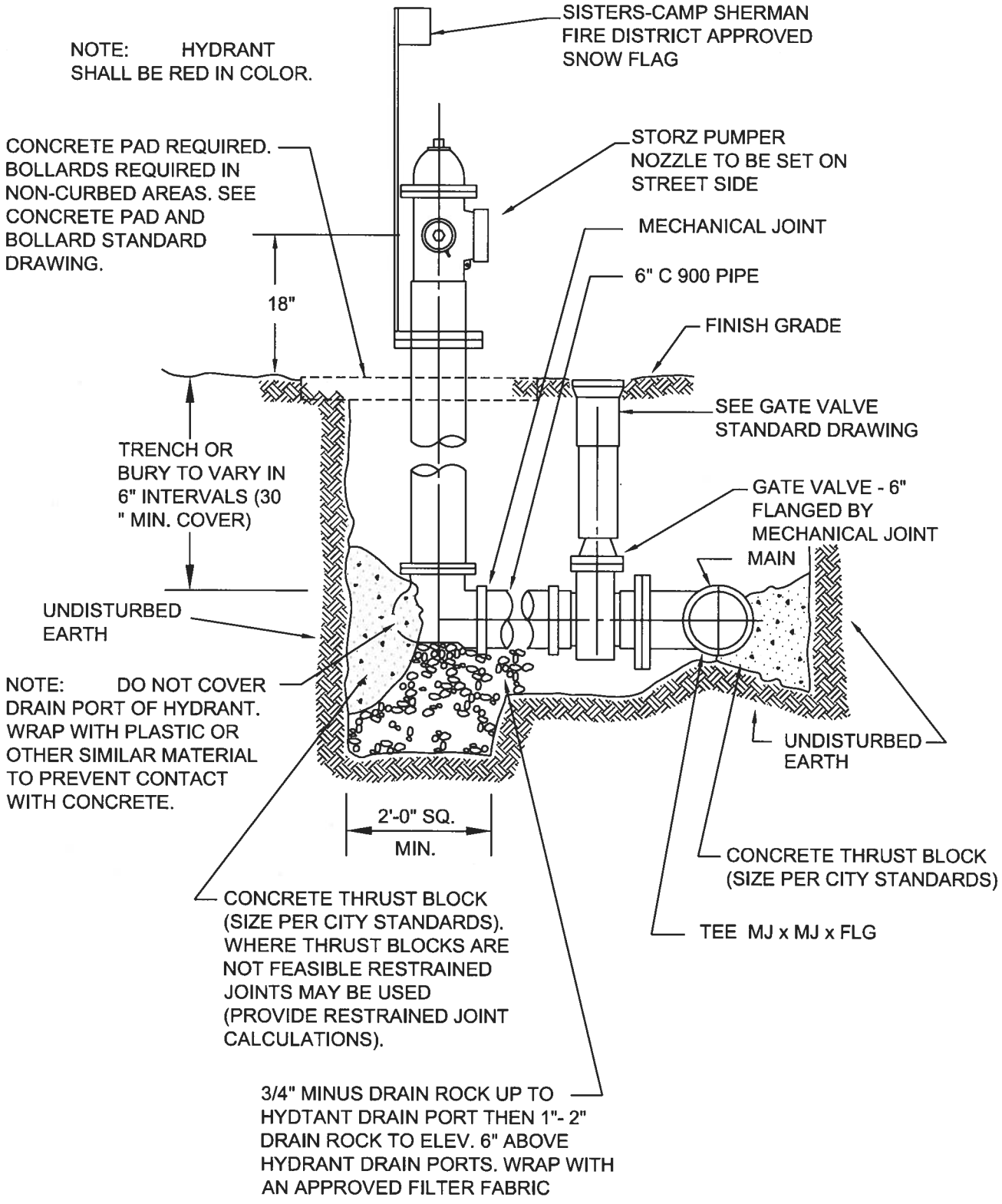


City of Sisters ◦ Standard Detail

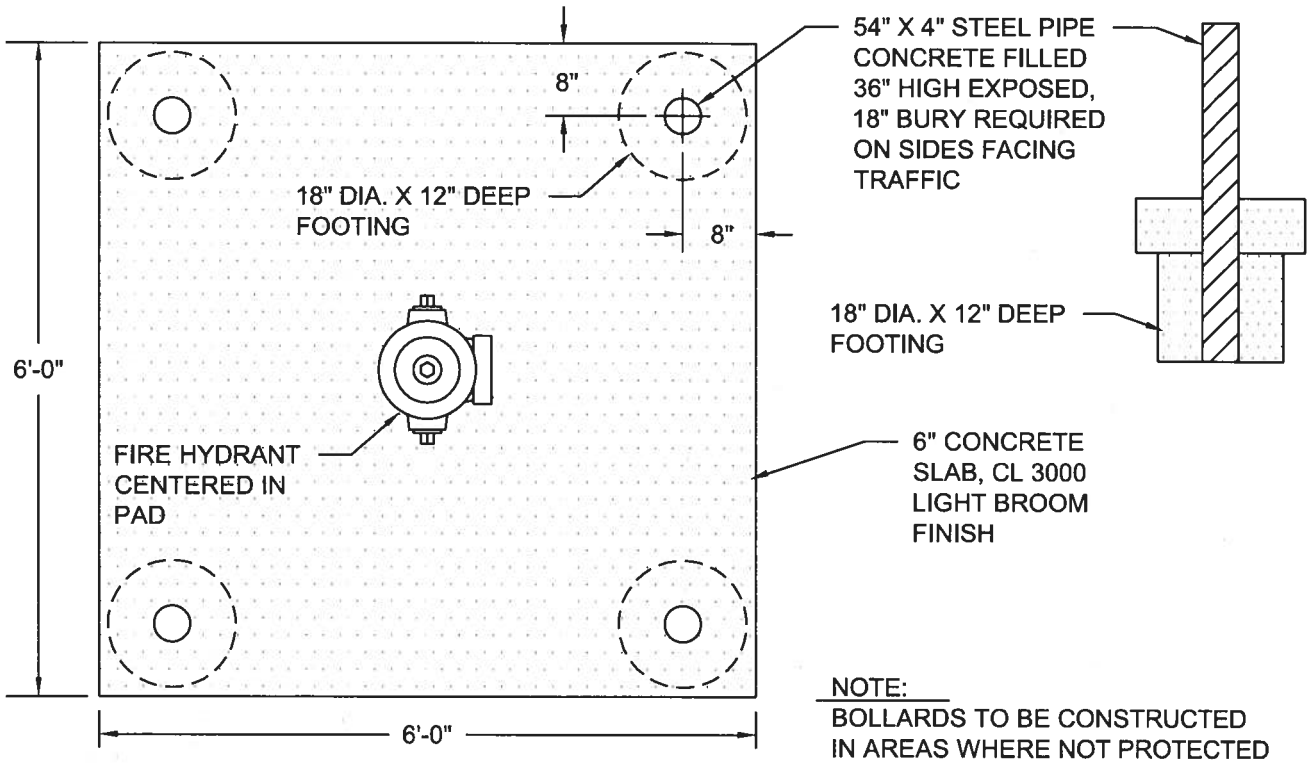
WATER MAIN VALVE
VALVE BOX DETAIL

SCALE:	NONE
DRAWN BY:	EH
APPROVED BY:	PB
REVISION DATE:	12/03/2013

DRAWING NO. 4-2

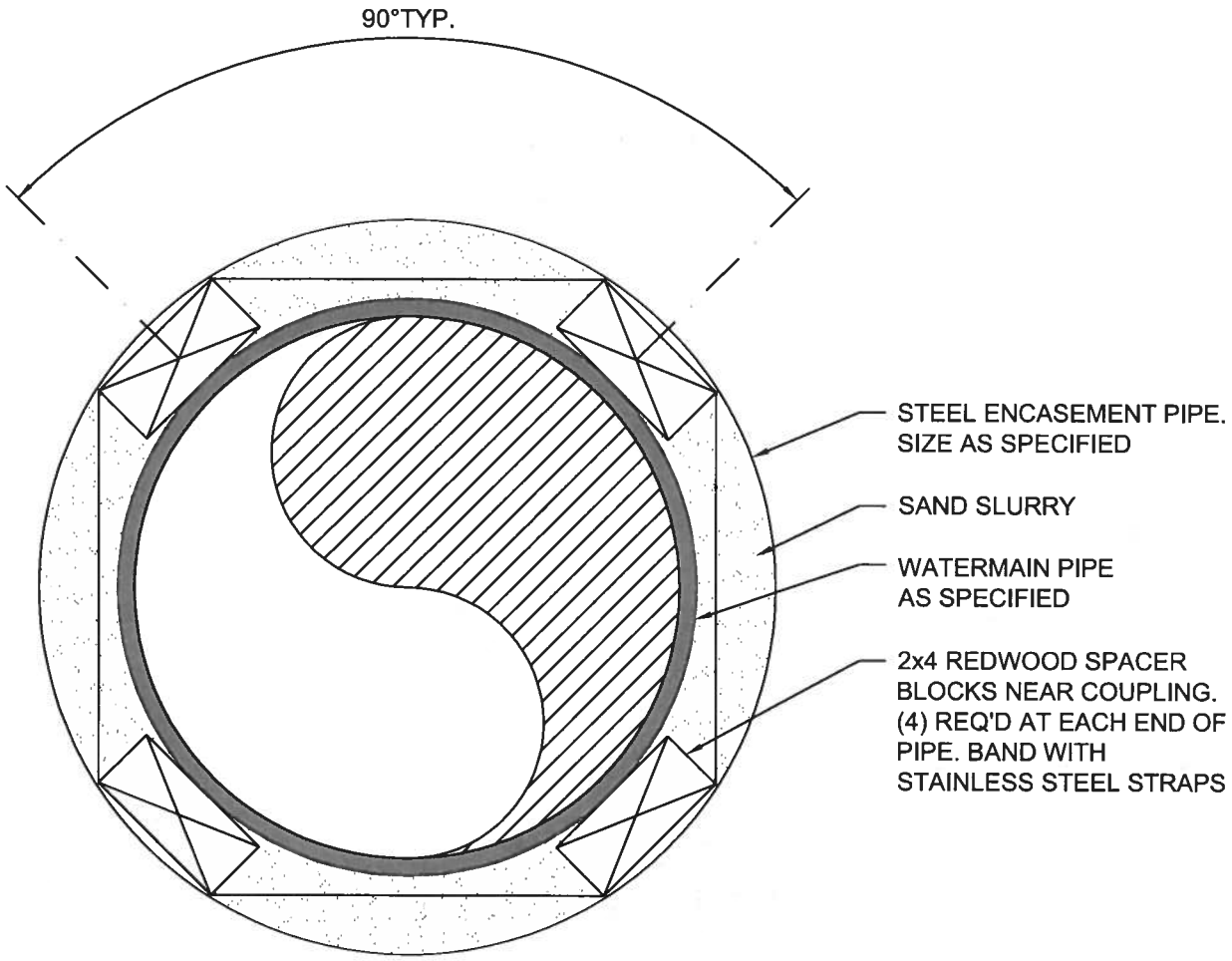


CITY OF SISTERS INCORPORATED 1946	**City of Sisters ◦ Standard Detail**	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	FIRE HYDRANT ASSEMBLY	APPROVED BY: PB	4-3
		REVISION DATE: 12/03/2013	

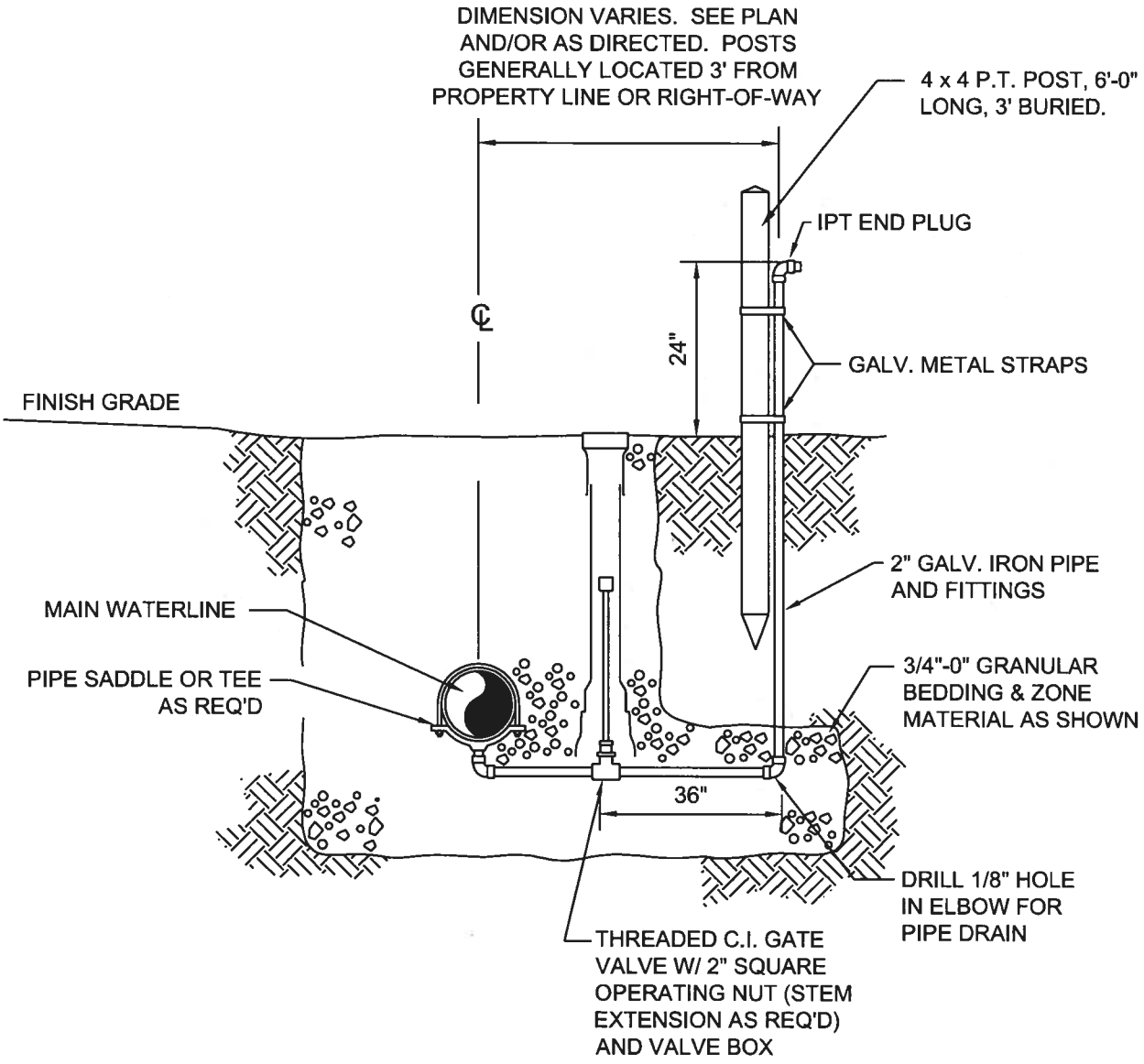


NOTE:
BOLLARDS TO BE CONSTRUCTED IN AREAS WHERE NOT PROTECTED BY CURB.

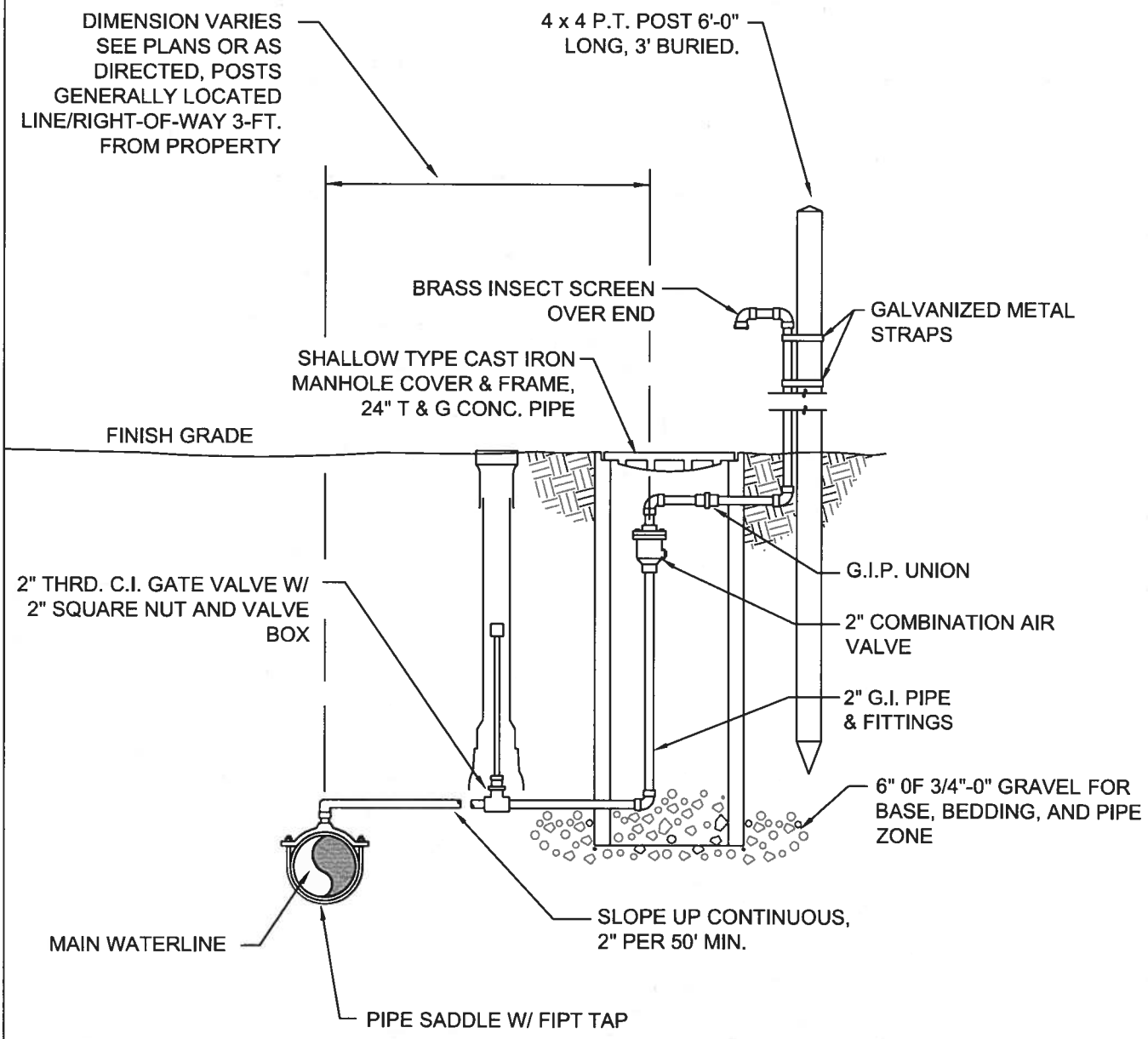
CITY OF SISTERS INCORPORATED 1946	**City of Sisters ◦ Standard Detail**	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	FIRE HYDRANT PAD AND BOLLARDS	APPROVED BY: PB	4-4
		REVISION DATE: 12/03/2013	



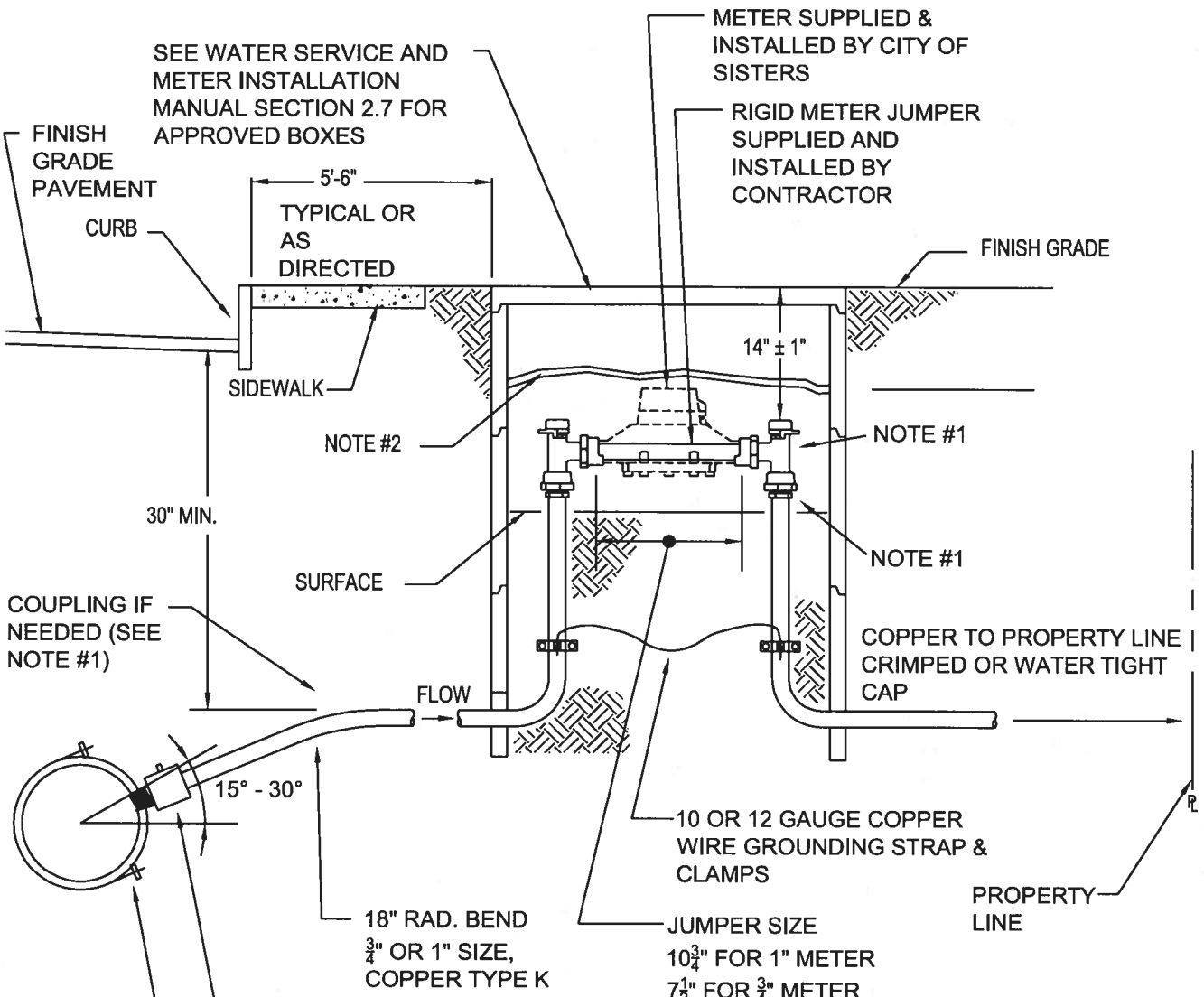
	City of Sisters ◦ Standard Detail	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	PIPE ENCASEMENT	APPROVED BY: PB	4-5
		REVISION DATE: 12/03/2013	



CITY OF SISTERS INCORPORATED 1946	**City of Sisters ◦ Standard Detail**	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	BLOW OFF ASSEMBLY	APPROVED BY: PB	4-6
		REVISION DATE: 12/03/2013	



	City of Sisters ◦ Standard Detail	SCALE: NONE	DRAWING NO.
		DRAWN BY: EH	
	COMBINATION AIR/VAC. RELIEF VALVE ASSEMBLY	APPROVED BY: PB	4-7
		REVISION DATE: 12/03/2013	



NOTE:

1. SEE WATER SERVICE AND METER INSTALLATION MANUAL FOR APPROVED FITINGS.
2. ½" CROSSLINK CLOSED CELL NATURAL T20 INSULATION, CUT TO FIT METER BOX

City of Sisters ◦ Standard Detail	SCALE: NONE	DRAWING NO.
	DRAWN BY: EH	
STANDARD 3/4" AND 1" SERVICE INSTALLATION	APPROVED BY: PB	4-8
	REVISION DATE: 12/03/2013	