

City of
ADAIR VILLAGE

*Grounded in history,
growing for the future.*

BENTON COUNTY, OREGON

PUBLIC INFRASTRUCTURE DESIGN
STANDARDS MANUAL

Guidelines for Development

Effective: July 1, 2009

Introduction

In all cities, the public right-of-way and public easements are special areas created for public transportation and for placement of storm and sanitary sewer systems and other utilities such as telephone, water and gas. All physical aspects of public infrastructure within the right-of-way and easements should be designed for public safety, efficient operation, and cost effective maintenance.

This document contains design standards, procedures, and standard drawings that are meant to establish, clarify, and assist both the City staff and private engineers and developers in creating safe, efficient, and cost effective water, sewer, street and drainage projects for the City of Adair Village. These standards and procedures will apply to both new construction and reconstruction, except where design standards cannot be properly applied because of unique situations. Limited width and available right-of-way, for instance, could elicit a less than standard street width. Unmovable trees or buildings that encroach too close to the public facility may warrant a deviation from the standard. Under circumstances such as these, some flexibility may be necessary to create a design that remains sensitive to the specific needs and character of an existing neighborhood or other physical limitations.

Efforts were made to cover a wide variety of topics and issues related to the development of sewer, water, storm, and streets. If additional items are not covered herein, they will be reviewed by the City Engineer, City Planner and other City staff during the development review process.

The cost for a printed copy of this manual is \$60.00, and \$15.00 for an electronic copy.

How to Use this Manual

Information in this Manual is organized by the following divisions:

1. Division 1: Water System Standards Manual
2. Division 2: Sewer System Standards Manual
3. Division 3: Transportation System Standards Manual
4. Division 4: Drainage System Standards Manual

An Engineering Policy Section at the beginning of the manual is intended to provide information and requirements for the Developer and the Developer's engineer. It is recommended that a Developer thoroughly review the entire manual to gain an understanding of the City's standards and requirements as well as the process that must be followed to plan, design, submit, and construct public improvements.

The City may update all or portions of this manual at anytime. It is the responsibility of the Developer and/or the Developer's engineer to ensure that they have the most recent and current version of the standards manual.

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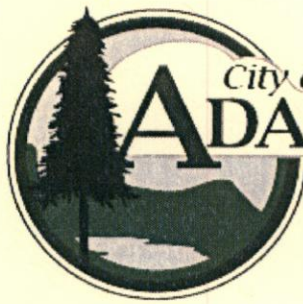
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BENTON COUNTY, OREGON

ENGINEERING POLICY
Guidelines for Development

Effective: July 1, 2009

1.0 Applicability

- 1.1 This policy applies to applicants developing improvements that involve construction of public utility system improvements. Public utility improvements include improvements to the water, sewer, drainage, or transportation infrastructure within the City. Such improvements shall be designed by the applicant in accordance with this Policy, and upon approval and acceptance of the construction by the City, the improvements shall become City owned and maintained.
- 1.2 These standard specifications shall relate only to public works construction in the City and are not to be identified with building codes, zoning ordinances and other regulations for which procedures and standards have been established.
- 1.3 A section on development criteria, hazard overlay zones, and general planning information is provided for the convenience of the developer.

2.0 General

- 2.1 Applicants shall design and construct all required public works improvements to City Standards. These Standards include the latest version in effect at the time of application of the following list of documents: Water System Design Standards Manual, Sanitary Sewer Design Standards Manual, Transportation System Design Standards Manual and the Drainage System Design Standards Manual. The four manuals will collectively form the **City of Adair Village Infrastructure Design Standards Manual**. Copies of these Standards are available at the Public Works Office and at City Hall for a nominal price. Designs must also conform to the current Water Master Plan, Wastewater Facilities Plan and other applicable master plans as determined by the City.
- 2.2 A Development Permit must be issued by the City prior to construction of any public works improvement. The Applicant must pay the current Permit Application Fee at the time of application.
 - 2.2.1 Other permits as required by the City may also include a Grading/Fill permit or a Heavy Haul permit as when excavated material is being transferred offsite to another disposal site.
- 2.3 Current Technical Plan Check and Inspection Fee shall be paid before approval of the final engineering plans for the required improvements. City approval of Applicant's construction documents and evidence of County and other agency approval must be obtained prior to the issuance of a Permit.
- 2.4 Applicant shall obtain all other necessary permits from Benton County, the State of Oregon, the Oregon Department of Environmental Quality (1200-C Erosion Control Permit if applicable), and all other agencies as required.
- 2.5 No connections to the City's utility systems for dwellings or other developments will be allowed until the Applicant's improvements are completed and accepted by the City or a satisfactory Improvement Agreement is entered into.

3.0 Public Utility and Infrastructure Design Standards

3.1 Water System Design Standards

- 3.1.1 Applicant shall provide water facilities for their development. This includes water mains, valves, and fire hydrants, blow-offs, combination air valves, service laterals, meter boxes, pump stations, storage tanks, and other required appurtenances.
- 3.1.2 All required public water system improvements shall be designed and constructed in accordance with the latest City of Adair Village Water Master Plan and the Water System Design Standards Manual.

3.2 Sewer System Design Standards

- 3.2.1 Applicant shall provide sewer facilities for their development. This includes sewer mains, manholes, clean-outs, service laterals, pump stations, and other required appurtenances.
- 3.2.2 All required public sanitary sewer system improvements shall be designed and constructed in accordance with the latest City of Adair Village Wastewater Facilities Plan, Sanitary Sewer Design Standards Manual and according to DEQ requirements and guidelines.

3.3 Street and Drainage Design Standards

- 3.3.1 Applicant shall provide street and transportation facilities as well as storm drainage facilities for their development. This includes streets, sidewalks, signs, curb, gutter, catch basins, manholes, drainage piping, culverts, inlets, traffic control devices, and other required appurtenances.
- 3.3.2 All required public transportation and drainage system improvements shall be designed and constructed in accordance with the latest City of Adair Village Transportation System and Drainage System Design Standards Manuals and in accordance with County, State, and other requirements as appropriate.

4.0 General Design Requirements

- 4.1 Persons planning to construct development must obtain a Permit from the City of Adair Village and pay the necessary engineering review fees in accordance with the "Engineering Policy – Guidelines for Development." Other permits required may include, a Public Works or Construction Permit as issued by Benton County, 1200-C Erosion Control Permit from the Oregon Department of Environmental Quality (DEQ) and ODOT, Corps of Engineers/Department of State Lands, and others as required by Federal, State, laws and regulations.

- 4.1.1 Other permits as required by the City may also include a Grading/Fill permit or a Heavy Haul permit as when excavated material is being transferred offsite to another disposal site.
- 4.2 All surveys for development of public works facilities shall be performed under the direction of a Professional Engineer (PE) or Professional Land Surveyor (PLS) licensed in the State of Oregon. At least one Benchmark shall be established or located within the project limits. Elevations shall be referenced to the NAV 88 datum. Exceptions shall be made for flood plane certifications and related drawings utilizing NGVD 29 datum. Survey shall be sufficient to accurately show existing facilities and topography.
- 4.3 Design drawings, specifications, and calculations shall be conducted by an Oregon licensed professional Engineer.
- 4.4 The engineer preparing the plans shall make necessary arrangements for locates on all underground utilities in the vicinity for use in preparing the plans. Such utilities shall be shown accurately in the plans.
- 4.5 Materials and details shall conform to the requirements of this manual.
- 4.6 All applicable laws, codes, regulations, and permit requirements shall be complied with.
- 4.7 Upon receiving approval from the City for the plans and specifications, the developer shall submit the plans to the Oregon Department of Environmental Quality for review and approval. The developer will submit proof of DEQ approval of the plans to the City prior to beginning any construction activities.

5.0 Design Plan Format

- 5.1 Plans shall be computer generated in an AutoCAD compatible format.
- 5.2 The plans shall be submitted on 22 x 34-inch or 11 x 17-inch sheets unless otherwise pre-approved by City Representative. Plans shall be blackline prints. Blueline copies are not acceptable. Letter size may not be less than 0.08-inches for 22 x 34-inch sheets and not less than 0.06-inches for 11 x 17-inch sheets.
- 5.3 Plans shall be drawn to scale. The scale shall be 1-inch = 2, 3, 4, or 5-feet vertically and 1-inch = 10, 20, 30, 40 or 50-feet horizontally. Details may be drawn at larger scales for clarity. Plan scale shall be called out for each drawing. A graphical scale bar shall be included on each sheet.

- 5.4 A north arrow shall be shown on each plan view sheet and other plan detail oriented differently than the main drawing on the sheet.
- 5.5 A title block shall appear on each sheet of the plan set placed in the lower right-hand corner, across the bottom edge of the sheet, or across the right-hand edge of the sheet. Title block shall include the name of the project, the engineering firm, the owner, the sheet title, the last revision date and the sheet number.
- 5.6 The seal of the registered Oregon Professional Engineer responsible for the preparation of the plans shall appear on each sheet. Final Plans must be stamped and signed by a Professional Engineer licensed in the State of Oregon. Plan approval will not be granted until final signed sets are received. Approval by the City does not relieve the Applicant's Engineer from the responsibility of the design.
- 5.7 Plans shall begin with a title sheet identifying the project and including a vicinity map showing the location of the project within the City. General notes and a sheet index should also be included.
- 5.7.1 General notes shall inform the Contractor to contact the Oregon Utility Notification Center for utility locates (1-800-332-2344), also 811, prior to the start of construction.
- 5.8 Plan views must show existing and proposed improvements and features within or adjacent to the project including survey monuments, edge of pavement, road centerline, buildings, curbs, gutters, sidewalks, culverts, ditches, streams, utility poles, and other surface improvements and features. The location of underground utilities including power, gas, water and sewer shall be shown as accurately as possible. Right-of-way, property lines, easements, street names, lot numbers, and other labels shall also be shown. Existing and finish grade contours (2 foot maximum) should be shown where possible.
- 5.9 At least one composite utility plan shall be included which shows all proposed improvements (water, sewer, streets, sidewalk, curb, culverts, storm drainage, etc.) in one plan view to help avoid or identify conflicts and designate horizontal separations and locations.
- 5.10 Benchmark used to establish elevation shall be shown on the plans.

6.0 Construction Provisions

- 6.1 All work within the public right-of-way shall be conducted by a licensed and bonded contractor. This requirement shall be stated on the

- construction drawings and specifications. A permit and appropriate bond shall be required prior to commencing work.
- 6.2 City shall be notified at least 2 working days in advance prior to commencing construction work.
- 6.3 Traffic control shall be signed, flagged and conducted in a manner conforming to ODOT standards (Manual of Uniform Traffic Control Devices, MUTCD) and approved by the City. If road closures or detours are anticipated, prior approval from the City and ODOT officials must be obtained, as appropriate. Traffic control plans shall be submitted with construction plans for review. Traffic control for projects with duration of 3 days or less shall conform to the ODOT Temporary Controls Handbook.
- 6.4 Safety Requirements. The contractor is responsible for observing the safety of the work and all persons and property coming into contact with the work. The contractor shall conduct his work in a manner complying with the requirements prescribed by OSHA.
- 6.5 Progress. Construction shall proceed in a systematic manner to minimize public inconvenience and disruption of services. All excavations, embankments, stockpiles, waste areas, etc. shall be kept protected. All roads, ditches, etc. shall be kept free from debris and shall be continually cleaned during the work. Dust control measures shall be employed as required and directed by the City.
- 6.6 Periodic inspection of the construction by City representatives shall be required. No concrete shall be poured; asphalt placed, or pipe backfilled without such inspections being made and approvals given. A tentative schedule for inspection shall be established when the permit is issued. The permit holder shall give the City a minimum of 2 working days advance notice before inspections fall due. It shall be the permit holder's responsibility to obtain City inspections and approvals before covering work.
- 6.7 Protection of Existing Improvements. Contractor shall contact the Utility Notification Center at least 48 hours in advance of digging operations to get approximate locations for buried utilities. Exact locations of buried facilities may not be known or shown and contractor is responsible to pot-hole carefully in advance of the work to avoid such facilities. Contractor shall coordinate with all utilities and notify them immediately in the event of any damage. Contractor shall protect, repair, and replace any damaged utilities as directed by the persons responsible for such utility. All landscape, grass, shrubs, signs, pavements, mail boxes, driveways, culverts, gravel surfacing, fencing, etc. shall be protected from damage and returned to conditions as good, or better than existed prior to

- construction. All costs for protection, repair, and replacement of all existing items shall be borne entirely by the contractor. Contractor shall obtain a release from any property owners for any claims of injury or property damage prior to final acceptance of the work by the City.
- 6.8 All existing survey monuments and control shall be protected, including individual property corner stakes. Any such monuments destroyed or altered during construction shall be restored by the contractor or developer in accordance with Oregon Revised Statutes as applicable.
- 6.9 Any temporary disruption to water or sewer service must be coordinated with, and approved by City and kept to the minimum length of time necessary. The City shall be notified at least 2 working days in advance of when an approved shut-down is desired. Contractor shall not operate any valves or hydrants without the City's approval. Property owners affected by loss of services or utilities shall be given 24 hour notice prior to the disruption of service.
- 6.10 Compaction testing equipment (nuclear gauge) shall be furnished and operated by the contractor or an independent testing firm shall be retained by the contractor or developer to perform compaction testing. Testing shall conform to the ODOT Manual of Field Testing Procedures (MFTP). Compaction testing shall be conducted in the presence of the City's inspector or representative. Sufficient tests, as determined by the City, will be taken to ensure that the materials and compaction efforts being used are adequate to obtain the required density. Several tests shall be taken on each lift placed during the first day of backfill operations. Additional tests will be taken periodically during the work. Alternate materials or methods will be required if adequate compaction is not being obtained.
- 6.11 Construction staking will be provided by the Developer's Engineer for establishing the alignment and grade of the transportation system to be constructed. Offset stakes shall be placed at no more than 100-foot intervals along the alignment. Grade staking, stationing, and other field layout shall be as required.
- 6.12 Work shall not begin unless City has approved plans and given approval to begin work. Contractor shall have a set of the approved plans on site at all times.
- 6.13 Trench foundation grades shall be constructed to within 0.1 feet of the grade shown in the plans. Surface tolerances shall be within 0.02 feet of plan elevation at any one point.

- 6.14 Open trench length at any one time shall not exceed 300 feet unless otherwise approved. Related resurfacing shall be completed within 800 feet of the open trench limit.

7.0 Dedications and Easements

- 7.1 Applicant shall obtain and record all off-site easements required for the project before City approval of the construction plans. Permanent utility easements shall be granted to the City for future repair and maintenance of all public improvements. Applicant shall coordinate with City to determine adequate easement widths for utilities prior to finalizing easements. The minimum easement width (for piping improvements) is 15 feet. The actual width may be greater than the minimum as the required width shall be at least equal to the point where a theoretical 1:1 slope from the outside edge of the pipe zone would daylight. All costs for obtaining and recording easements created by private development shall be borne by the developer.

8.0 Applicant Engineering Requirements

- 8.1 Applicant shall retain a licensed Oregon Professional Engineer to design and prepare their construction plans and specifications. To avoid a conflict of interest, the Applicant's Engineer shall not be working as the City Engineer at the time of the application, plan check period, or construction period.
- 8.2 Applicant's Engineer shall obtain a copy of the City's Infrastructure Design Standards Manual and adhere to the design and engineering requirements, and standard details and specifications contained therein.
- 8.3 Engineering Plans and Specifications for the work shall be prepared and submitted to the City for review. Plans and specifications must also be submitted and approved by DEQ and the Oregon Drinking Water Program (Health Division), as required and after approval by the City.
- 8.4 Applicant's Engineer shall submit a construction cost estimate for the public utilities to be provided. The costs for public utilities shall be complete and accurate. The cost estimate shall be submitted to the City along with the plans and specifications. The City Engineer will review the cost estimate for reasonableness and may require updates and modifications. Final plan approval will not be issued until an approved cost estimate is provided.
- 8.5 Applicant's Engineer will provide construction staking to facilitate the construction of the improvements to the proper line and grade.
- 8.6 Applicant's Engineer will provide construction observation and inspection during the project work as required to ensure plan compliance and allow accurate as-builts to be prepared. Daily inspection reports shall be turned in to the City on a weekly basis. Reports shall include date and time of arrival, weather conditions, description of construction activities, and all testing procedures and results. If

inspection is significantly deficient, a stop-work order may be issued. Applicant's Engineer shall also provide a reasonable tentative schedule of construction progress.

- 8.7 Applicant's Engineer shall ensure that accurate markups are maintained during construction and shall prepare Record (As-Built) Drawings for the project. Record Drawings shall accurately show the locations and depths of the installed improvements with sufficient tie-out dimensions to permanent objects to allow easy location in the future. Each sheet of the drawings shall be stamped "As-Built". Drawings must be acceptable to the City and Applicant's Engineer shall correct any deficiencies noted by the City. As-Built elevations shall be within 0.1-foot of installed conditions. Horizontal dimensions shall be within 0.5-foot of installed conditions. Two (2) complete printed and signed Mylar sets of Record Drawings shall be delivered to the City upon project completion. An additional complete digital copy of the Record Drawings shall be provided to the City in AutoCAD format on a CD-ROM.
- 8.8 Following completion of construction, Applicant's Engineer shall submit (with the As-Built drawings) a letter certifying completion. The letter shall certify that the work was conducted in accordance with the approved plans and specifications and that the site and adjacent properties are stable with respect to settlement and subsidence, sloughing of cut and fill slopes, and proper erosion control measures have been placed.

9.0 Permit Issuance

- 9.1 Applicant shall apply for a Permit at City Hall to initiate the plan review process. The Permit Application Fee shall be paid at the time of application. The Permit Application Fees are shown in the Fee Schedule.
- 9.2 Applicant must provide evidence of County approval showing the proposed project complies with all County planning, zoning, and other requirements. Evidence of any other permit or approval from other agencies as may be required by law shall also be obtained. Such evidence must be supplied to the City before a Permit will be issued. Preliminary plat approvals should be obtained prior to plan submission.
- 9.3 Applicant shall submit to the City, four (4) copies of detailed construction plans and specifications prepared by the Applicant's Engineer. The City will review the documents for compliance with City Standards and Master Plans following receipt of required Plan Check and Inspection Fee. If acceptable, one (1) copy will be returned to the Applicant with a notice of plan approval. If changes in the documents are required, City will return one (1) copy back to the Applicant with deficiencies noted. The Applicant will then correct the documents and resubmit four (4) corrected copies.
- 9.4 Applicant shall provide a warranty or maintenance bond or other written guarantee acceptable to the City in the amount of 20% of the construction cost. This bond shall guarantee materials and workmanship for a period of one (1) year following acceptance of the improvements by the City, and it shall ensure the satisfactory repair or replacement of any facility damaged during construction.

- Bond shall list City as the Obligee and the Developer or Developer's contractor as the Principal.
- 9.5 Applicant shall provide a copy of an insurance certificate showing that the Applicant or each of his/her contractors is covered by general commercial liability and property damage insurance in the amounts of not less than \$1,000,000/\$1,000,000 bodily injury liability/property damage with an aggregate limit of a least \$2,000,000. The policy shall include coverage for contractual liabilities. An insurance certificate shall also be provided showing that each contractor maintains an automobile liability insurance policy with combined single limits of at least \$1,000,000 per occurrence for bodily injury, personal injury, and property damage. Both policies shall include a 30-day notice of cancellation clause and shall include endorsements naming as additional insured "The City of Adair Village", its officers, agents, and employees while acting within their official capacity as such.
- 9.6 Contractor shall submit a hold harmless statement which holds the City harmless from all liability and loss based upon or arising out of damage or injury caused by or in connection with the performance of construction.
- 9.7 The City reserves the right to waive Engineering review for very minor improvements for individual single family dwellings. Professional Engineer preparation of minor drawings may also be waived at the City's discretion.
- 9.8 A permit shall lapse if construction for which the permit was issued has not commenced within ninety (90) days of the date of issuance. To reinstate the permit, the Applicant shall submit a written request to the City stating reasons for failure to commence, provide a new construction commencement date, and pay a permit reinstatement fee. The City may impose additional conditions deemed necessary for the project at that time.
- 9.9 The Development Permit will be issued and construction may begin after the following steps have been completed satisfactorily:
- 9.9.1 Approval of the construction plans by the City with written notification of plan approval.
- 9.9.2 Submittal of acceptable calculations and other supporting documents to the City Engineer (including progress schedule) when requested.
- 9.9.3 Approval of the detailed cost estimate by the City.
- 9.9.4 Approval of the warranty or maintenance security by the City.
- 9.9.5 Receipt of Hold Harmless Statement.
- 9.9.6 Approval of all legal documents, easements, and other documents as required by review comments.
- 9.9.7 Submittal of written approval from Benton County for the subdivision, plat, streets, and land use, etc. as may be applicable.

- 9.9.8 Submittal of evidence of issuance/approval for any required erosion control permits and plans, or other permits as may be required.
- 9.9.9 Receipt of required Engineering Plan Check and Inspection fees.
- 9.9.10 Completion of all appeal periods such as land use approval or floodplain modification notices.
- 9.9.11 Submittal of approval of plan by the Oregon Department of Human Services – Drinking Water Program (Health Division) for potable water related projects.
- 9.9.12 Submittal of approval of plan by the Oregon Department of Environmental Quality for sewer related projects.

10.0 City Engineering Plan Check and Inspection

- 10.1 The initial Plan Check and Inspection Fee deposit is based on a percentage of the City-approved estimated construction cost of the public facilities to be constructed. Applicant's Engineer shall prepare a detailed cost estimate that includes all such facilities that are a part of the project. City Engineer will review the cost estimate and modifications may be required before approval of the cost estimate. The cost estimate shall be submitted along with the plans and specifications.
- 10.2 Fees are required to enable the City to thoroughly review the Applicant's plans and specifications to ensure that constructed improvements meet City Standards and comply with the planning efforts of the City. This is required when improvements are constructed that will become permanently owned and maintained by the City.
- 10.3 Periodic inspection of the construction by City representatives shall be required. No concrete shall be poured; asphalt placed, or pipe backfilled without such inspections being made and approvals given. A tentative schedule for inspection shall be established when the permit is issued. The permit holder shall give the City a minimum of 2 working days advance notice before inspections fall due. It shall be the permit holder's responsibility to obtain City inspections and approvals before covering work.
- 10.4 The Plan Check and Inspection Fee deposit will initially be set at 5% of the construction cost with a minimum fee as stated in the Fee Schedule. Half of the fee is due upon submission of the final plans for approval and the other half is due upon approval of the final plans.
- 10.5 The final total fee will be determined by the level of effort required by the City in reviewing plans and providing inspections. Should the Applicant have well prepared plans and specifications that require little or no changes, and Applicant provides suitable inspection such that extensive inspection by the City is not required, the initial deposit may not be fully used and the remaining balance will

be returned to the Applicant. Should review and inspection required by the City exceed the initial deposit fee; the Applicant will be required to pay an additional deposit before work can continue. In all cases, the total fee will cover the City's actual expenses for Engineering plan review and inspection and Planning Reviews.

11.0 Project Acceptance

- 11.1 The City shall provide the permit holder a letter formally accepting the improvements for City ownership, operation and maintenance subject to the usual exception as to the 1-year guarantee on materials and workmanship, when the following conditions are met:
- 1) Construction is complete.
 - 2) The City has inspected the finished work and found it acceptable.
 - 3) The permit holder's Engineer submits a certificate of completion.
 - 4) The permit holder's Engineer submits "as-built" Record Drawings according to the requirements herein.
 - 5) Copies of satisfactory passage of water line leakage tests, hydrostatic tests, air tests, deflection tests, and other quality control tests have been furnished to the City.
 - 6) The permit holder furnishes the City with a copy of a non-lien affidavit certifying that all bills in connection with the work have been paid in full.
 - 7) Satisfactory provisions have been made in the form of recorded plats or easements to ensure the City's access to the public works facilities for purposes of operation and maintenance.
 - 8) City furnished copy of legal release from any claims of injury or property damage relating to the project.
- 11.2 The Developer shall provide the City with a maintenance or warranty bond or other appropriate security in the amount of 20% of the total improvement costs to serve as a one-year security for the warranty period.

12.0 Improvement Agreement

- 12.1 If a developer desires to defer construction of a portion of the public works improvements to be constructed, and if such deferral is determined by the City to have no adverse effect on the City's interests, the developer shall enter into an appropriate Improvement Agreement with the City. Said improvement agreement shall set forth completion dates for the items of work to be deferred, and it shall constitute an assurance that all improvements will be made in a timely manner.

- 12.2 As a condition of the Improvement Agreement, Applicant shall provide a completion bond or other written guarantee acceptable to the City in the amount of 120% of the construction cost of the deferred improvements. Bond shall list the City as the Obligee and the Developer as the Principal.
- 12.3 The City Council may impose other conditions of approval of such deferments.

13.0 Other Conditions

- 13.1 Issuance of a permit or acceptance of completed work does not guarantee that other City facilities will be expanded, enlarged, or altered in response to any increased demand or system loading that occurs because of the work covered under the permit.
- 13.2 The City retains the right to terminate public (City) utility service or connections to such service at any time the Applicant or Applicant's Engineer or agent fails to comply with the provisions of the City Standards, this document, or other associated permits and approvals.
- 13.3 Neither the City, or the City Engineer, assumes responsibility or liability for the Applicant or Applicants Engineer recommendations or engineering design.
- 13.4 Plan approval means that the plans have been reviewed for reasonableness and compliance with the minimum City standards. This approval does not supercede those standards unless specifically verified in writing by the City. Plan approval does not relieve the Applicant's Engineer from responsibility for errors, omissions, or deficiencies in the plans.
- 13.5 It is intended that the City will provide only spot inspections to satisfy themselves that work is proceeding according to approvals and that adequate inspection is being provided by the Applicant's Engineer. Responsibility for ensuring compliance with approved plans and specifications lies with the Applicant. Should the City feel that inadequate inspection is being provided; the City may issue a stop-work order, or may provide a City representative to inspect the work more regularly. Should additional City inspection be required beyond the normal spot inspections, the Applicant fees for inspection may increase. Applicant's Engineer shall provide a tentative construction schedule to allow City to plan spot inspection dates and times.

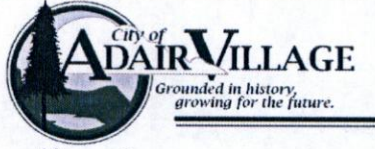
Guidelines for Development Engineering Policy

Sample Forms

Development Permit Application
Public Improvement Project Performance Bond
Public Improvements Warranty Bond
Hold Harmless
Resolution Adopting Form
Development Review Administration Flow Chart

City of Adair Village

6030 NE William R. Carr St
Adair Village, Oregon 97330
(541)745-5507 Fax: (541) 745-5530



Development Permit Application For Public Works Improvements

Permit Number
Date Submitted
Received By
Projected Review Date

Project Name: _____

Project Address: _____

Description of Project: _____

Number of Lots Served by Project: _____ Immediate _____ Ultimate

Development Permit Application Fee: \$25.00 Per Lot. Development Permit Reinstatement Fee: \$15.00

Fee: \$ _____

Received By: _____ Date: _____ Check No. _____

Easements Required: Yes No Tax Lots: _____

Applicant / Owner	Engineer / Designer
Name	Name
Address	Address
City/Zip	City/Zip
Phone	Phone
	License #

Contractor: _____ CCB #: _____

Address: _____ Phone: _____

City / Zip: _____

Applicant Signature: _____ Date: _____

Estimated Construction Cost: \$ _____

Approved Estimated Construction Cost: \$ _____

Plan Check/Inspection Fee: \$ _____

(\$2,000.00 minimum or 5% of approved estimated public facilities construction cost)

Initial Deposit (1/2 of total fee, due at time of plan submission): \$ _____

Received By: _____ Date: _____ Check No. _____

Balance Deposit (1/2 of total fee, due upon final plan approval): \$ _____

Received By: _____ Date: _____ Check No. _____

Permit Approved By: _____ Date: _____

Additional Plan Check and Inspection Fees may be necessary as described in the "Engineering Policy – Guidelines for Development" document. Conditions of Permit: All work shall be done in accordance with all applicable provisions of Federal, state, and local law, ordinance, and administrative rules. All work shall conform to City Standards. Applicant shall indemnify, defend, and save harmless the City of Toledo, its officers, employees, and agents from any and all claims arising out of or in connection with any work done under this Permit.

Check List

Plan Review

- City received evidence of County approval for (as required) Date: _____
- Plans and Specifications submitted by the Owner/Developer Date: _____
- Site plan (showing existing underground utilities, wells etc and proper separation)
 - Storm sewer analyses (as required) provided
 - Receiving sanitary sewer analysis provided
 - Design Criteria list provided
 - Specifications
 - All easements and right of ways shown (15 foot minimum easement width)
 - Detail sheets (Manholes, cleanouts, trench, appurtenances etc.)
 - Plan and profile sheets (line size, pipe material, lengths, slope, depth, manhole invert and lid elevations)
 - Grading/fill plan provided
- Grading / Fill permit required Yes No
- Heavy Haul permit required Yes No
- Estimated construction cost received from Developer/Owner Yes No
- Construction cost estimate approved by the City Yes No
- Preliminary plan review fee received from Developer/Owner Date: _____
- Plans and Specifications submitted to City Engineer Date: _____
- City Engineer comments received and returned to Developer/Owner Date: _____
- Final development plans submitted to the City Date: _____
- (Three sets of plans and specifications)
- Plans submitted to DEQ for review Date: _____
- (Developer/Owner to pay DEQ review fee)
- Current Land Us Compatibility (LUCS) provided to City on parcel Date: _____
- NPDES 1200C-Storm water permit included within submittal Date: _____
- (Sites of 1 acre or more in size)
- DEQ letter of approval obtained Date: _____
- Drinking Water Program approval obtained Date: _____
- Public Liability Insurance Certificate received Date: _____
- Hold Harmless Statement received Date: _____
- City issues approval of plans for construction purposes Date: _____
- Final plan review fee received from Developer/Owner Date: _____
- Construction schedule (for spot inspections) received Date: _____
- Project to begin by: Date: _____
- Estimated project completion: Date: _____
- City representative to conduct site visits during construction Yes No
- Project Developer/Owner Engineer present at construction Yes No
- Documentation of field test(s) received by City Yes No
- Waterline leakage test Date: _____
 - Hydrostatic test Date: _____
 - Air test Date: _____
 - Deflection test Date: _____
 - Other (as required) Date: _____

Project Completion / Acceptance

- Project Construction completion date Date: _____
- City has completed final inspection and found it acceptable Date: _____
- Permit holders Engineer submits certification of completion and that construction is in accordance with the plans and specifications
 Date: _____
- Three copies of as built plans received by the City Date: _____
- Non-lien affidavit received by the City Date: _____
- Required off-site easements obtained and recorded Date: _____
- Warranty or maintenance bond provided to City Date: _____
- Final approval from City Engineer received Date: _____
- Total (actual) cost of Public Works construction \$ _____

Permit /project check list is intended to provide a general guidelines in the development planning process and is not guaranteed to be complete. The City of Toledo is committed to assisting a developer in completing the planning process in as timely and efficient many as possible.

NOTES:

**PUBLIC IMPROVEMENT PROJECT
PERFORMANCE BOND**

KNOW ALL MEN BY THESE PRESENTS:

That we, insert name of developer here, as Principal, and insert name of bonding company here, a Corporation organized and doing business under and by virtue of the laws of the State of _____ and duly licensed to conduct a general surety business in the State of Oregon, as Surety, are held and firmly bound unto the City of Adair Village, Oregon as Obligee in the sum of

120% of Improvement Cost (\$ _____)
dollars for which payment, well and truly to be made, we bind ourselves, our heirs, executors and successors, jointly and severally firmly by these presents.

THE CONDITIONS OF THE OBLIGATION IS SUCH THAT:

WHEREAS, the above named Principal, as a condition of the Development Permit for development of insert project title here, entered into an Improvement Agreement with said Obligee to complete the improvements specified in said Agreement within the permitted time frame and in compliance with City of Adair Village standards and requirements.

NOW THEREFORE, the condition of this obligation is such, that if the above Principal shall well and truly perform said agreement during the original term thereof or of any extension of said term that may be granted by the Obligee with or without notice to the Surety, this obligation shall be void, otherwise it shall remain in full force and effect.

IN WITNESS WHEREOF, the seal and signature of said Principal is hereto affixed and the corporate seal and the name of the said Surety is hereto affixed and attested by its duly authorized Attorney-in-fact _____,
this _____ day of _____, 20____.

PRINCIPAL

SURETY

by: _____

by: _____

(This document required only if Developer enters into an Improvement Agreement for deferred improvements or as otherwise required by the City of Adair Village)

PUBLIC IMPROVEMENT PROJECT
WARRANTY BOND

KNOW ALL MEN BY THESE PRESENTS:

That we, insert name of Developer or Contractor here as Principal, and insert name of Surety here, a Corporation organized and doing business under and by virtue of the laws of the State of _____ and duly licensed to conduct a general surety business in the State of Oregon, as Surety, are held and firmly bound unto the City of Adair Village, Oregon as Obligee in the sum of

20% of Improvement Cost (\$ _____)
dollars for which payment, well and truly to be made, we bind ourselves, our heirs, executors and successors, jointly and severally firmly by these presents.

THE CONDITIONS OF THE OBLIGATION IS SUCH THAT:

WHEREAS, the above named Principal, as a condition of the Development Permit for development of _____, has agreed to properly complete said project in compliance with City of Adair Village standards and requirements.

WHEREAS, the above named Principal, as a condition of the Development Permit shall guarantee replacement and repair of improvements related to said project for a period of one year following final acceptance of said improvements;

NOW THEREFORE, if the above Principal shall indemnify the Obligee for all loss that Obligee may sustain by reason of any defective materials or workmanship which become apparent during the period of one year from and after acceptance of the said improvements by Obligee, then this obligation shall be void; otherwise it shall remain in full force and effect.

IN WITNESS WHEREOF, the seal and signature of said Principal is hereto affixed and the corporate seal and the name of the said Surety is hereto affixed and attested by its duly authorized Attorney-in-fact,

This _____ day of _____, 20____.

Principal

Surety

Principal Signature

Attorney-in-Fact

HOLD HARMLESS

To the fullest extent of the law, *insert name of prime contractor here*, hereinafter referred to as Contractor, will defend, indemnify and hold harmless the City of Adair Village, its officials, employees, servants, and agents from and against all claims, demands, and judgments (including attorney fees), made or recovered against them including but not limited to damages to real or tangible personal property or for bodily injury or death to any person, arising out of, or in any manner connected with the performance of work on the Project entitled *insert official name of project here*, by Contractor, its officers, employees, sub-contractors and agents.

Contractor agrees to provide insurance, as required by the City of Adair Village Engineering Policy and by the permit issued by the City of Adair Village for construction of the Project.

The insurance certificates shall be submitted to the City of Adair Village for approval prior to start of work on the Project and shall include an additional insured endorsement naming the City of Adair Village as an additional insured on the liability insurance policy.

Name of Contractor

Signature of Authorized Representative

Title

Date

COPY

**BEFORE THE CITY COUNCIL OF THE
CITY OF ADAIR VILLAGE, OREGON**

In the Matter of Adopting Public Utility)
Infrastructure Design and Material Standards and)
Engineering Guidelines for Development by the)
City of Adair Village and)

ORDINANCE 2011 - 001

WHEREAS, the City of Adair Village is empowered to set technical and managerial standards for public utility improvements within the City Limits, including water, sewer, transportation, and drainage improvements: and

WHEREAS, the City finds it necessary to establish and implement uniform engineering design and material standards to aid in the interpretation, application, and implementation of development standards; and

WHEREAS, the City finds it necessary to establish and implement uniform permit application procedures and fee schedules to allow sufficient review and inspection of development plans and specifications by City staff and the City Engineer in order to protect the integrity and function of the public infrastructure system and the level of service provided to the City's customers; now therefore

NOW, THEREFORE, THE CITY OF ADAIR VILLAGE CITY COUNCIL ORDAINS AS FOLLOWS:

Section 1. The provisions of the "Public Infrastructure Design Standards Manual" shall be adhered to for projects involving the sanitary sewer system, the water system, the transportation system, and the storm drainage system improvements within the City's area of service.

Section 2. The officers, agents, and employees of the City of Adair Village are authorized to take all actions necessary to effectuate the provisions of this Ordinance.

Section 3. Existing Section 8.200 SPECIFICATIONS FOR IMPROVEMENTS of the Adair Village Land Use Development Code is repealed and is replaced with new language below.

"The design and construction standards in the "2009 Adair Village Public Infrastructure Design Standards Manual" have been adopted in Land Use Code Section 8.700. The developer or land divider shall prepare and submit to the City for review and approval, plans and specifications in compliance with this Code and other applicable City ordinances. Where specific City standards

COPY

are lacking, the plans and specifications shall comply with the intent of this Code based upon engineering standards appropriate for the improvements proposed. These standards shall be so noted and identified in the drawings and specifications provided.”

Section 4. Existing Section 8.700 ADOPTED DESIGN AND CONSTRUCTION STANDARDS of the Adair Village Land Use Development Code is repealed and is replaced with new language below.

“The City of Adair Village hereby adopts the design and construction standards for public improvements established in the “2009 Adair Village Public Infrastructure Design Standards Manual,” for all public improvements including, but not limited to, improvements and extension of the water system, sanitary sewer system, storm drain system, and streets, sidewalks, and driveways.

The City will maintain a current copy of the City “2009 Adair Village Public Infrastructure Design Standards Manual” together with all amendments and/or addendums published and those permanent modifications made to the “Design Standards Manual.”

Section 5. Existing Section 8.800 MODIFICATIONS PERMITTED of the Adair Village Land Use Development Code is repealed. A new Section 8.800 ONE-TIME MODIFICATIONS will replace that section with new language below.

“The City may approve one-time modifications for a particular public improvement upon written request, if in the opinion of the City Engineer, the requested modification is necessary in order to complete the improvement and the modification would not adversely impact safety or the life span and quality of the system, or the maintenance and repair requirements.”

Section 6. Emergency Clause. The provisions of this ordinance are necessary for the immediate preservation of the peace, health and safety of the people of the City of Adair Village and it is in the best interests and welfare of the residents of the City of Adair Village to implement the new Code at once. Therefore an emergency is hereby declared to exist and this ordinance shall be in full force and effect upon its passage by the City Council and approval by the Mayor on the Effective Date.

COPY

Section 7. Effective Date. Passed by the City Council and approved by the Mayor of the City of Adair Village this 5th day of April 2011, the Adair Village "Public Infrastructure Design Standards Manual" shall become effective on April 5, 2011.

City of Adair Village, Oregon, April 5, 2011

CITY OF ADAIR VILLAGE

William R. Am

MAYOR

R. Foster

CITY RECORDER

Approved as to Form:

DD M
City Attorney

First Reading: March 15, 2011

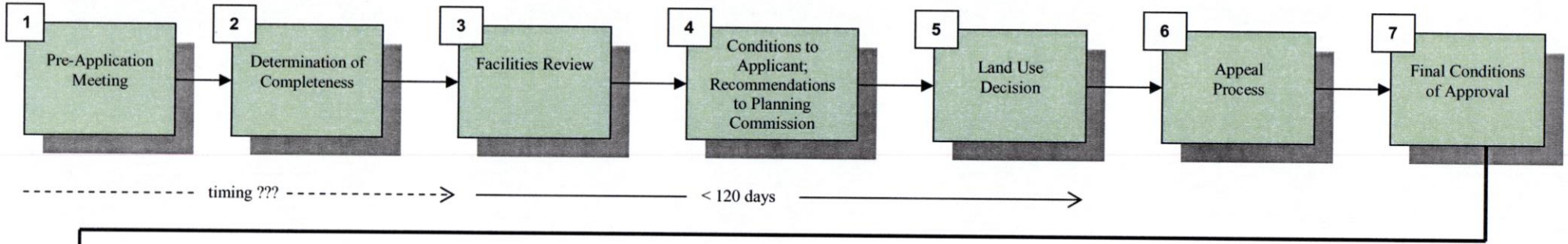
Second Reading: April 5, 2011

Recording Secretary: Drew Foster

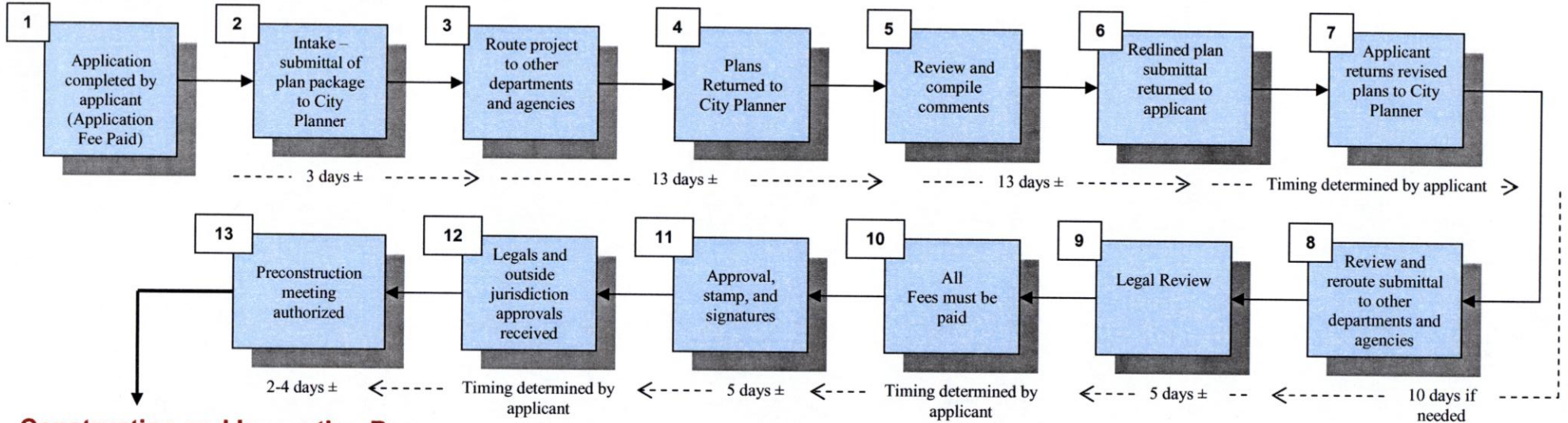
City of Adair Village - SITE DEVELOPMENT AND RELATED PROCESSES

(simplified – omits detailed steps)

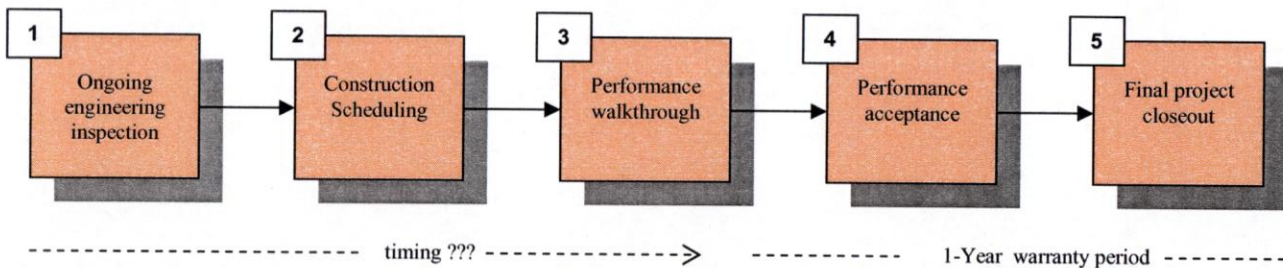
Land Use Permitting Process (If no land use planning issues apply, skip directly to Development Planning Process)



Development Planning Process

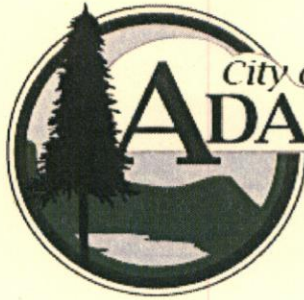


Construction and Inspection Process



“Ensuring the integrity of the City of Adair Village’s infrastructure.”

Flowchart intended to provide general overview of the planning process. Some activities are entirely within the control of the City. Others are not. Estimates of timing for individual activities are provided to assist a developer in determining the approximate amount of time the planning process is likely to take. The estimates are in no way a guarantee as to how long any project will take. The City of Adair Village is committed to assisting a developer in completing the planning process in as timely a manner as possible.



City of
ADAIR VILLAGE

*Grounded in history,
growing for the future.*

BENTON COUNTY, OREGON

DIVISION 1:
WATER SYSTEM DESIGN STANDARDS MANUAL
Guidelines for Development

Effective: July 1st, 2009

Section 1 – General Design Requirements

- 1.1 The purpose of this manual is to set standards for the design and construction to serve new and future development. This manual may be updated periodically and the design engineer shall ensure that they have the latest version.

Section 2 – Design Plan Format

- 2.1 Engineering plans and specifications shall be prepared for all public works improvements. Plans shall be clear and legible and show all improvements in sufficient detail to allow for determination of compliance with City standards, and proper field construction. City engineer or City representative may require additional detail if deemed necessary.
- 2.2 Plan shall show the location, stationing, and size of all sewer mains and services including appurtenances such as manholes, clean-outs, tees, and wyes. Stationing shall be called out for specific items to be installed. Matchlines shall be used when continuing to other sheets.
- 2.3 Profile view with stationing and elevation shall be provided for water mains. Profile shall show existing ground, finish grade, backfill class materials, pipe size and slope, and all existing and proposed utilities crossing the profile. Profile shall be generated along the water pipe centerline. Vertical separation shall be shown for crossing utilities.
- 2.4 Detail drawings shall be provided for typical trench sections, manholes, clean-outs, sewer service laterals, and others as required.
- 2.5 Project specifications shall be provided covering materials and workmanship in accordance with this document and standard engineering practice. Specifications not detailed herein shall generally conform to 2002 Oregon Standard Specifications or latest version of. All specifications shall be subject to City approval.
- 2.6 Refer to the city's "Engineering Policy – Guidelines for Development" document for additional requirements and submittal procedures.

Section 3 – Water System Design Requirements

- 3.1 Minimum size for new water mains is 6-inches unless otherwise approved. Water pipe sizes shall also conform to the requirements in the latest Water System Master Plan. Hydraulic calculations shall be provided to show that pipe size is adequate for conveying fire flows during peak demand periods for each specific development.
- 3.2 Peak domestic water demand used in calculations shall be at least 10 gpm per single family dwelling or EDU for developments with 1-10 lots, 5 gpm for 10-25 lots, and 3 gpm for larger developments.
- 3.3 Minimum depth of cover is 36-inches over top of pipe barrel. Individual water services shall have at least 30-inches of cover.

- 3.4 Water piping shall be located 10 feet horizontally away from any sanitary sewer mains or laterals when possible. Vertical separations less than 18-inches shall not be designed into new improvements. All water line and sewer line shall be separated in accordance with OAR 333-061-0050 provisions.
- 3.5 Permanent utility easements shall be provided granting the City access to the public water system improvements for future maintenance and repair. Minimum easement width is 15 feet for a single pipeline at normal depths. Waterlines shall be located at the center of the easement except where the public portion of an individual service terminates at the edge of the easement. Wider easements may be required for deep piping.
- 3.6 Creation of dead-end water mains shall be avoided by looping new piping to connect to existing system piping in at least two locations. If a dead-end is allowed by the City for unusual cases, a fire hydrant shall be provided at the end of the line.
- 3.7 Fire Flow and Hydrant Requirements:
- 3.7.1 A minimum flow of 1,000 gpm is required at hydrants for one- and two-family dwellings not exceeding 3,600 square feet and located greater than 10 feet apart.
- 3.7.2 Other structures or situations will require greater fire flows. Greater flow shall be determined by using the "Guide for Determination of Needed Fire Flow", latest edition published by the Insurance Services Office (ISO) to obtain an optimum public protection classification.
- 3.7.3 Fire flow is the flow rate of water supply available measured at the hydrant with at least a 20 psi residual pressure remaining at all points in the system. Sprinkler systems may require a higher flow rate
- 3.7.4 Fire Hydrants shall be located to provide easy access from streets. Hydrants shall be spaced no less than 500 feet apart. The maximum distance to any point on street or road frontage to a hydrant shall be 250 feet.
- 3.7.5 Fire flows and hydrant locations may be subject to Fire Department approval. The City reserves the right to modify fire flow requirements and hydrant spacing on a case-by-case basis. Final placement locations shall be subject to approval by the Fire Chief.
- 3.8 Provisions for system flushing of all segments of water mains shall be incorporated into the design. Flushing may be accomplished through fire hydrants and/or blow-off assemblies. A velocity of at least 5 feet per second shall be possible in the water main through the operation of the hydrant or blow-off assembly.
- 3.9 Combination air valve (CAV) assemblies shall be placed at all high points in the piping system where air could potentially accumulate. Additional valves may be required on long sections of pipe. Pipelines shall be designed to minimize the number of CAVs required.
- 3.10 Backflow prevention assemblies are required on all domestic lines for commercial buildings, all fire service lines, and all irrigation lines. Backflow prevention assemblies are also required on residential domestic service lines greater than or equal to 2-inches in

diameter, or when internal plumbing is greater than 32 feet above the water main, or when the property has a well connected to the domestic plumbing. Other instances may require backflow prevention devices when required by the City. The type of backflow prevention device required is dependent on the degree of hazard and must be approved by the City and in accordance with OAR. Device must be included in the current "Approved Backflow Prevention Assembly List" published by the Oregon Drinking Water Program. All backflow prevention devices shall be located on the applicant's property and are the property owner's responsibility to test and maintain in accordance with the manufacturer's instructions and Oregon statutes. All devices shall be installed downstream from a water meter or shall include flow detectors as applicable. Devices shall be installed as close to the water meter as possible and as directed.

3.10.1 Reduced Pressure Backflow Assemblies generally required for:

- Any tax lot with an auxiliary water supply on or available to it, including above or below ground source (wells are most common)
- Commercial buildings within industrial zones
- Medical or veterinary centers
- Dry cleaners and commercial laundries
- Any water system which has a pump to supplement pressure
- Sewage pump stations
- Irrigation systems designed to use chemical injection
- Gas stations
- Mortuaries
- Other high hazards as determined by the City

3.10.2 Double Check Backflow Assemblies generally required for:

- Any fire system or water line to a private fire hydrant (see Section 9)
- Multi-story buildings with plumbing in excess of 32 feet above the water main
- Shopping centers or large retail stores
- Restaurants or fast food establishments
- Any water service which is larger than 2-inches in diameter
- Any tax lot served by two water services
- Irrigation systems with pop-up sprinkler heads

3.11 Minimum system operating pressures shall be 20 psi at the property line during peak domestic flow conditions and simultaneous fire flows. This minimum pressure applies to the entire distribution system. All public water system improvements shall be designed to provide pressures not less than 40 psi and not greater than 80 psi during normal peak demand periods without fire flows. If minimum pressures cannot be obtained, developer must provide a high-level water system for the development area subject to The City approval. Individual private pressure reducing valves shall be provided for any service with an excess of 80 psi.

3.12 New Water Service and Metering

3.12.1 All new water services shall be individually valved and metered. Each tax lot shall have a separate water service. Minimum service line size is 3/4-inch. Commercial and industrial user service line sizing greater as required.

- 3.12.2 Services shall be perpendicular to the water main with no horizontal direction changes between the connection and the water meter. Service laterals shall be located close together for two adjoining lots to facilitate quick meter reading.
- 3.12.3 When property is subdivided or partitioned each lot shall be provided its own individual water service assembly (meter, corporation stop, meter box).
- 3.12.4 It is the responsibility of the owner/developer to provide each lot with an individual water service assembly. There shall be only one meter per box.
- 3.12.5 New construction shall have the meter box set in the sidewalks if new sidewalks are poured. If sidewalk remains untouched meter box location shall be determined by City public works operators.
- 3.12.6 There shall be a minimum of (6) inches of meter gravel (3/4 minus) in the meter box up to the underneath side of the meter. The meter gravel shall not cover the meter.
- 3.12.7 The meter box shall be set over the meter, so the meter is the center of the meter box.
- 3.12.8 City public works operators will install the customer valves at the time the meter is installed. The City will bill all the costs for parts and labor to the party requesting the installation.
- 3.12.9 There shall not be any debris (i.e. concrete screenings, wood, or trash) put or left in the meter box.
- 3.12.10 Do not concrete in the meter box.
- 3.12.11 The City public works operators will have final say in the meter box final inspection.
- 3.13 Main extensions shall be installed through new development to allow logical extension of the City waterline grid to allow future development of adjacent undeveloped or underdeveloped properties. This will include the extension of water mains in easements across the property to adjoining properties and across street frontages of the property to adjoining properties when the main is located in the street right-of-way. Property with multiple frontages will be required to extend water along all frontages. This will allow future connection without disrupting improvements constructed for the development.
- 3.14 For pipe placed on slopes steeper than 15%, restrained joint pipe or joint restraint devices shall be installed see Standard Detail Drawings.
- 3.15 A temporary connection with an approved backflow device is required for flushing and disinfection procedures. Permanent connection to the existing system shall not be made until passing disinfection results are obtained and approved by the City. See Section 8.8.
- 3.16 All details shall conform to the Standard Detail Drawings. Required items or installations for which no detail drawing exists, applicant's engineer shall submit

sufficient design data and drawings for The City's approval. All such submitted drawings may require modification prior to approval for use.

Section 4 – Water System Materials

- 4.1 All materials shall be newly manufactured. No rebuilt, reconditioned or used material will be allowed. Materials shall be made in USA unless otherwise approved.
- 4.2 All materials in contact with potable water shall be ANSI/NSF-61 listed.
- 4.3 Oregon Standard Specifications (OSS) – Means the 2002 Oregon Standard Specifications for Construction produced by ODOT and APWA, including latest revisions.
- 4.4 Concrete shall conform to OSS Section 00440, Commercial Grade Concrete. Compressive field strength shall not be less than 3,000 psi at 28 days. Maximum aggregate size shall be 1½-inches. Slump shall be between 2 and 4 inches.
- 4.5 Non-Shrink Grout. Grout shall be Sika 212, Euco N-S, Five Star, or approved equal nonmetallic cementitious commercial grout exhibiting zero shrinkage per ASTM C827. Grout shall not be amended with cement or sand and shall not be reconditioned with water after initial mixing. Nonshrink grout shall be placed and packed only with the use of an approved commercial bonding agent. Unused grout shall be discarded after 20 minutes.
- 4.6 Trench Backfill Materials
 - 4.6.1 Foundation Stabilization: 1½"-0 or 2"-0 aggregate base rock meeting OSS Sections 00641 and 02630. Required when native trench foundation material contains groundwater, or is unsuitable to provide a firm foundation in the opinion of the City Engineer.
 - 4.6.2 Pipe Bedding and Zone: ¾"-0 dense-graded aggregate, uniformly graded from coarse to fine and meeting OSS Section 02630.10.
 - 4.6.3 Class A Backfill: Native or common excavated material, free from organic or other deleterious material, free from rock larger than 3-inches, and which meets the characteristics required for the specific surface loading or other criteria of the backfill zone in the opinion of the City Engineer. If stockpiled material becomes saturated or unsuitable, Class B, C or D Backfill shall be substituted.
 - 4.6.4 Class B Backfill: ¾"-0 or 1"-0 dense-graded aggregate, uniformly graded from coarse to fine and meeting OSS Section 02630.10.
 - 4.6.5 Class C Backfill: Clean sand with no particles larger than ¼-inch.
 - 4.6.6 Class D Backfill: Pit run or bar run material, well graded from coarse to fine, with maximum aggregate size of 3 inches.
 - 4.6.7 Class E Backfill (CLSM or CDF): Controlled Low-Strength Material (cement slurry) conforming to OSS Section 00442.

- 4.6.8 Compaction: Material (except Class E Backfill) shall be compacted in multiple lifts (6-inch maximum lift) to obtain 95% of the maximum dry density as determined by AASHTO T-99.
- 4.6.9 All Backfill within public right-of-ways or within 5 feet of a traveled surface shall be Class B Backfill, except where Class E Backfill is required under pavements by Benton County.
- 4.7 Water Pipe Materials
- 4.7.1 Water mains shall generally be constructed of PVC unless ductile iron pipe is called for. Exposed piping in vaults and vault penetration spools shall be ductile iron. PVC and DI pipe shall be made in the USA.
- 4.7.2 PVC pipe, 4- through 12-inch nominal diameter shall be rigid PVC made from class 12454-A or B compounds as defined in ASTM D1784. Pipe shall be NSF 61 approved for use as water distribution piping. Pipe shall be Class 150 meeting DR18, minimum, conforming to all requirements of AWWA C900. Pipe shall integral wall-thickened bells with bonded-in elastomeric gaskets meeting ASTM F477.
- 4.7.3 PVC pipe, 14- through 30-inch nominal diameter pipe shall meet the requirements of AWWA Standard C905 and shall be NSF 61 approved for use as water distribution piping. Pipe shall integral wall-thickened bells with bonded-in elastomeric gaskets meeting ASTM F477. Joint design shall conform to ASTM D3139. Pipe shall be Class 165 meeting DR25, minimum.
- 4.7.4 Ductile iron pipe shall be Class 52 minimum thickness manufactured in accordance with ANSI/AWWA C151/A21.51 under method of design outlined in ANSI/AWWA C150/A21.50. Pipe interior shall be cement mortar lined in accordance with ANSI/AWWA C104/A21.4. External pipe coating shall be an asphaltic coating in accordance with ANSI/AWWA C151/A21.51.
- 4.7.5 Galvanized steel pipe shall be Schedule 40, hot-dipped galvanized, seamless or electric resistance welded type, standard weight, threaded fitting type, conforming to ASTM A53.
- 4.7.6 Polyethylene pipe, $\frac{3}{4}$ - through 2-inch nominal diameter shall be high-density polyethylene pressure rated pipe (PE3408) meeting cell classification 345464A and having NSF 14/61 certification. Pipe shall be compatible with IPS fittings. SIDR 7, 200 psi, meeting the requirements of ASTM D2239 and AWWA C901. Pipe shall have a 50-year manufacturer's warranty.
- 4.8 Fittings
- 4.8.1 Gray and ductile iron fittings shall be used for water main piping. Fittings shall conform to ANSI/AWWA C110/A21.10 Standard (full body) or ANSI/AWWA C153/A21.53 (compact), with 250 psi minimum working pressure rating. Fittings shall be made in the USA as manufactured by U.S. Pipe, Clow, Union, American Ductile Iron Pipe, or Tyler.

- 4.8.2 All gray and ductile iron fittings shall be cement mortar lined and seal coated inside in accordance with ANSI/AWWA C104/A21.4. Interior seal coat shall be NSF-61 certified. Exterior of fittings shall have an asphaltic coating in accordance with ANSI/AWWA C110/A21.10.
- 4.8.3 Joints and gaskets for mechanical joint fittings shall conform to ANSI/AWWA C111/A21.11 Standard. Gasket material shall be standard SBR rubber, or EPDM.
- 4.8.4 Bolts and hardware for mechanical joint fittings shall be corrosion resistant "T" head bolts and hexagonal nuts conforming to AWWA C111 and ASTM A325. Bolts and nuts for mechanical joints shall be 300 series stainless steel or Cor-Blue coated. Bolts and nuts for flanged fittings, couplings, and other fittings shall be 300 series stainless steel or Cor-Blue coated.
- 4.8.5 Flange fittings shall be faced and drilled to standard 125-pound template per ANSI B16.1 Standard unless otherwise indicated or required to connect to other 250-pound fittings. Flange gaskets shall be virgin SBR rubber, 1/8-inch thick. Gasket shall be full-face cut with holes to pass bolts.
- 4.8.6 Joint restrainers for MJ fittings shall be Megalug by EBAA Iron, or approved equal, specifically designed for the type of pipe material used.
- 4.8.7 Restrained flange adapters shall be Megaflange by EBAA Iron specifically designed for the type of pipe material used.
- 4.8.8 Red brass pipe nipples shall be seamless, M.I.P threaded, rated for 150 psi and conforming to ASTM B43 and ASTM B687. Bronze fittings shall meet the requirements of ASTM B62 with NPT threaded ends conforming to ANSI/ASME B16.15.
- 4.8.9 Galvanized iron fittings shall be 150-lb standard malleable iron fittings with NPT standard threads, conforming to ASTM A53 and ASTM A153.
- 4.8.10 Tapping Sleeves shall have ASTM A240 Type 304/304L stainless steel shell and lugs and ASTM A536 Grade 65-45-12 ductile iron flange. Bolts shall be ASTM A193 Type 304 stainless steel. Nuts shall be ASTM A194 Type 304 stainless steel, heavy hex, coated. Gaskets shall be SBR per ASTM D2000 MAA 610 compounded for water service. Romac Industries "SST", or approved equal.
- 4.8.11 Couplings shall have ASTM A536 Grade 65-45-12 ductile iron center sleeves and end rings. Bolts and nuts shall be trackhead, heavy hex, rolled thread, high strength, low alloy, corrosion resistant steel per AWWA C111. Gaskets shall be SBR per ASTM D2000 MBA 710, compounded for water service.
- 4.8.12 Service brass shall only be as shown in the Standard Details and as otherwise approved.

4.9 Valves

- 4.9.1 Valves shall be placed at logical locations in accordance with the minimum locations shown in the standard details. Valves shall be sized equivalent to the water piping adjacent to the valve. Valves 8-inch and smaller shall be gate valves. Valves 10-inch and larger shall be butterfly valves. Valves shall be approved by the City through submittals.
- 4.9.2 Gate Valves 2-inch through 8-inch shall be iron bodied, resilient wedge, non-rising stem (NRS), O-ring sealed, fusion bonded epoxy lined and coated valves conforming to the latest revision of AWWA C509. Valves shall have a 200 psi working pressure (water, non-shock) rating. Valve ends shall be mechanical joint or flanged joint as applicable. Furnish with standard 2-inch square operating nut when buried and handwheel operator where exposed. Bonnet bolts shall be stainless steel.
- 4.9.3 Butterfly Valves shall be rated for buried service and meet the requirements of the latest revision of Class 150B, AWWA C504. Valves shall have cast iron body, ASTM A126 Class B, resilient Buna-N rubber seat and cast iron disc with stainless steel contacting edge. Shaft shall be 18-8 type 304 stainless steel conforming to ASTM A276. Valve ends shall be mechanical joint or flanged joint as applicable. Furnish with standard 2-inch square operating nut when buried and lever operator where exposed.
- 4.9.4 Bolts and nuts for buried valves shall be 300 series stainless steel or Cor-Blue coated.

4.10 Hydrants

- 4.10.1 Fire hydrants shall meet or exceed AWWA C502, latest revision for dry barrel fire hydrants. Rated working pressure shall be 250 psig. Test pressure shall be 500 psig.
- 4.10.2 Nozzle section, upper and lower standpipes, and hydrant base shall be ductile iron. All exterior fasteners below grade shall be stainless steel.
- 4.10.3 Main valve closure shall be compression type, opening against the pressure and closing with the pressure. Seat diameter shall be 5¼ inches. The seat shall be bronze threaded into bronze mating material for easy field repair.
- 4.10.4 Nozzle section shall be designed for easy 360 degree rotation by the loosening of no more than 4 bolts.
- 4.10.5 Hydrant shall be designed so that removal of all working parts can be accomplished without excavating.
- 4.10.6 The draining system shall be bronze and be positively activated by the main operating rod. Hydrant shall have a sliding bronze drain valve.

- 4.10.7 Hydrant shall have an internal travel stop nut in the top housing. Operating threads shall be factory lubricated and be O-ring sealed from water, moisture, and dirt.
- 4.10.8 Hydrant shall be of the traffic type. A frangible barrel and rod coupling designed to break upon traffic impact will protect the hydrant and connecting piping. Main valve shall remain closed upon impact.
- 4.10.9 Upper operating nut shall be ductile iron, 1½-inch pentagon standard. Opening direction shall be counter-clockwise (CCW).
- 4.10.10 Hydrant shall have two (2) 2½-inch hose nozzles, and one (1) 4½-inch pumper port. 4½-inch threads shall be NST standard. All threads shall conform to NFPA National Standard Fire Hose Coupling Screw Threads.
- 4.10.11 Hydrant bottom connection shall be 6-inch nominal diameter mechanical joint. Flange joint may be approved in some cases due to space constraints.
- 4.10.12 Hydrants shall be painted yellow. Field touch-up will be required if scratched or marred.
- 4.10.13 Hydrants shall be Kennedy Guardian.
- 4.11 Miscellaneous Materials
 - 4.11.1 Tracer wire shall be No. 10 AWG, solid or stranded copper with blue colored insulation. Insulation shall be 30 mil thick HDPE designed for direct bury.
 - 4.11.2 Warning tape shall be 6-inch wide, 4-mil thick, blue color, reading "CAUTION – WATERLINE BURIED BELOW."
 - 4.11.3 Other materials not covered herein should generally conform to the 2002 Oregon Standard Specifications and are subject to The City's approval. Service brass shall be as shown in the standard detail drawings.

Section 5 – Water System Installation

- 5.1 Prepare trench in accordance with the standard detail in a safe manner. Place and compact foundation stabilization materials as required. Notify City to allow for inspection of trench bottom.
- 5.2 Place and compact pipe bedding material before placing pipe in the trench. Dig depression for pipe bells to provide uniform bearing along the entire pipe length. Thoroughly compact bedding material.
- 5.3 Prior to lowering pipe into the trench, the Engineer and City's representative will check for damage to the pipe. The Contractor shall repair or replace, as directed, all damaged or flawed pipe prior to installation.

- 5.4 PVC pipe shall be installed and handled in accordance with the Uni-Bell Plastic Pipe Association standards UNI-B-3, AWWA C605, these specifications and the manufacturer's installation guide. The Contractor shall have on site all proper tools and equipment to properly and safely install the pipe.
- 5.5 Thoroughly clean inside the pipe before laying. Prevent foreign material from entering the pipe while it is being placed in the trench. Remove all foreign material from the inside of the pipe and joint before the next pipe is placed. Keep debris, tools, rags or other materials out of the pipe at all times. When pipe laying is not in progress, cover the exposed end of the pipe using a watertight expanding plug, or by other approved means to prevent entry of trench water or other foreign materials into the pipe.
- 5.6 Lay pipe with bell ends facing the direction of laying. For lines on an appreciable slope, face bells up-grade unless otherwise directed by the City.
- 5.7 Thoroughly clean the ends of the pipe to remove all foreign matter from the pipe joint. Lubricate the bell and spigot ends with NSF approved pipe lubricant, as recommended by the manufacturer. Furnish the gaskets required for the joint being assembled. Install the gasket with uniform tension around the joint groove before placing the pipe in the trench.
- 5.8 Provide concrete thrust blocking at all bends, valves, tees and other fittings in accordance with the Plans, as required to prevent movement due to thrust. Mechanical joint restraints shall also be installed.
- 5.9 At no time shall pipe be deflected, either in the vertical or horizontal plane, in excess of the maximum deflection recommended by the pipe manufacturer. Deflection at any joint shall not exceed $2\frac{1}{2}^{\circ}$. Maximum deviation from grade shall not exceed $\frac{1}{2}$ -inch.
- 5.10 Where new water pipe is installed near existing or new sanitary sewer lines, all provisions of current OAR 333-61-050 (Crossings – Sanitary sewers and waterlines), regarding placement of pipe near, under, or over sanitary sewer lines shall be followed.
- 5.11 Tracer wire shall be brought to the surface and connected at each valve box. All joints and/or splices in the wire shall be made with a designed waterproof splice kit. Wire shall be taped to pipe every 5 feet and shall be run straight with a small amount of slack.
- 5.12 Place materials in the pipe zone in layers not greater than 6 inches thick and in a manner that equalizes the pressure on the pipe and minimizes stress. As required under the haunches of pipe and areas not accessible to mechanical tampers or to testing, compact with hand methods to ensure thorough contact between the material and the pipe. Before placing the pipe zone material, condition, aerate, or wet the material so that the moisture content of each layer is within minus 4% to plus 2% of optimum moisture content.
- 5.13 Provide proper Backfill Class material as required. Backfill the trench above the pipe zone in successive lifts. Do not allow the backfill to free-fall into the trench until at least 3 feet of cover is provided over the top of the pipe. Modify the compaction as necessary to protect the pipe. Compact each lift to not less than 95% of the maximum density.
- 5.14 Warning tape shall be placed over the pipe zone material, approximately 15 to 18 inches below finish grade, in accordance with the Standard Detail Drawings. Lay tape flat and untwisted, centered over the pipe and with wording facing upwards.

- 5.15 If the specified compaction is not obtained, contractor shall remove material, modify compaction procedures, and/or reduce the thickness of lifts as required. Do not proceed with additional excavation or pipe laying until the backfill can be compacted to the satisfaction of the City.
- 5.16 CLSM. When CLSM Backfill is required, backfill above pipe zone with CLSM material. If the CLSM is to be used as a temporary surfacing, backfill to top of the trench and strike off to provide a smooth surface. If CLSM is not to be used as a temporary surface, backfill to bottom of the proposed resurfacing. Use steel plates to protect the CLSM from traffic a minimum of 24 hours. Comply with Benton County requirements.
- 5.17 Restore all surfaces after backfill is complete. Base rock, asphalt paving and concrete paving methods and materials shall conform to Oregon Standard Specifications as approved by the City and Benton County.
- 5.18 Do not make permanent connections to existing mains until disinfection is completed. A temporary connection with an approved backflow device is required for flushing and disinfection procedures. Permanent connection to the existing system shall not be made until passing disinfection results are obtained and approved by the City.
- 5.19 Filling and Flushing. After installation of water piping, fill pipes slowly with potable water at a maximum rate of 500 gpm while venting all air. Take all required precautions to prevent entrapping of air in the pipes. Flush all sections of pipe to remove any solids or material that may be in the pipe. If no hydrant is installed at the end of the main, provide a tap large enough to develop sufficient flow rates to achieve a velocity of at least 5 feet per second in the main. If sufficient velocity cannot be obtained, pigging is required. Control and dispose flushing water in a proper manner to avoid erosion, flooding, property damage, and discharge of chlorinated water in an unacceptable manner.
- 5.20 Pigging
- 5.20.1 If a flushing velocity rate of 5 fps is not attainable with the available pipe configuration or fittings, the new piping shall be pigged to obtain a cleansing flush of the piping.
- 5.20.2 Pigging shall be accomplished with at least three (3) polyurethane foam pigs designed for cleaning of waterline piping. Pigs shall be as manufactured by Knapp Polly Pig, Inc. or approved equal.
- 5.20.3 The Contractor shall have the option to run a single pig three times or to run three separate pigs at the same time. If the pigs are rammed at the same time, they shall be numbered so as to identify them when they are ejected from the piping.
- 5.20.4 Necessary fittings, ejection ports, and other facilities shall be designed and shown on the plans.
- 5.20.5 Contractor shall provide adequate erosion control means to prevent damage from the flushing or pigging process.

- 5.20.6 The City's inspector shall be given 48 hours notice prior to pigging beginning and shall be on-hand to observe and approve the pigging procedure and process that is utilized.
- 5.20.7 If after pigging the new line the bacteriological test fails, the line shall be re-pigged and retested.
- 5.20.8 Pigging can be used as an option to flushing at the Contractor's discretion.
- 5.21 Testing and Disinfection. After flushing, water system shall be tested for leakage and disinfected according to the following Sections. Provide all temporary taps as required. All items not passing tests shall be repaired or replaced as required.

Section 6 – Water System Pressure (Hydrostatic) Testing

- 6.1 All waterlines and service lines shall be subjected to hydrostatic pressure testing. Testing shall be conducted by the Contractor in the presence of the Engineer. City must be notified at least 2 working days in advance.
- 6.2 Testing shall not be commenced until all thrust blocking has been in place for not less than **10 days** and sufficient backfill has been placed to prevent pipe movement.
- 6.3 Furnish and operate all pumps, gauges, plugs, saddles, corporation stops, miscellaneous hose and piping, and measuring equipment necessary for performing the test. Provide certifications of accuracy for gauges from an approved laboratory when requested.
- 6.4 Test Procedure
- 6.4.1 The test section shall be filled with water and all air expelled from the pipe prior to testing. City will provide water for testing at a time of day when sufficient quantities of water are available for normal system operation.
- 6.4.2 All valves isolating the test section shall be securely closed and the specified test pressure applied by means of a pump connected near the lower end of the test section.
- 6.4.3 The test pressure shall be **150 psi** and the duration shall be at least **2-hours** at the test pressure. Provide additional pumping during the test period to continuously maintain pressure within 5 psi of that required. Use a clean container of potable water to supply the pump.
- 6.4.4 Accurately determine the quantity of water required to maintain and restore the required pressure at the end of the test by pumping through an approved positive displacement water meter.
- 6.4.5 The allowable leakage rate for the test section shall be determined from the following formula:

$$L = \frac{SD\sqrt{p}}{148,000}$$

L = allowable leakage (gph)
S = length of pipe tested
D = nominal diameter of pipe (inches)
p = average test pressure during test (psi)

- 6.4.6 If the amount of water added to the section exceeds the allowable leakage, the Contractor shall, determine the source of leakage, repair or replace the defective elements, and repeat the test until the allowable leakage requirements have been satisfied.
- 6.4.7 All visible leaks on new waterlines shall be repaired, regardless of the amount of leakage.
- 6.4.8 Make all tests with hydrant auxiliary gate valves open and pressure against the hydrant valve. After the pipe test is completed, test each gate valve in turn by closing it and relieving the pressure beyond. This test of the gate valve is acceptable if there is no immediate loss of pressure.

Section 7 – Water System Disinfection

- 7.1 All lines installed or modified under this Contract shall be sterilized prior to connection to the existing system, in accordance with the following procedure, AWWA Standards C651 through C654, and current OAR 333-61-050 (Disinfection of Facilities).
- 7.2 Prior to commencing disinfection procedures, all lines shall be flushed thoroughly to remove dirt, construction debris and other potential contaminants.
- 7.3 The Contractor shall have the option of utilizing either a liquid chlorine gas-water mixture, direct fed chlorine gas, sodium hypochlorite solution, or a calcium hypochlorite and water mixture for disinfection.
- 7.4 Disposal of chlorinated water from the reservoir tank or pipelines shall be performed in conformance with the most recent draft or edition of *Best Management Practices for the Disposal of Chlorinated Water* by the Oregon Department of Environmental Quality. Chlorinated water used for disinfection of waterlines and service lines shall not be directly disposed of into or impair the waters of the State (i.e. lakes, creeks, streams and wetlands).
- 7.5 The Contractor shall provide all equipment, materials, and workmanship required to complete the flushing and disinfection of waterlines and appurtenances.
- 7.6 Disinfection Procedure
 - 7.6.1 The Contractor shall inject chlorine solution into the beginning of the waterline through a corporation stop inserted in the horizontal axis of the pipe. Make no connections between the existing distribution system and the non-disinfected pipelines unless a State Drinking Water Program approved backflow preventer is installed in the connecting line.
 - 7.6.2 The solution shall have a free chlorine residual of at least 25 mg/L, but not more than 100 mg/L. All entrapped air shall be discharged from the line and all surfaces wetted. Chlorinated water shall be retained in the pipe for at least 24-hours. A free residual of not less than 10 mg/L shall be found in all parts of the line after the 24-hour period has elapsed.

- 7.6.3 After the 24-hour period, all valves in the mainline shall be operated and all hydrants flushed with a residual of at least 10 mg/L being found. If the residual concentration within any part of the chlorinated section is found to be less than 10 mg/L, the Contractor shall flush, rechlorinate, and retest all sections until a 10 mg/L residual is obtained.
- 7.6.4 Upon obtaining the minimum 10 mg/L residual following the 24-hour disinfection period, the Contractor shall flush the section with potable water until the chlorine residual is equivalent to the residual of the existing system water. A minimum of one sample shall then be taken from the pipe for microbiological analysis.
- 7.7 Microbiological Sampling and Analysis
- 7.7.1 The Contractor is responsible for collecting and submitting samples to a certified independent testing laboratory for microbiological analysis.
- 7.7.2 The Engineer or City representative shall be present to witness the collection of the water samples for testing. Chain of custody procedures shall be utilized during the collection and transport of samples to the laboratory.
- 7.7.3 The Contractor shall bear all costs associated with the required testing, including laboratory fees, materials required, and transportation costs. The Contractor also shall pay for all additional tests required as a result of failing to meet the bacterial limits.
- 7.7.4 If the results of the microbiological analysis indicate that the water is free of coliform organisms, the waterline may be put into service.
- 7.7.5 If the results of the microbiological analysis indicate that coliform organisms are present, then the waterline shall be flushed, rechlorinated, and retested until a coliform-free sample is obtained.
- 7.7.6 A minimum of one sample from each separable structure or pipeline shall be obtained for analysis. The presence of coliform organisms shall be determined using the Colilert 24-hour test, Method MMO-Mug, or other methods approved by the Oregon State Drinking Water Program.
- 7.8 Connections to Existing System
- 7.8.1 New waterlines shall not be connected to the existing system until passing microbiological testing results have been received. An approved double-check backflow device shall be temporarily installed and shall remain until all tests have passed. Device shall be sufficiently large to provide adequate flushing. Merely leaving a valve closed is not acceptable. After disinfection has been completed satisfactorily, the tie-in may be made. Tie-in fittings and small section of pipe shall be disinfected as specified below.
- 7.8.2 Where new waterlines connect to existing lines and the tie-in requires a portion of the new construction to be brought into service immediately upon completion of the tie-in, the new piping and appurtenances shall be disinfected by liberally

spraying or brushing on 1% hypochlorite solution (i.e. 1 gallon 5.25% bleach mixed with 4 gallons potable water), waiting 10 minutes, and then thoroughly flushing. This is generally limited to cut-in fittings.

- 7.8.3 The Contractor shall take care not to allow foreign material to enter the pipe and appurtenances during installation.
- 7.8.4 Upon completion of the tie-in, the new piping and appurtenances shall be flushed.

Section 8 – Standards for Private Fire Protection Systems

- 8.1 Fire service backflow prevention assemblies shall be installed at the property line, or edge of the public waterline easement as approved by the City. The fire service line from the public right-of-way or utility easement to the backflow assembly will be privately owned and shall meet all City standards. The delineation between the public and private line shall occur as close to the public main as possible and delineated with an in-line public valve in accordance with City standards. A backflow prevention assembly for a fire service line may be installed inside of a building if it can be done within twenty feet of the tapping valve or tee.
- 8.2 Private fire lines shall include a flow meter and vault located in the public right-of-way or utility easement. Materials and configuration shall be as approved by the City.
- 8.3 Only approved Double Detector Check Backflow Assemblies are to be used for backflow prevention on fire line services.
- 8.4 Only approved resilient seat indicating valves are allowed on fire line assemblies.
- 8.5 Installation must comply with the Oregon Uniform Fire Code as adopted and amended by the State of Oregon Fire Marshal, and City Standards.

Section 9 – Standards for Special Projects

- 9.1 The design of the following are considered special projects and are not covered in detail in this manual.
 - 9.1.1 Water Distribution Pumping Stations
 - 9.1.2 Pressure Regulating Stations
 - 9.1.3 Storage Facilities
- 9.2 Review and approval of special projects will be made on a case by case basis. Developer should coordinate early in the planning stages with the City to determine specific requirements for the site. All aspects of any special project will be designed and constructed as required by the City.
- 9.3 In general, when adequate pressures are not available by gravity through the existing system a suitable pump station is required to serve the development. Pump stations shall be designed and constructed in accordance with City requirements. When possible, pumping stations will convey water to a high level storage tank. When suitable tank elevations are not possible the City may allow hydropneumatic tank type booster pump

stations. When a storage tank cannot be provided, a fire pump will be needed in addition to the normal service pumps. Provisions for fire flows during power outages must be accommodated.

- 9.4 Pump buildings and storage tanks will have adequate site sizing and access.
- 9.5 Pumping stations will normally require 480 volt, 3-phase electrical service. Flow meters, PLC based control systems, flow and level displays, and SCADA system outputs will be required.
- 9.6 Storage tanks will have a volume equal to at least 120,000 gallons plus 600 gallons per lot served. Tanks will be glass fused to steel of a bolt together design unless otherwise approved by the City. Tanks will be designed in conformance with the latest Oregon Structural Specialty Code in effect. Access hatches, exterior aluminum and interior stainless steel ladders, and other appurtenances will be included. Tank water level will be monitored with a submersible pressure transducer. An exterior mechanical tank level device will also be required.

Guidelines for Development Water System Designs Standards Manual:

Testing and Data Sheet

Hydrostatic Pressure Test Data Sheet

City of Adair Village

6030 NE William R Carr St.
Adair Village, Oregon 97330
(541) 745-5507 Fax: (541) 745-5530



Test Date
Inspector

Hydrostatic Pressure Test Data Sheet Inspection Report Form

Project Name: _____

Contractor: _____

Test Pressure _____ (psi)

Allowable Leakage Rate (L)

$$L = \frac{SD\sqrt{P}}{148,000}$$

L = Allowable leakage (gph)
 S = Length of pipe tested (feet)
 D = Nominal diameter of pipe (inches)
 P = Average test pressure during test (psi)

Allowable Leakage Rate Calculation

	Pipe Segment Description	Length of Pipe (S)	Diameter (D) (in)	Allowable Leakage Rate (L) (gal/hr)
1				
2				
3				
4				
5				
Total Allowable Leakage Rate (gal/ hr):				

Hydrostatic Test Data

Time	Elapsed Time (min)	Pressure (psig)	Water Added (gal)	Pressure After Adding Water (psig)
	---		---	---

Total Elapsed Time: Total Water Added:

Actual Leakage Rate:

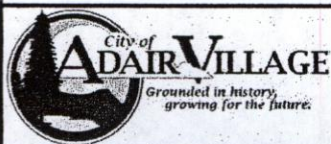
$$L_{\text{actual}} = \frac{\text{Total Water Added (gal)}}{(\text{Total Elapsed Time (min)} / 60)} = \frac{(\text{gal})}{(\text{min} / 60)} = \text{_____ (gal/hr)}$$

Actual Leakage Rate ≤ Allowable Leakage Rate? Yes No

Inspector's Signature: _____ Date: _____

STANDARD DETAIL DRAWINGS INDEX

- W-050: STANDARD UTILITY LOCATIONS
- W-100: TYPICAL WATER VALVE LOCATIONS (MINIMUM)
- W-150: TYPICAL WATERLINE TRENCH DETAILS
- W-151: STREET CUT STANDARD DETAIL
- W-170: PIPE ANCHOR / TRENCH CUT-OFF WALL DETAIL
- W-200: STANDARD WATER VALVE SETTING DETAIL
- W-205: VALVE OPERATOR EXTENSION DETAIL
- W-300: STANDARD FIRE HYDRANT ASSEMBLY DETAIL
- W-400: 2" BLOW-OFF ASSEMBLY
- W-401: 2" BLOW-OFF ASSEMBLY W/ BLOW-OFF HYDRANT
- W-405: 4"+ BLOW-OFF ASSEMBLY
- W-500: 2" COMBINATION AIR VALVE ASSEMBLY
- W-600: STANDARD 3/4" WATER SERVICE CONNECTION
- W-605: STANDARD 1" WATER SERVICE CONNECTION
- W-608: STANDARD 2" WATER SERVICE CONNECTION
- W-700: CONCRETE THRUST BLOCKING DETAILS
- W-800: REDUCED PRESSURE BACKFLOW ASSEMBLY (3/4" - 2")
- W-805: REDUCED PRESSURE BACKFLOW ASSEMBLY (2 1/2" UP)
- W-900: DOUBLE CHECK VALVE ASSEMBLY (3/4" - 2")
- W-905: DOUBLE CHECK DETECTOR ASSEMBLY (2 1/2" UP)



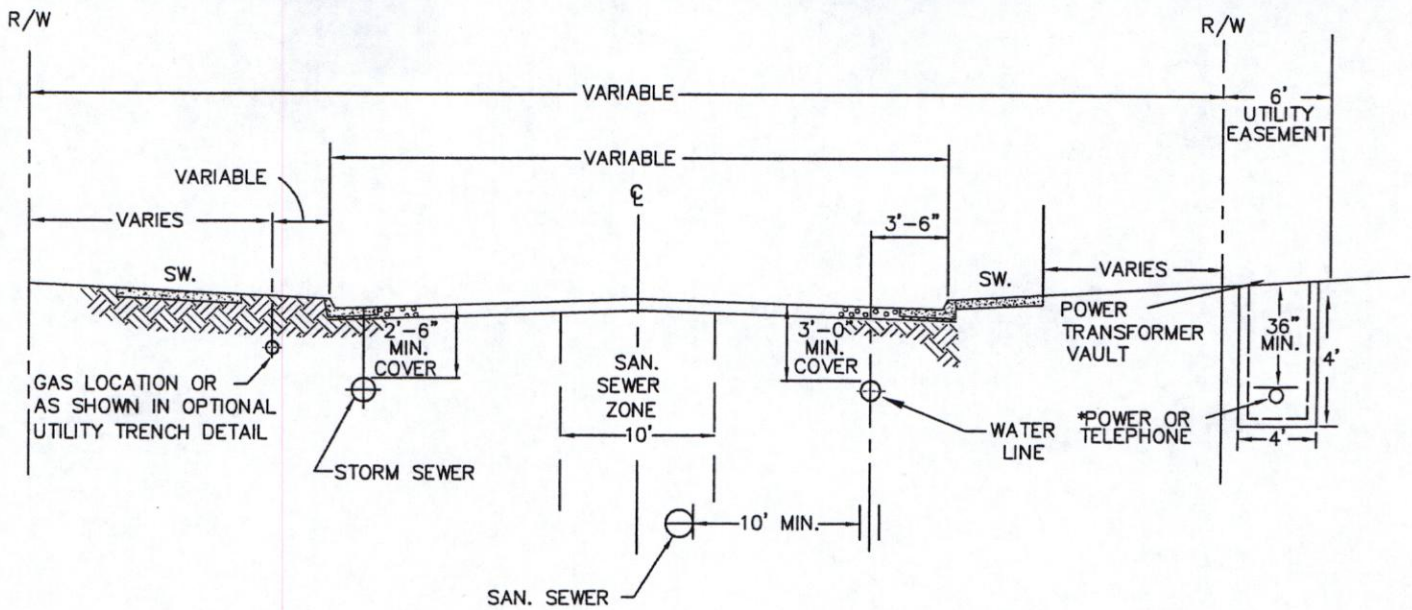
City of Adair Village
6030 NE William R Carr St.
Adair Village, Oregon 97330
(541) 745-5507 Fax: (541) 745-5530

**STANDARD DETAIL
DRAWING INDEX**

DETAIL NO.

W-010

04/29/2009



NOTES:

1. WATER LOCATED 3'-6" INSIDE FROM FACE OF CURB OR AS OTHERWISE DIRECTED.
2. 10' HORIZONTAL SEPARATION BETWEEN WATER AND SEWER WHERE POSSIBLE. COMPLY WITH SEPARATION REQUIREMENTS OF OAR 333-061-050.
3. WATER DISTRIBUTION MAINS SHALL HAVE 36" MINIMUM COVER OR AS OTHERWISE DIRECTED.
4. SEWER MAINS SHALL HAVE 5.25' (63") MINIMUM COVER UNLESS OTHERWISE APPROVED TO AVOID CONFLICTS WITH WATER AND OTHER UTILITIES.
5. WATER MAINS SHALL BE LOCATED ON NORTH OR EAST SIDE OF STREET WHEN PRACTICAL.
6. SEWER, STREETS AND DRAINAGE SUBJECT TO CITY STANDARDS.
7. MANHOLE LIDS SHALL NOT BE LOCATED DIRECTLY IN NORMAL WHEEL PATH.
8. ALL LAYOUTS AND LOCATIONS ARE SUBJECT TO CITY APPROVAL.



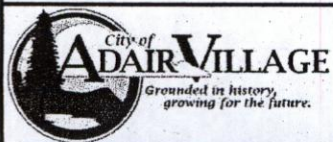
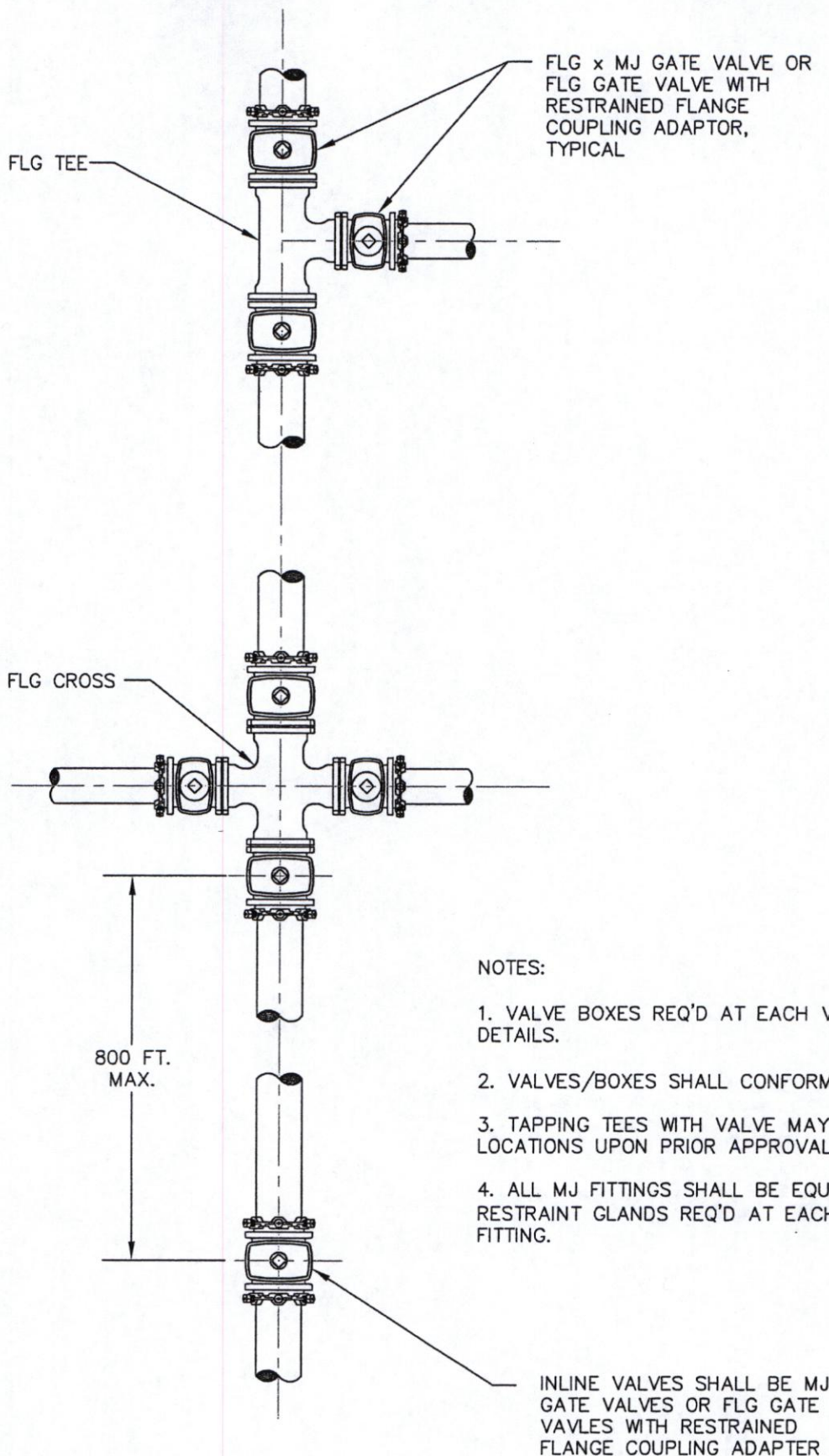
City of Adair Village
 6030 NE William R Carr St.
 Adair Village, Oregon 97330
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STANDARD UTILITY LOCATIONS

DETAIL NO.

W-050

04/29/2009



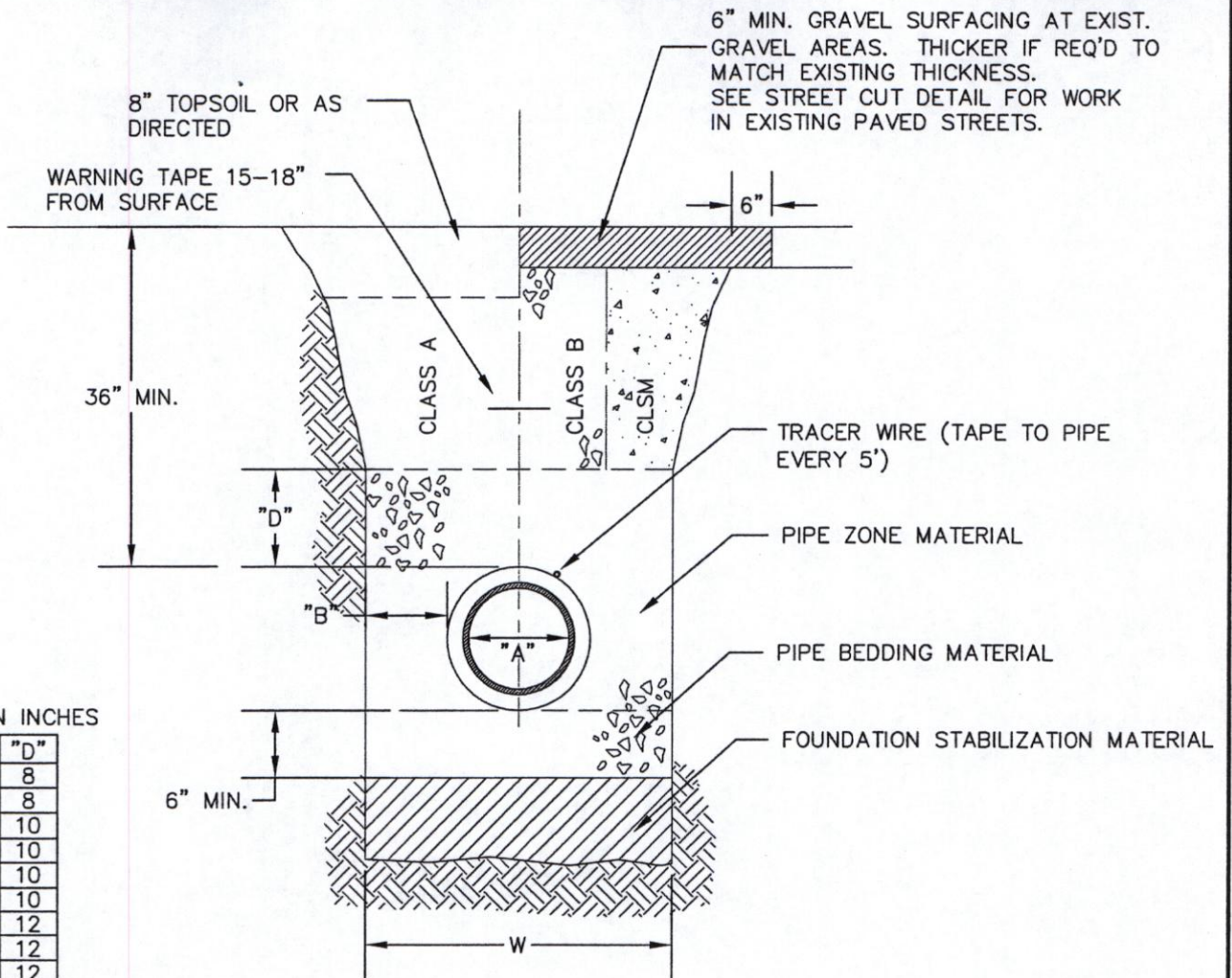
City of Adair Village
6030 NE William R Carr St.
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**TYPICAL WATER VALVE
LOCATIONS (MINIMUM)**

DETAIL NO.

W-100

04/29/2009



DIMENSIONS IN INCHES

"A"	"B"	"D"
4	10	8
6	10	8
8	10	10
10	10	10
12	12	10
14	12	10
16	16	12
18	16	12
24	18	12
30	18	12
36	24	14

NOTES:

1. TRENCH EXCAVATION SHALL BE CONDUCTED IN A SAFE MANNER WITH ALL NECESSARY BRACING AND SHORING PROVIDED FOR COMPLIANCE WITH OSHA.
2. FOUNDATION STABILIZATION SHALL BE PROVIDED WHEN MATERIAL AT BOTTOM OF TRENCH IS UNSUITABLE IN THE OPINION OF THE CITY TO PROVIDE A STABLE TRENCH BASE.
3. CONSTRUCTION IN STATE AND COUNTY RIGHT-OF-WAY SHALL COMPLY WITH STATE, COUNTY AND CITY DESIGN STANDARDS.
4. CLASS B BACKFILL REQUIRED IN ALL ROADWAYS AND TRAFFIC PATHS EXCEPT WHERE CDF BACKFILL IS REQUIRED BY COUNTY, STATE, OR CITY.
5. TRACER WIRE REQUIRED AT ALL NON-METALLIC PIPELINES. WIRE SHALL BE 10 GA. MINIMUM SOLID COPPER WIRE WITH BLUE 30 MIL THICK HDPE INSULATION RATED FOR DIRECT BURY. USE APPROVED WATERPROOF SPLICE AT ALL CONNECTIONS.
6. WARNING TAPE SHALL BE 6" WIDE, 4 MIL THICK, APWA BLUE, READING "CAUTION WATER LINE BURIED BELOW".
7. MATERIALS SHALL BE AS SPECIFIED WITHIN THE CITY DESIGN STANDARDS MANUAL.
8. COMPACT ALL FILL TO 95% MDD PER ASTM D698. SUFFICIENT COMPACTION TESTS WILL BE REQUIRED TO PROVE METHODS AND COMPACTION EFFORT IS SUFFICIENT.



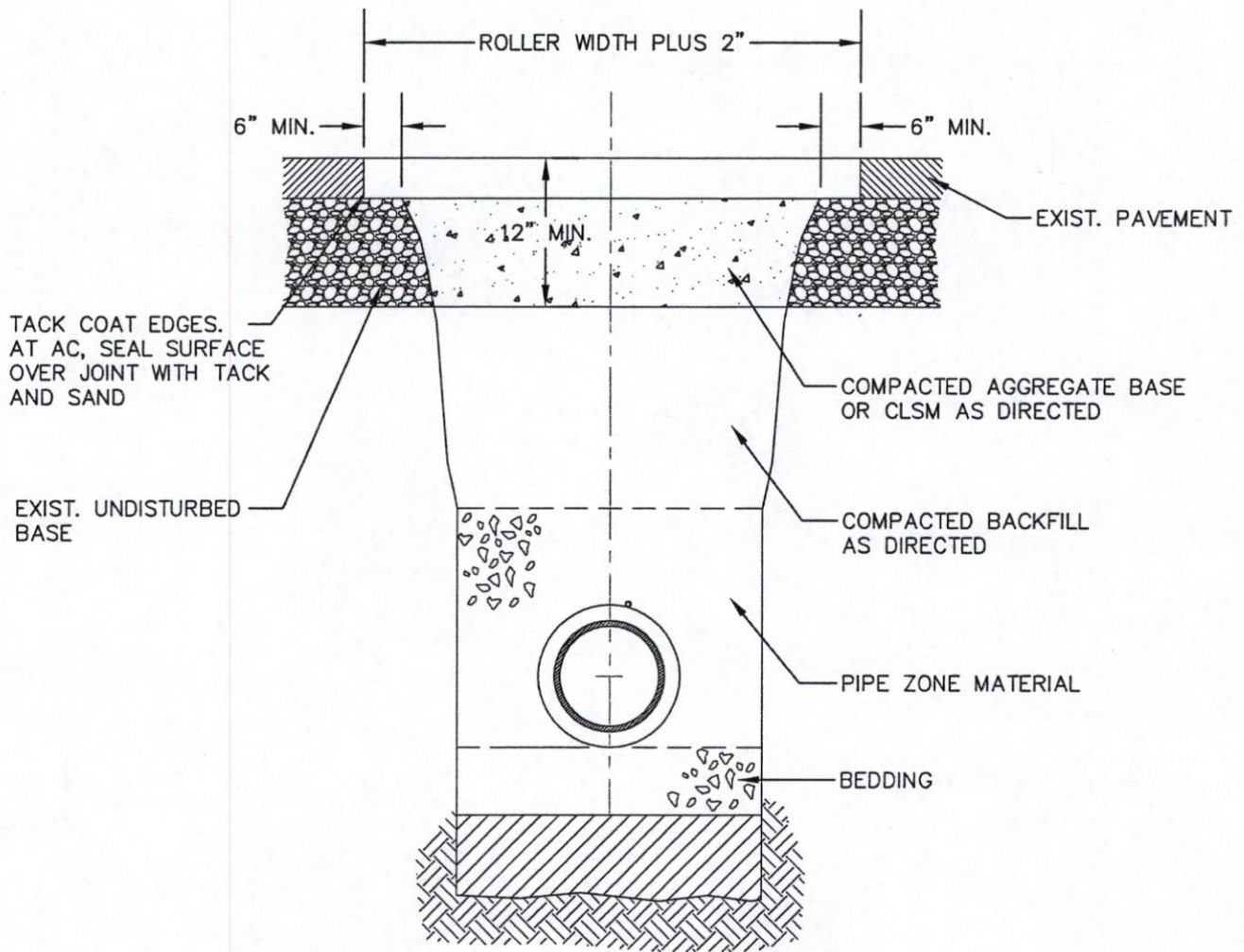
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TYPICAL WATERLINE
TRENCH DETAILS

DETAIL NO.

W-150

04/29/2009



NOTES:

1. ALL EXISTING AC OR PCC PAVEMENT SHALL BE SAWCUT IMMEDIATELY PRIOR TO REPAVING.
2. CONCRETE PAVEMENT SHALL BE REPLACED WITH CONCRETE TO A MINIMUM THICKNESS OF 6 INCHES OR TO THE THICKNESS OF REMOVED PAVEMENT, WHICHEVER IS GREATER.
3. PLACE AC MIX TO A MINIMUM THICKNESS OF 4 INCHES OR THE THICKNESS OF REMOVED PAVEMENT, WHICHEVER IS GREATER. COMPACT AS DIRECTED.
4. COMPLY WITH THE REQUIREMENTS OF THE AGENCY HAVING JURISDICTION OVER THE ROAD IN WHICH THE STREET CUT OCCURS.



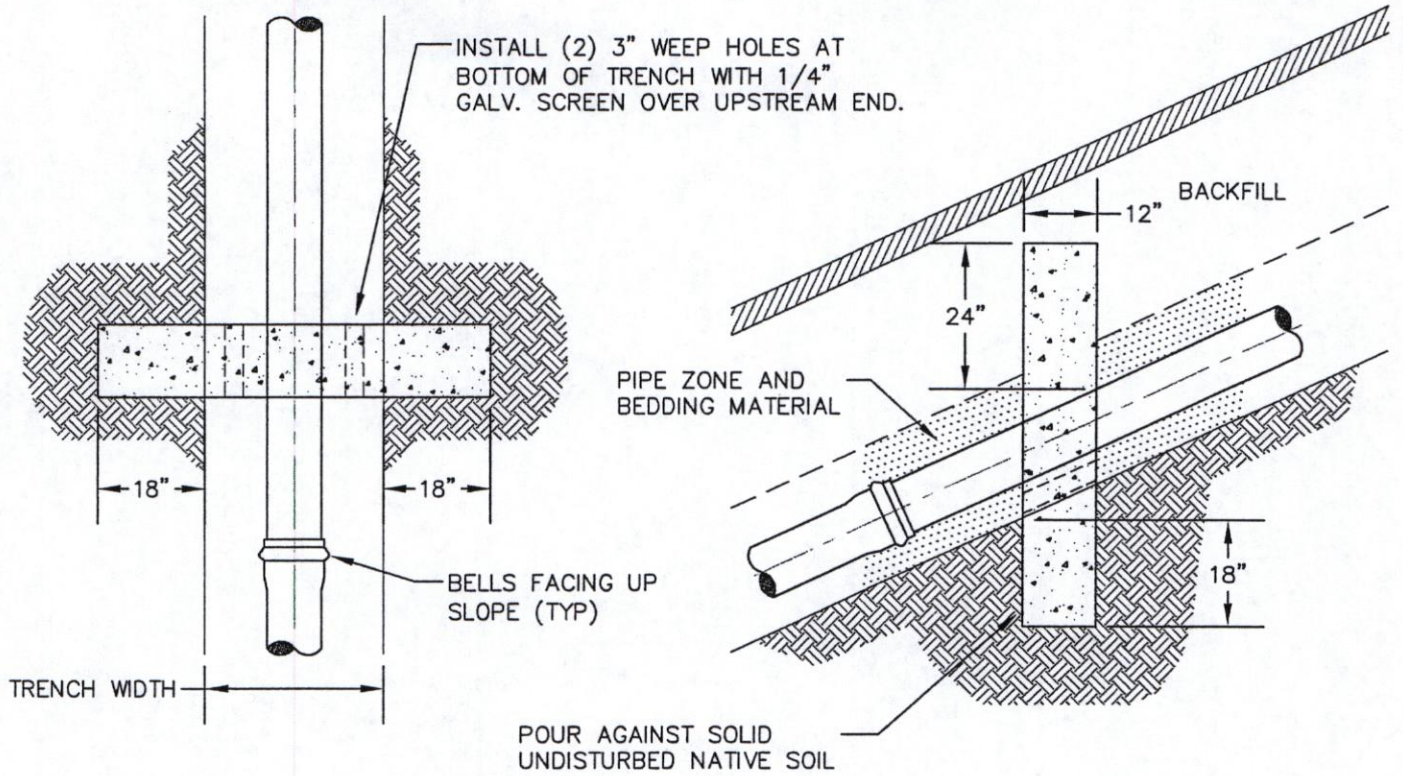
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**STREET CUT
 STANDARD DETAIL**

DETAIL NO.

W-151

04/29/2009



NOTES:

1. CUT-OFF WALLS REQ'D AT ALL PIPELINES WHERE SLOPE EXCEEDS 20%.
2. RESTRAINED JOINT PIPE REQUIRED AT SLOPES BETWEEN 15% AND 20%.
3. WALLS SHALL BE FORMED WITHIN TRENCH. REMOVE FORMS PRIOR TO BACKFILLING.
4. CONCRETE SHALL HAVE 3000 PSI COMPRESSIVE STRENGTH MIN. (CLASS 3000).

5. SPACING OF WALLS SHALL BE:

SLOPE	SPACING
20-34%	35 FEET
35-50%	25 FEET
51+ %	15 FEET



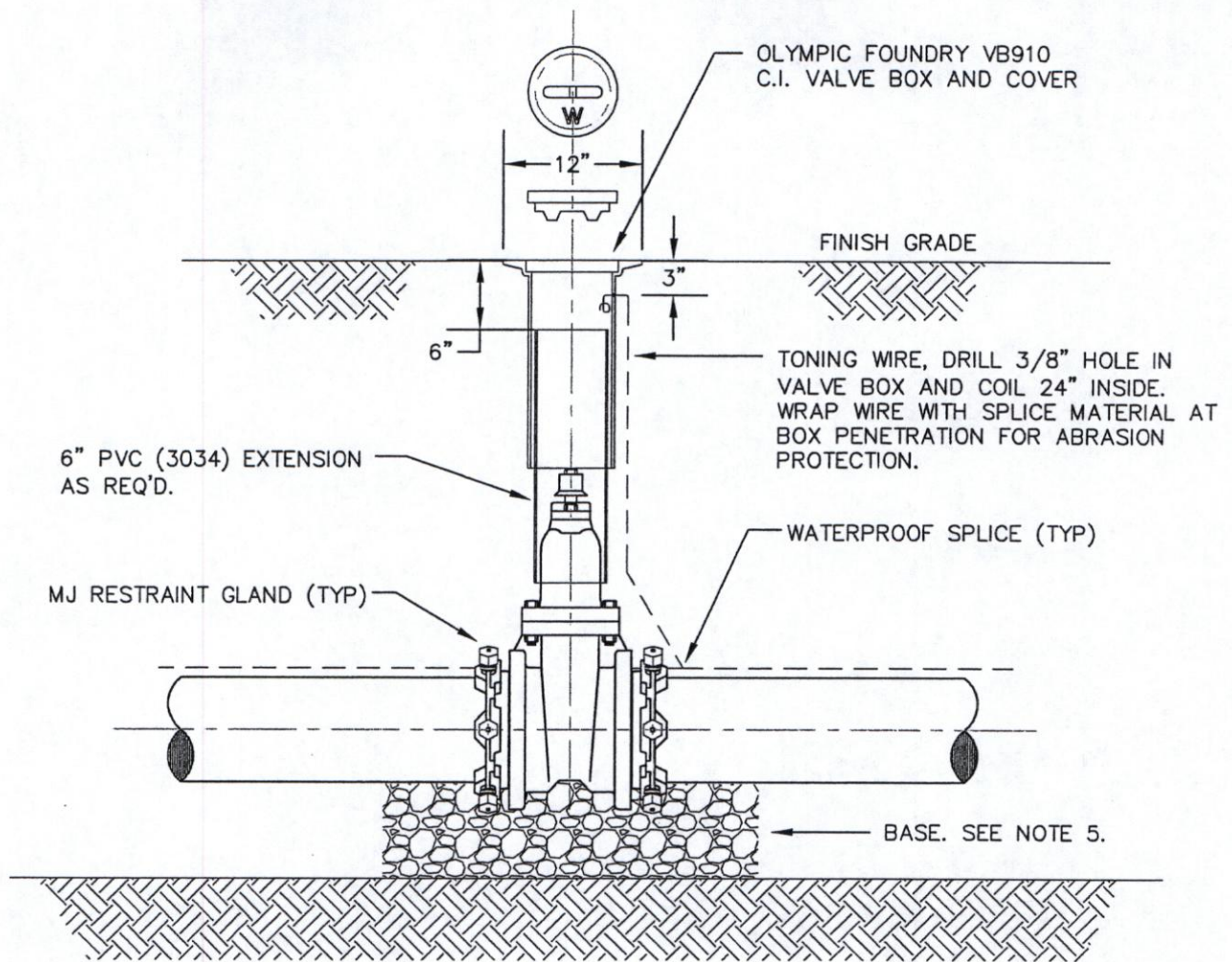
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PIPE ANCHOR / TRENCH
CUT-OFF WALL DETAIL

DETAIL NO.

W-170

04/29/2009



NOTES:

1. VALVE BOX SHALL BE CENTERED OVER VALVE OPERATING NUT.
2. PVC EXTENSION SHALL BEGIN AS CLOSE TO VALVE AS POSSIBLE AND SHALL EXTEND TO WITHIN 6" OF GROUND SURFACE.
3. TOP OF VALVE BOX SHALL BE FLUSH WITH FINISH GRADE.
4. VALVE EQUIPPED WITH 2" SQUARE OPERATING NUT LOCATED WITHIN 24" FROM GROUND SURFACE. SEE VALVE OPERATOR EXTENSION DETAIL WHERE REQUIRED.
5. VALVES 12" AND SMALLER SHALL BE PROVIDED WITH CLASS B BASE. VALVES LARGER THAN 12" SHALL BE INSTALLED ON PRECAST CONCRETE PIER BLOCK.
6. NO PIPE JOINTS ALLOWED WITHIN 10' OF IN-LINE VALVES UNLESS JOINT RESTRAINT DEVICE PROVIDED.



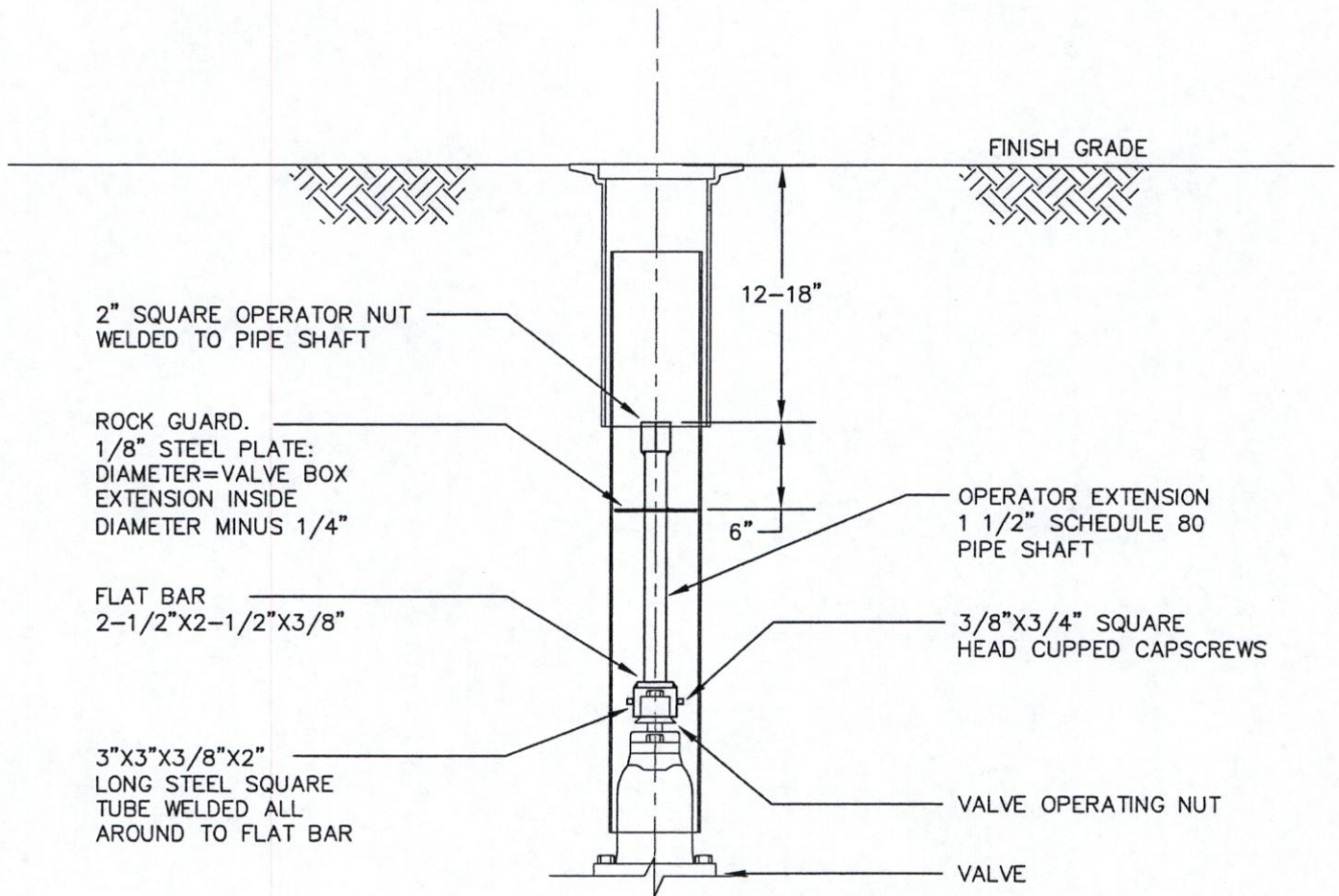
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STANDARD WATER VALVE
 SETTING DETAIL

DETAIL NO.

W-200

04/29/2009



NOTES:

1. WHERE DEPTH IS OVER 6 FEET, A SECOND ROCK GUARD PLATE IS REQUIRED EQUALLY SPACED BETWEEN THE TOP ROCK GUARD AND THE VALVE NUT.
2. EXTENSION IS REQUIRED WHEN VALVE OPERATING NUT IS GREATER THAN 24 INCHES FROM FINISHED GROUND SURFACE.



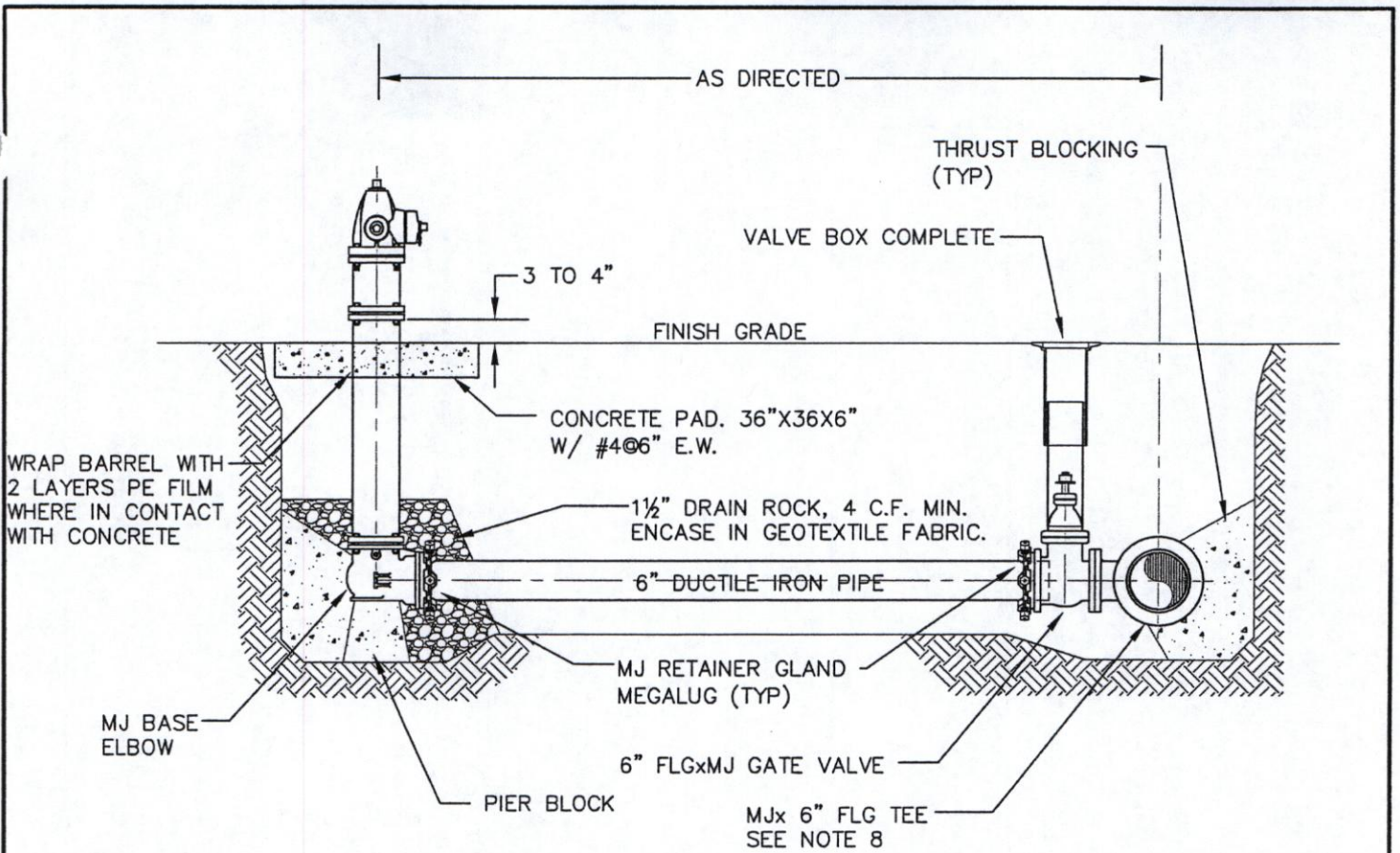
City of Adair Village
6030 NE William R Carr St.
Adair Village, Oregon 97330
(541) 745-5507 Fax: (541) 745-5530

VALVE OPERATOR
EXTENSION DETAIL

DETAIL NO.

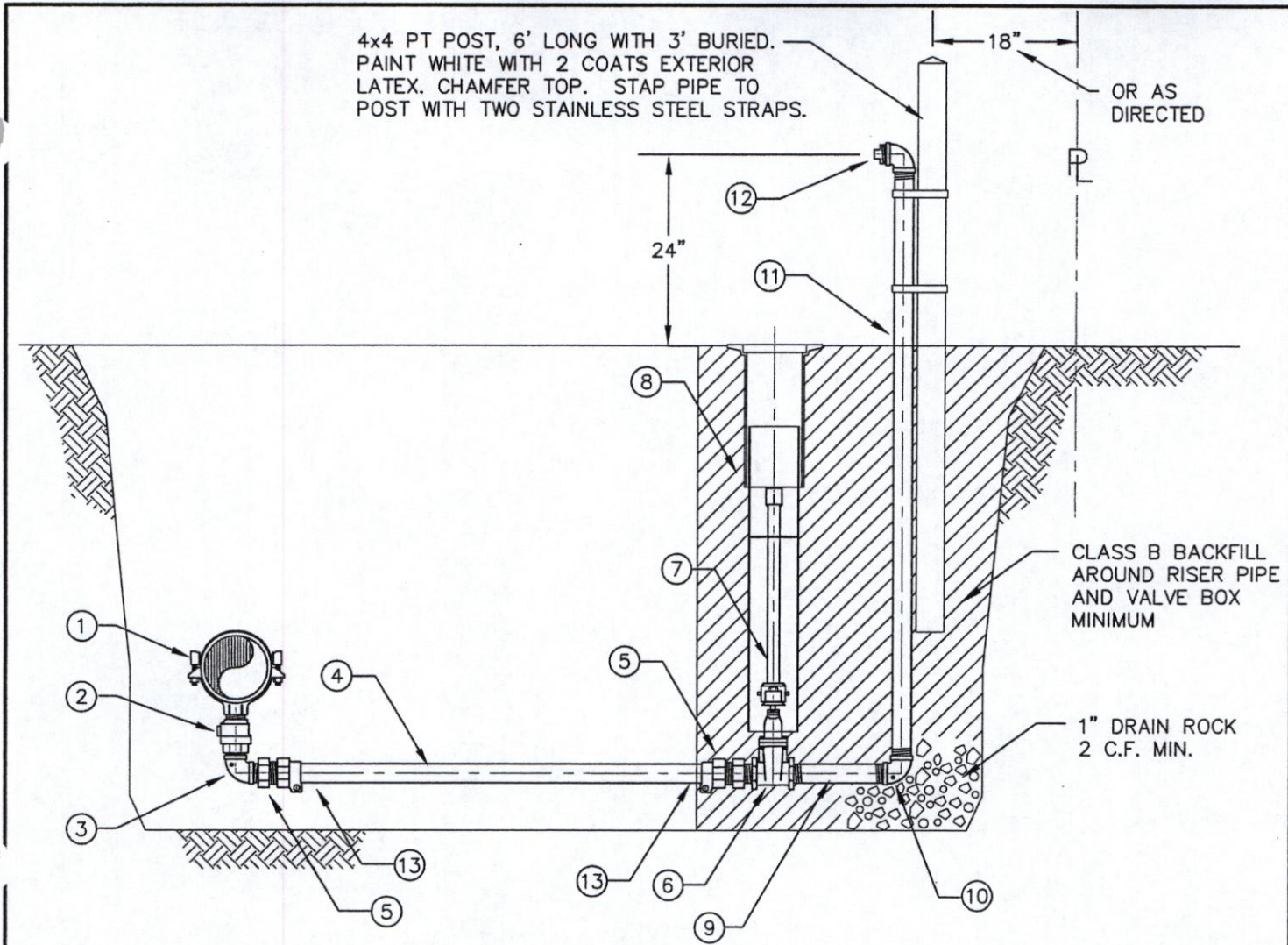
W-205

04/29/2009



NOTES:

1. FIELD VERIFY SPOOL LENGTHS AND HYDRANT BARREL LENGTH REQUIRED AT EACH HYDRANT. NO JOINTS ALLOWED WHERE SPOOL LENGTH IS LESS THAN 18 FEET.
2. HYDRANT SHALL BE INSTALLED PLUMB.
3. KEEP DRAIN HOLES CLEAR AND FREE TO DRAIN.
4. SEE DETAILS FOR VALVE SETTING, THRUST BLOCKING, AND TRENCH.
5. HYDRANTS, VALVES AND OTHER MATERIALS SHALL BE AS SPECIFIED IN THE STANDARDS MANUAL.
6. A MINIMUM OF 36" OF CLEAR SPACE AROUND HYDRANTS IS REQUIRED PER UFC (NO POSTS, WALLS, SIGNS, ETC.). 5 FOOT MIN. DESIRED. THERE SHALL BE NO OBSTRUCTIONS DIRECTLY IN LINE WITH ANY OF THE PORTS OF A HYDRANT.
7. HYDRANT PUMPER PORT SHALL FACE DIRECTION OF ACCESS.
8. WHERE WATERMAIN IS LOCATED ON A SIGNIFICANT SLOPE, TEE AND VALVE SHALL BE MJxMJ WITH RESTRAINTS SO THAT VALVE MAY BE INSTALLED PLUMB.



4x4 PT POST, 6' LONG WITH 3' BURIED.
 PAINT WHITE WITH 2 COATS EXTERIOR
 LATEX. CHAMFER TOP. STAP PIPE TO
 POST WITH TWO STAINLESS STEEL STRAPS.

OR AS
 DIRECTED

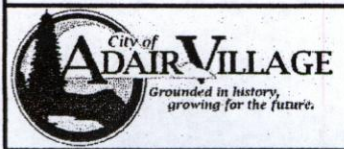
CLASS B BACKFILL
 AROUND RISER PIPE
 AND VALVE BOX
 MINIMUM

1" DRAIN ROCK
 2 C.F. MIN.

ITEM	SIZE	DESCRIPTION	SPECIFICATION
1	AS REQ'D	SADDLE	FORD 202BS, ROMAC 202BS; 2" FIP TAP
2	2"	BALL CORP. STOP	MIP IN x MIP OUT; FORD FB500-7, MUELLER B-2969, McDONALD 3131B
3	2"	ELBOW	304 SS OR BRASS 90° ELBOW
4	2"	PIPE	HDPE (PE 3408), SIDR 7, 200 PSI, IPS FITTING COMPATIBLE, NSF 61
5	2"	PE PJ COUPLING	PEP PJ x MIP; FORD C86-77-IDR7, MUELLER E-15429, McDONALD 4753-33
6	2"	GATE VALVE	AWWA C509 RESILIENT WEDGE GATE VALVE, THRD. ENDS, 2" NUT
7	AS REQ'D	EXTENSION	VALVE OPERATOR EXTENSION
8	N/A	VALVE BOX	VALVE BOX AND COVER
9	2"	NIPPLE	SCH. 40 304 SS OR BRASS THRD. NIPPLE, 12" LONG
10	2"	ELBOW	304 SS OR BRASS 90° ELBOW, DRILL 1/8" HOLE FOR DRAIN
11	2"	PIPE	SCH. 40 304 SS OR BRASS PIPE AS REQ'D
12	2"	ELBOW/PLUG	304 SS OR BRASS ELBOW WITH MIP THRD. PLUG
13	2"	STIFFENER	304 STAINLESS STEEL INSERT STIFFENER

NOTES:

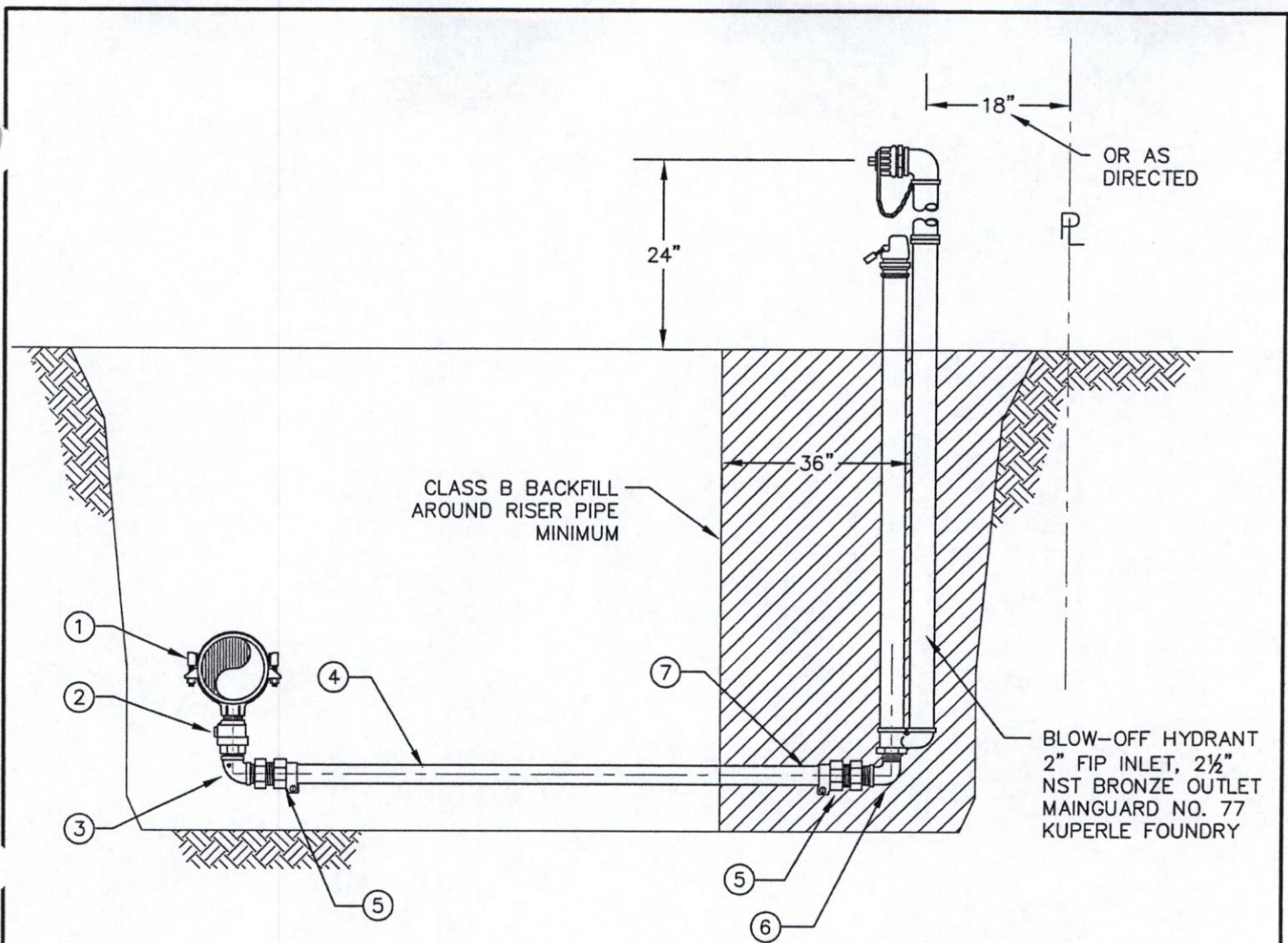
USE ONLY WHERE APPROVED. GENERALLY LOCATED AT LOCAL LOW POINTS IN THE PIPING SYSTEM WHERE HYDRANT IS NOT PRACTICAL. HYDRANTS OR LARGER BLOW-OFF MUST ALSO BE LOCATED NEARBY TO ALLOW PROPER FLUSHING. MAY BE ALLOWED ON 6" AND SMALLER MAINS WHERE LINE PRESSURE EXCEEDS 75 PSI.



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2" BLOW-OFF ASSEMBLY

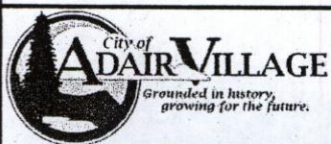
DETAIL NO.
W-400
04/29/2009



ITEM	SIZE	DESCRIPTION	SPECIFICATION
1	AS REQ'D	SADDLE	FORD/ROMAC 202BS; 2" FIP TAP
2	2"	BALL CORP. STOP	MIP IN x MIP OUT; FORD FB500-7, MUELLER B-2969, McDONALD 3131B
3	2"	ELBOW	304 SS OR BRASS ELBOW
4	2"	PIPE	HDPE (PE 3408), SIDR 7, 200 PSI, IPS FITTING COMPATIBLE, NSF 61
5	2"	PJ COUPLING	PEP PJ x MIP; FORD C86-77-IDR7, MUELLER E-15429, McDONALD 4753-33
6	2"	STREET ELBOW	304 SS OR BRASS STREET ELBOW
7	2"	STIFFENER	304 STAINLESS STEEL INSERT STIFFENER

NOTES:

USE ONLY WHERE APPROVED. GENERALLY LOCATED AT LOCAL LOW POINTS IN THE PIPING SYSTEM WHERE HYDRANT IS NOT PRACTICAL. HYDRANTS OR LARGER BLOW-OFF MUST ALSO BE LOCATED NEARBY TO ALLOW PROPER FLUSHING. MAY BE ALLOWED ON 6" MAINS WHERE LINE PRESSURE EXCEEDS 75 PSI.



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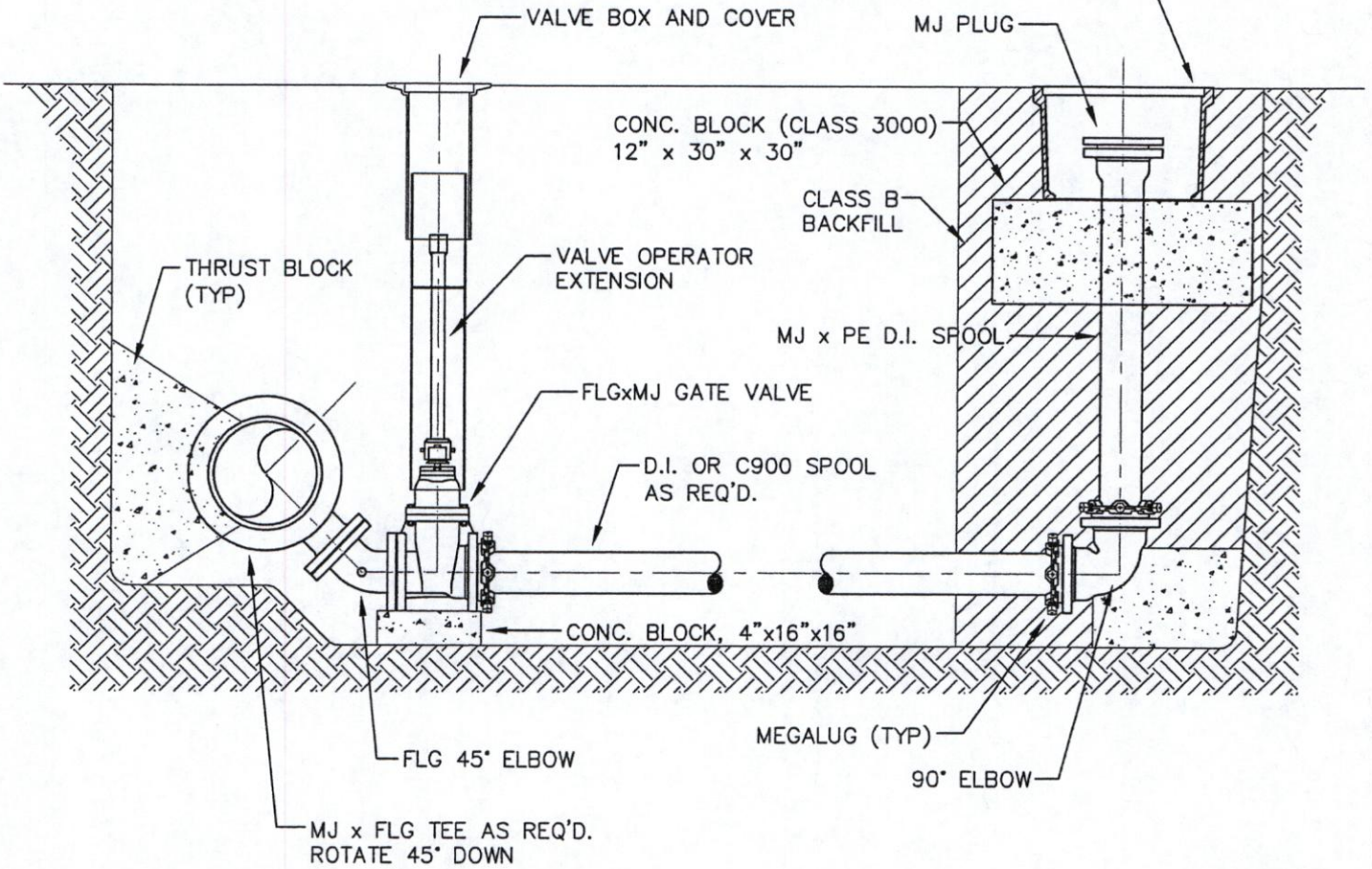
**2" BLOW-OFF ASSEMBLY
 W/ BLOW-OFF HYDRANT**

DETAIL NO.

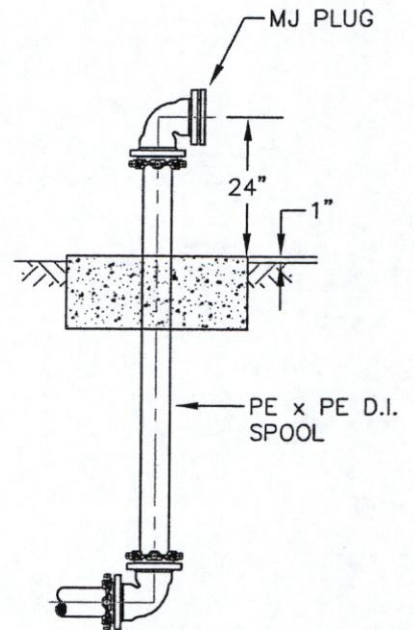
W-401

04/29/2009

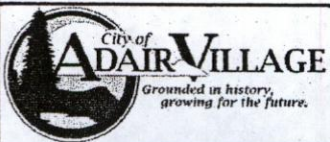
METER BOX (12X18X12): ARMORCAST A6001425
 COVER: ARMORCAST A6001426T
 LOCATE AS DIRECTED.



MAIN SIZE	BLOW-OFF SIZE
6"	4"
8"	4"
10"	6"
12"	6"
14"	8"
16"	8"
18"	10"
20"	10"
24"	12"



ALTERNATE EXPOSED END
 DISCHARGE AS DIRECTED



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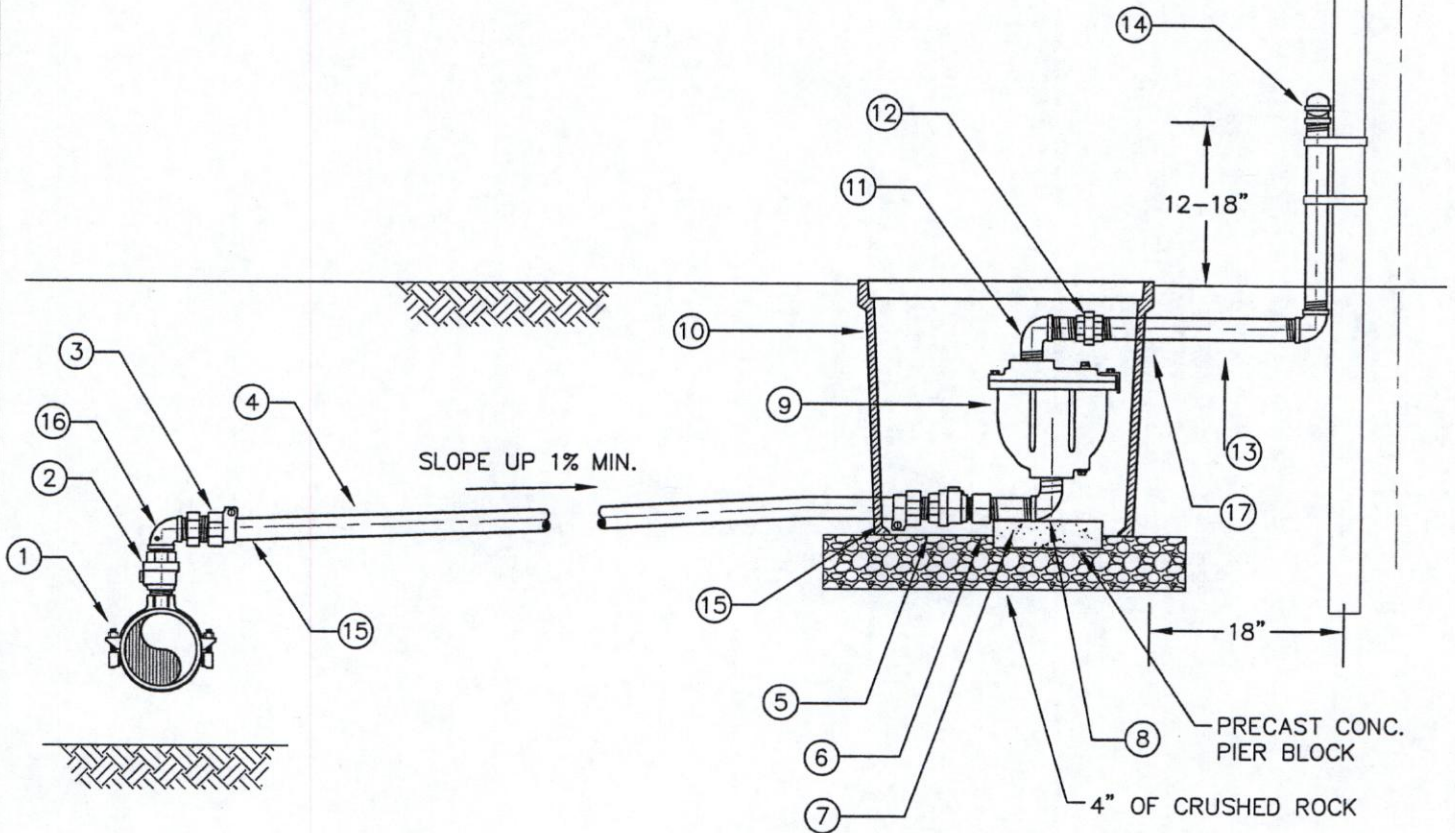
4"+ BLOW-OFF ASSEMBLY

DETAIL NO.

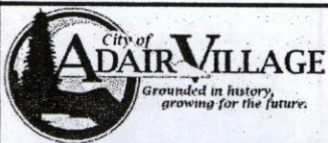
W-405

04/29/2009

4x4 PT POST, 6' LONG WITH 3' BURIED.
PAINT WHITE WITH 2 COATS EXTERIOR
LATEX. CHAMFER TOP. STAP PIPE TO
POST WITH TWO STAINLESS STEEL STRAPS.



ITEM	SIZE	DESCRIPTION	SPECIFICATION
1	AS REQ'D	SADDLE	FORD/ROMAC 202BS; 2" FIP TAP
2	2"	BALL CORP. STOP	MIP IN x MIP OUT; FORD FB500-7, MUELLER B-2969, McDONALD 3131B
3	2"	PJ COUPLING	MIP x PEP PJ; FORD C86-77-IDR7, MUELLER E-15429, McDONALD 4753-33
4	2"	PIPE	HDPE (PE 3408), SIDR 7, 200 PSI, IPS FITTING COMPATIBLE, NSF 61
5	2"	BALL CORP. STOP	PEP PACK JOINT x MIP; FORD FB1101-7, MUELLER E-25029, McDONALD 4704B-33
6	2"	COUPLING	THREADED 304 SS OR BRASS COUPLING, SHORT
7	2"	NIPPLE	THREADED 304 SCH. 40 SS OR BRASS NIPPLE, 6" LONG
8	2"	STREET ELBOW	304 SS OR BRASS 90° STREET ELBOW
9	2"	CAV	COMBINATION AIR VALVE; VAL-MATIC 202C, APCO 145C
10	17"X30"X28"	VAULT	ARMORCAST A6001640TAPCX28 WITH COVER A6001947T
11	2"	STREET ELBOW	304 SS OR BRASS 90° STREET ELBOW AND SHORT SS OR BRASS NIPPLE
12	2"	UNION	STAINLESS STEEL OR BRASS UNION
13	2"	VENT PIPE	SS OR BRASS PIPE AND FITTINGS AS SHOWN
14	2"	TEE VENT	ALUMINUM T-VENT, 20 MESH SS SCREEN, MORRISON BROS. FIG 155
15	2"	STIFFENER	304 STAINLESS STEEL INSERT STIFFENER
16	2"	ELBOW	304 STAINLESS STEEL OR BRASS ELBOW
17	2"	HOLE	CORE DRILL HOLE IN BOX FOR TIGHT FIT AT PIPE USE LINK-SEAL IF NECESSARY TO PREVENT MOVEMENT AND DIRT



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2" COMBINATION AIR VALVE ASSEMBLY

DETAIL NO.

W-500

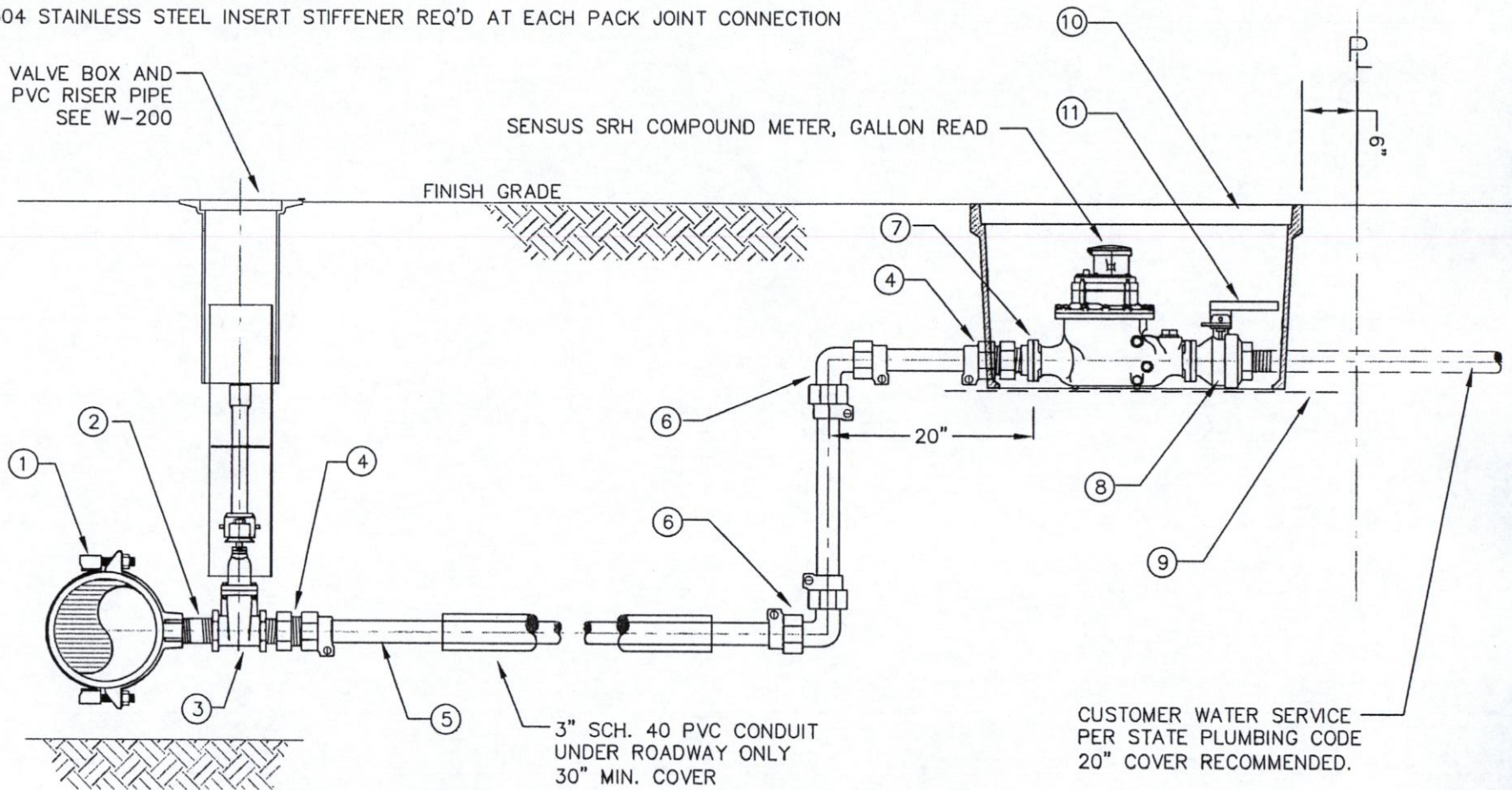
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**STANDARD 2" WATER
SERVICE CONNECTION**

SEE W-150 FOR TRENCH DETAILS
304 STAINLESS STEEL INSERT STIFFENER REQ'D AT EACH PACK JOINT CONNECTION



ITEM	SIZE	DESCRIPTION	SPECIFICATION
1	AS REQ'D	SADDLE	FORD/ROMAC 202BS; 2" FIP TAP
2	2"	NIPPLE	BRASS OR 304 SS NIPPLE, MIPxMIP, 4" LONG
3	2"	GATE VALVE	AWWA C509 RESILIENT WEDGE GATE VALVE, THRD. ENDS, 2" NUT
4	2"	PJ COUPLING	MIP x PEP PJ; FORD C86-77-IDR7, MUELLER E-15429, McDONALD 4753B-33
5	2"	SERVICE PIPE	HDPE (PE 3408), SIDR 7, 200 PSI, IPS FITTING COMPATIBLE, NSF 61
6	2"	PJ ELBOW	PEP PACK JOINT ELBOW; FORD L66-77-IDR7, McDONALD 4761-33
7	2"	ADAPTER	METER FLANGE x 2" FIP OUTLET; FORD CF31-77, McDONALD 610F
8	2"	BALL METER VALVE	METER FLG x FIP; FORD BF13-777W; MUELLER B-24337, McDONALD 6101M
9	24"x36"	FELT PAPER	90-LB FELT PAPER, ASPHALT SATURATED
10	17"x30"x18"	METER BOX	ARMORCAST A6001640PCX18, A6001947TDZ (COVER), A6000482T (DROP-IN)
11	N/A	HANDLE	BALL VALVE HANDLE; FORD HB-67S, McDONALD 6120BS

DETAIL NO.

W-608

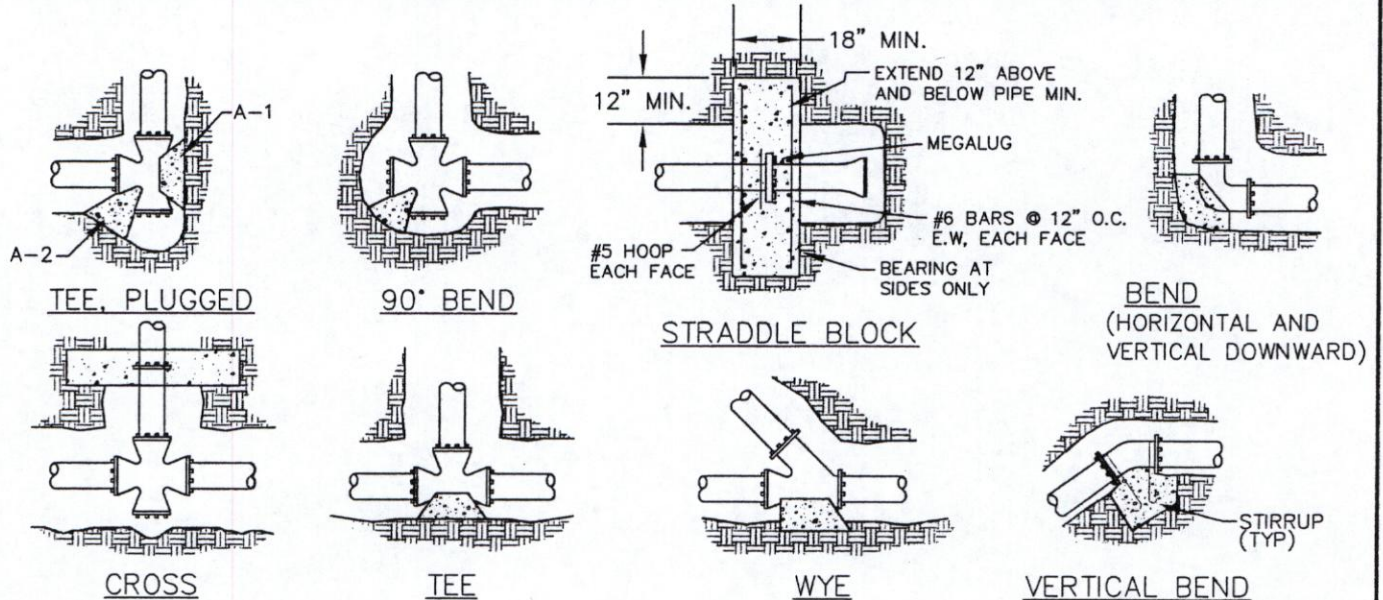
04/29/2009

(HORIZONTAL)
BEARING AREA OF THRUST BLOCKS
IN SQUARE FEET

(VERTICAL UP)
VOLUME OF THRUST
BLOCK IN CUBIC YARDS

FITTING SIZE	TEE, WYE, DEAD END, AND HYDRANT	STRADDLE BLOCK	90° BEND	TEE PLUGGED ON RUN		45° BEND	22-1/2° BEND	11-1/4° BEND	90° BEND	45° BEND	22-1/2° BEND	11-1/4° BEND
				A-1	A-2							
4	1.0	1.0	1.4	1.0	1.4	0.8	0.4	0.2	0.82	0.45	0.23	0.11
6	2.1	2.1	3.0	2.1	3.0	1.6	0.9	0.5	1.85	1.00	0.51	0.26
8	3.8	3.8	5.4	3.8	5.4	2.9	1.5	0.8	3.29	1.78	0.91	0.46
10	5.9	5.9	8.4	5.9	8.4	4.5	2.3	1.2	5.14	2.78	1.42	0.71
12	8.5	8.5	12.0	8.5	12.0	6.5	3.3	1.7	7.40	4.01	2.04	1.03
14	11.6	11.6	16.4	11.6	16.3	8.9	4.5	2.3	10.08	5.45	2.78	1.40
16	15.1	15.1	21.4	15.1	21.3	11.6	5.9	3.0	13.16	7.12	3.63	1.82
18	19.1	19.1	27.0	19.1	27.0	14.6	7.5	3.8	16.66	9.02	4.60	2.31
20	23.6	23.6	33.3	23.6	33.3	18.1	9.2	4.7	20.57	11.13	5.67	2.85
24	34.0	34.0	48.0	34.0	48.0	26.0	13.3	6.7	29.62	16.03	8.17	4.11

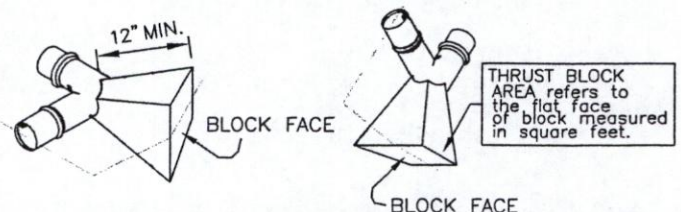
ABOVE BEARING AREAS BASED ON TEST PRESSURE OF 150 PSI AND AN ALLOWABLE SOIL BEARING STRESS OF 2000 POUNDS PER SQUARE FOOT. DESIGNER IS CAUTIONED TO ENSURE THAT 2000 PSF BEARING IS AVAILABLE.



NOTES:

1. CONCRETE BLOCKING TO BE POURED AGAINST UNDISTURBED EARTH.
2. ALL CONCRETE TO BE CLASS 3000 MINIMUM.
3. INSTALL 6 MIL PLASTIC BETWEEN PIPE AND/OR FITTINGS BEFORE POURING CONCRETE BLOCKING.
4. CONCRETE SHALL BE KEPT CLEAR OF ALL JOINTS AND ACCESSORIES.
5. TIE RODS SHALL BE DEFORMED GALVANIZED COLD ROLLED STEEL, 40000 PSI TENSILE STRENGTH (ASTM A615) COAT WITH COAL TAR EPOXY AFTER INSTALLATION.
6. BEARING AREA REQ'D AT REDUCERS IS THE DIFFERENCE BETWEEN VALUES FOR DEAD END FOR EACH END SIZE (IE 6x8 = 3.8-2.1 = 1.7 S.F.)

RODS FOR VERTICAL BENDS		
FITTING SIZE	ROD SIZE	EMBEDMENT
10" AND LESS	#5	17"
12"-16" (11.25')	#5	17"
12"-16" (22.5')	#7	24"
12" (45')	#7	24"
14"-16" (45')	#9	30"



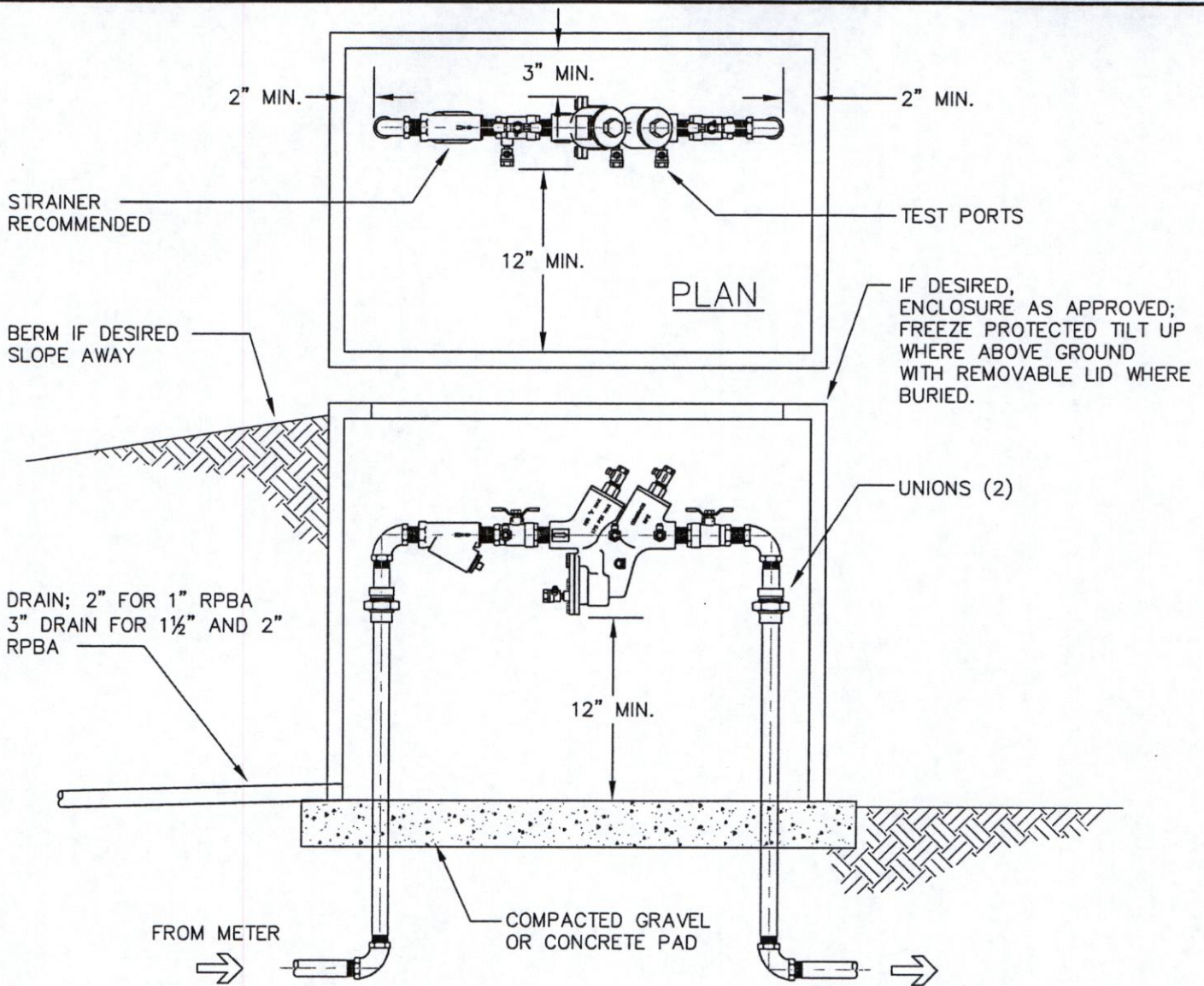
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CONCRETE THRUST BLOCKING
STANDARD DETAILS

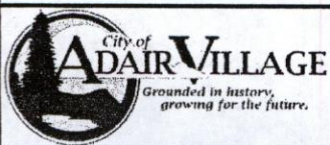
DETAIL NO.

W-700

04/29/2009



1. RPBA MUST BE INSTALLED ABOVE NATURAL GROUND, BUT MAY HAVE A BERM AROUND ENCLOSURE.
2. BOTTOM AND SIDE CLEARANCES ALSO APPLY WHEN ASSEMBLIES ARE INSTALLED INSIDE BUILDING.
3. RPBAs SHALL ALWAYS BE INSTALLED IN HORIZONTAL ORIENTATION UNLESS DEVICE SPECIFICALLY APPROVED FOR VERTICAL INSTALLATION.
4. RPBAs SHALL ALWAYS BE INSTALLED ABOVE THE 100 YEAR FLOOD LEVEL UNLESS OTHERWISE APPROVED.
5. RELIEF VALVES SHALL NOT BE PLUGGED OR EXTENDED.
6. PROVIDE PROTECTION FROM FREEZING.
7. RPBAs SHALL NOT BE INSTALLED IN AN ENCLOSURE UNLESS AN AIR-GAPPED DRAIN TO DAYLIGHT IS PROVIDED AND BRASS OR PLASTIC PLUGS ARE PROVIDED IN ALL TEST PORTS. DRAIN SHALL BE BORE SIGHTED SLOPING 1/8" PER FOOT MIN.
8. MAXIMUM HEIGHT OF INSTALLATION SHALL NOT EXCEED 5 FEET FOR ASSEMBLY UNLESS THERE IS A PERMANENT PLATFORM INSTALLED IN ACCORDANCE WITH OCCUPATIONAL SAFETY AND HEALTH (OSHA) STANDARDS TO FACILITATE SERVICING THE ASSEMBLY.
9. LOCATION OF DEVICE SHALL BE AS DIRECTED BY THE CITY. GENERALLY LOCATED AS CLOSE TO MAIN CONNECTION AS POSSIBLE, IMMEDIATELY AFTER WATER METER.
10. INSTALLATION MAY CREATE CLOSED SYSTEM. CONSULT LOCAL PLUMBING CODES.



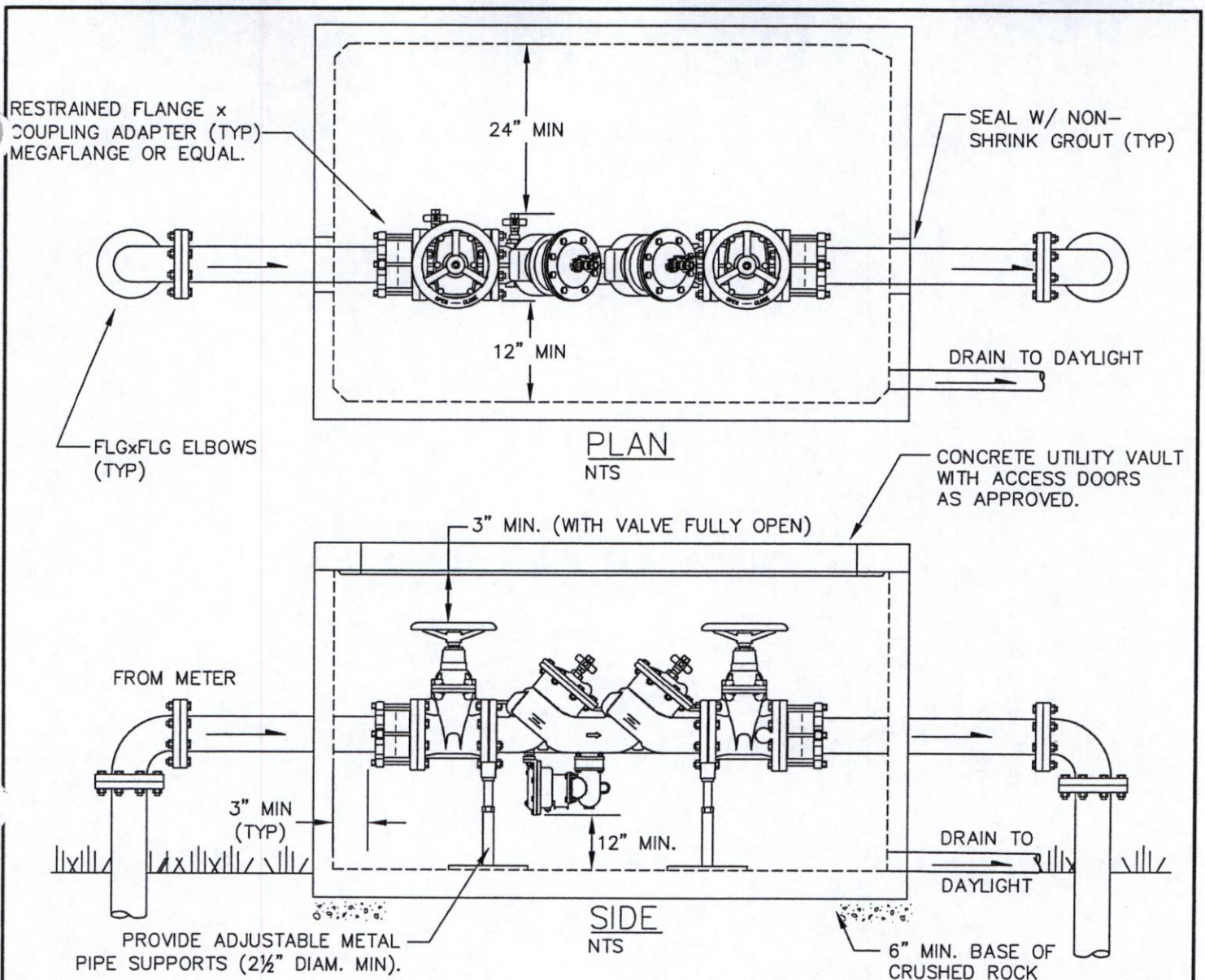
City of Adair Village
 6030 NE William R Carr St.
 Adair Village, Oregon 97330
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REDUCED PRESSURE BACKFLOW ASSEMBLY (3/4" - 2")

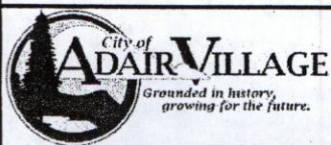
DETAIL NO.

W-800

04/29/2009



1. ASSEMBLY SHALL NOT BE SUBJECT TO FLOODING.
2. RPBA SHALL BE INSTALLED ABOVE THE 100 YEAR FLOOD LEVEL, UNLESS OTHERWISE APPROVED.
3. RPBAs ARE TYPICALLY INSTALLED ABOVE-GRADE IN WELL-DRAINED AREAS, BUT MAY BE INSTALLED BELOW-GRADE IN VAULT IF AN ADEQUATE AIR-GAPPED, BORE-SIGHTED DRAIN (SLOPE 1/8"/FT.) TO DAYLIGHT IS PROVIDED.
4. DRAIN LINES SHALL BE SIZED TO ACCOMMODATE FULL RELIEF VALVE DISCHARGE FLOW.
5. CLEARANCES ALSO APPLY WHEN ASSEMBLIES ARE INSTALLED INSIDE BUILDING.
6. BRASS OR PLASTIC TEST PORT PLUGS ARE REQUIRED FOR ALL VAULT INSTALLATIONS.
7. ALL EXPOSED PIPE AND FITTINGS SHALL BE DUCTILE IRON.
8. RPBA SHALL BE INSTALLED HORIZONTALLY UNLESS DEVICE IS SPECIFICALLY APPROVED FOR VERTICAL INSTALLATION.
9. PROVIDE PROTECTION FROM FREEZING.
10. DO NOT PLUG OR EXTEND RELIEF VALVES.
11. MAXIMUM HEIGHT OF INSTALLATION SHALL NOT EXCEED 5 FEET UNLESS THERE IS A PERMANENTLY INSTALLED PLATFORM MEETING OSHA STANDARDS TO FACILITATE SERVICING THE ASSEMBLY.
12. LOCATION OF DEVICE SHALL BE AS DIRECTED BY THE CITY. GENERALLY LOCATED AS CLOSE TO MAIN CONNECTION AS POSSIBLE, IMMEDIATELY AFTER WATER METER.



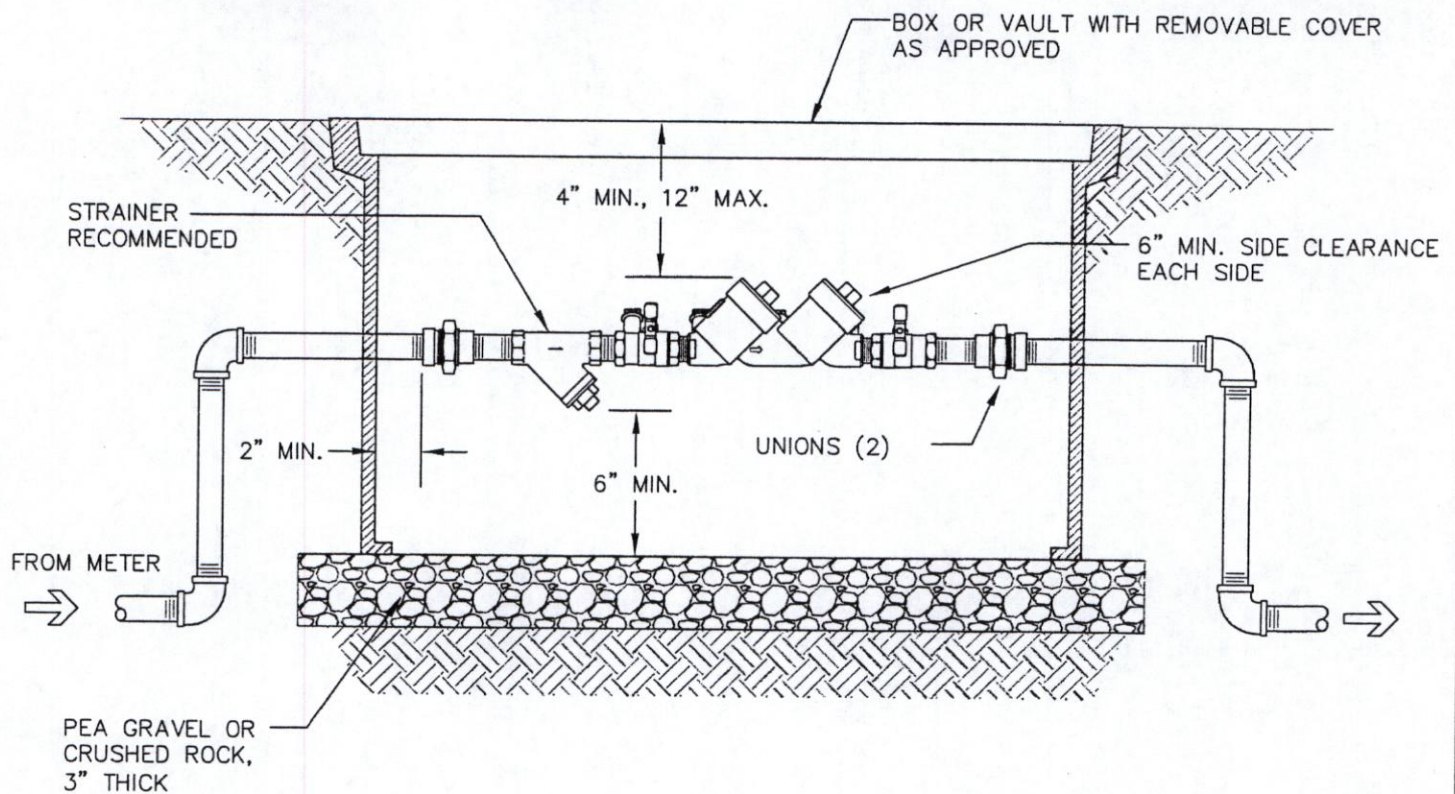
City of Adair Village
6030 NE William R Carr St.
Adair Village, Oregon 97330
(541) 745-5507 Fax: (541) 745-5530

**REDUCED PRESSURE
BACKFLOW ASSEMBLY
(2 1/2" UP)**

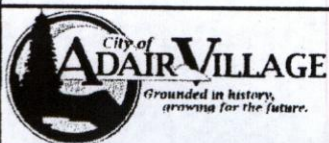
DETAIL NO.

W-805

04/29/2009



1. PROTECTION FROM FREEZING SHALL BE PROVIDED.
2. DCVAs MAY BE INSTALLED BELOW GRADE IN A BOX OR VAULT WITH BRASS OR PLASTIC PLUGS PROVIDED IN ALL TEST PORTS AND ASSEMBLY IS NOT TO BE SUBJECT TO CONTINUOUS IMMERSION.
3. DCVAs SHALL BE PROVIDED WITH ADEQUATE AIR-GAPPED DRAINAGE. DRAIN SHALL NOT BE CONNECTED TO SANITARY OR STORM DRAIN SYSTEMS.
4. LOCATE AS DIRECTED AS CLOSE TO MAINLINE CONNECTION AS POSSIBLE. GENERALLY LOCATED IMMEDIATELY AFTER WATER METER.
5. MAY BE INSTALLED VERTICALLY IF INTERNALLY SPRING LOADED, HAS NORMAL FLOW UPWARD, AND IS RECOMMENDED BY MANUFACTURER FOR VERTICAL INSTALLATION.
6. CLEARANCES SHALL ALSO APPLY WHEN INSTALLED INSIDE BUILDING.
7. SHALL NOT BE INSTALLED AT A HEIGHT GREATER THAN 5 FEET UNLESS THERE IS A PERMANENTLY INSTALLED PLATFORM MEETING OSHA STANDARDS TO FACILITATE SERVICING THE ASSEMBLY.
8. INSTALLATION OF A BACKFLOW ASSEMBLY MAY CREATE A CLOSED SYSTEM. CONSULT LOCAL PLUMBING CODES FOR PRESSURE RELIEF VALVE AND THERMAL EXPANSION REQUIREMENTS.
9. USE ONLY DEVICES LISTED ON CURRENT LIST OF STATE APPROVED DEVICES.



City of Adair Village
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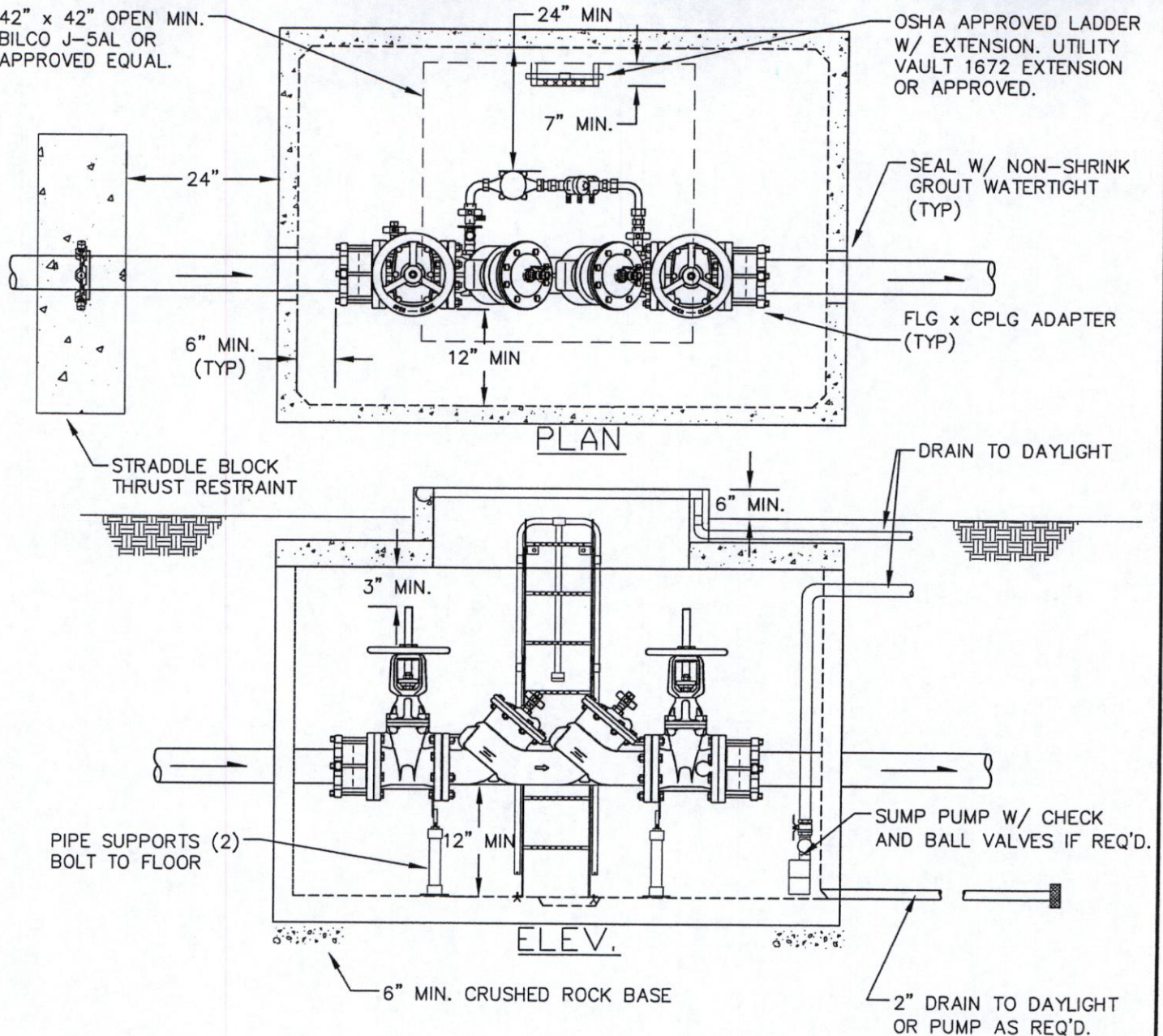
DOUBLE CHECK VALVE ASSEMBLY (3/4" - 2")

DETAIL NO.

W-900

04/29/2009

42" x 42" OPEN MIN.
BILCO J-5AL OR
APPROVED EQUAL.



NOTE:

1. FOR FIRE LINE INSTALLATIONS. SUBMIT DETAIL DRAWING AND SPECS FOR APPROVAL.
2. ASSEMBLY SHALL NOT BE SUBJECT TO FLOODING.
3. DCDAs ARE TYPICALLY INSTALLED BELOW-GRADE. DRAIN TO DAYLIGHT OR PUMP AS REQUIRED.
4. PUMP SHALL HAVE MIN. CAPACITY OF 5 GPM. DRAIN SHALL HAVE BACKWATER VALVE AND RODENT SCREEN.
5. BRASS OR PLASTIC PLUGS ARE REQUIRED FOR ALL TESTING PORTS.
6. DOMESTIC SERVICE SHALL NOT BE INSTALLED OFF THE FIRE SERVICE UNLESS APPROVED.
7. VAULTS SHALL BE PRECAST CONCRETE AS REQUIRED.
8. ALL EXPOSED PIPE AND FITTINGS SHALL BE DUCTILE IRON.
9. LOCATE AS DIRECTED BY THE CITY. GENERALLY LOCATED AS CLOSE TO MAIN CONNECTION AS POSSIBLE, IMMEDIATELY AFTER WATER METER.



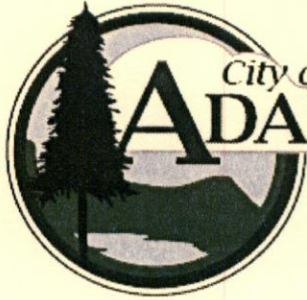
City of Adair Village
6030 NE William R Carr St.
Adair Village, Oregon 97330
(541) 745-5507 Fax: (541) 745-5530

**DOUBLE CHECK DETECTOR
ASSEMBLY (2 1/2" UP)**

DETAIL NO.

W-905

04/29/2009



City of
ADAIR VILLAGE

*Grounded in history,
growing for the future.*

BENTON COUNTY, OREGON

DIVISION 2:
SANITARY SEWER DESIGN STANDARDS
MANUAL
Guidelines for Development

Effective: July 1, 2009

Section 1 – General Design Requirements

- 1.1 The purpose of this manual is to set standards for the design and construction of sanitary sewer system improvements to serve new and future development. This manual may be updated periodically and the design engineer shall ensure that they have the latest version.
- 1.2 Storm water, including street, roof, or footing drainage shall not discharge into the sanitary sewer system.
- 1.3 Upon receiving approval from the City for the plans and specifications, the developer shall submit the plans to the Oregon Department of Environmental Quality for review and approval. The developer will submit proof of DEQ approval of the plans to the City prior to beginning any construction activities.

Section 2 – Design Plan Format

- 2.1 Engineering plans and specifications shall be prepared for all public works improvements. Plans shall be clear and legible and show all improvements in sufficient detail to allow for determination of compliance with City standards, and proper field construction. City engineer or City representative may require additional detail if deemed necessary.
- 2.2 Plan views must show existing and proposed improvements and features within or adjacent to the project including survey monuments, edge of pavement, road centerline, buildings, curbs, gutters, sidewalks, culverts, ditches, streams, utility poles, and other surface improvements and features. The location of underground utilities including power, gas, water and sewer shall be shown as accurately as possible. Right-of-way, property lines, easements, street names, lot numbers, and other labels shall also be shown. Existing and finish grade contours (2 foot maximum) should be shown where possible.
- 2.3 Plan shall show the location, stationing, and size of all sewer mains and services including appurtenances such as manholes, clean-outs, tees, and wyes. Stationing shall be called out for specific items to be installed. Matchlines shall be used when continuing to other sheets.
- 2.4 Profile view with stationing and elevation shall be provided for sewer mains. Profile shall show existing ground, finish grade, invert and manhole rim elevations, backfill class materials, pipe size and slope, and all existing and proposed utilities crossing the profile. Profile shall be generated along the sewer pipe centerline. Vertical separation shall be shown for crossing utilities.
- 2.5 Detail drawings shall be provided for typical trench sections, manholes, clean-outs, sewer service laterals, and others as required.
- 2.6 Refer to the City's "Engineering Policy – Guidelines for Development" document for additional requirements and submittal procedures.

Section 3 – Sanitary Sewer System Design Requirements

- 3.1 All sanitary sewers and facilities shall be designed, submitted, reviewed, and constructed in accordance with Oregon DEQ guidelines and City standards. Developer's engineer should review OAR 340-052, DEQ Sanitary Sewer Design Notes dated 1994, OAR 340-052 Appendix A dated 1981, DEQ Standards for Design and Construction of Wastewater Pump Stations dated May 2001, and other guidelines as applicable. See Oregon DEQ's website for guidance manuals <http://www.deq.state.or.us/wq/wqrules/Guidance.htm>
- 3.2 Minimum size for new sewer mains is 8-inches unless otherwise approved. Hydraulic calculations shall be performed to ensure that pipe size is adequate for conveying peak instantaneous flows at full development of any subdivision with pipe flow no more than 80% full depth. Capacity shall be based on Manning's Equation with "n" = 0.013 and pipe flowing at full depth. Minimum slopes required are shown in the table below. Slopes for larger gravity sewers shall be calculated so as to provide a velocity of at least 2.0 ft/sec flowing full or half full.

Pipe I.D. (inches)	Minimum Slope (ft drop per ft length)	Capacity (gpm)
6	0.006	219
8	0.0040	344
10	0.0028	540
12	0.0022	786
15	0.0017	1200

- 3.3 Sewers with minimal flow such as upper reaches of laterals serving few dwellings shall be steepened to provide a 2.0 ft/sec velocity. Actual flows during initial years of use shall be carefully evaluated in this regard.
- 3.4 Pipe size shall not be increased larger than necessary for capacity in order to meet grade requirements, e.g., 10-inch pipe used instead of 8-inch to allow decreased slope.
- 3.5 Flows used in design calculations shall be in conformance with acceptable standard practice. For dwellings, a flow of 100 gpcd shall be used (includes normal infiltration) as a design basis for average daily flow. A peaking factor of 3.5 shall be applied for peak instantaneous flows. When requested, Engineer shall submit to City the design calculations used for sizing the proposed sanitary sewer system.
- 3.6 Public sewerage facilities shall be designed to allow the logical service of all parcels or tracts of land within the basin being considered. Sewer lines shall be sized and extended, at the owner's or developer's expense, to all adjacent parcels approximately equal to or higher in elevation to facilitate future development.
- 3.7 Minimum depth of cover is normally 63-inches over top of pipe barrel for gravity sewer mains (based on providing 18-inch vertical separation below an 8-inch water line with 36-inch cover). Shallower depths may be allowed providing at least 18-inches of vertical separation is provided at all water main and water service crossings.

- 3.8 Sanitary sewer piping shall be located 10 feet horizontally away from any parallel water main or service when possible. All water line and sewer line shall be separated in accordance with OAR 333-061-0050 provisions.
- 3.9 No private sanitary sewer shall be located within any lot other than the lot which is the site of the building or structure served by such sewer. Exceptions may include common areas in planned unit developments, and public right-of-ways as approved by the City. Each lot shall have its own service lateral. Shared service laterals are not allowed.
- 3.10 Service laterals shall not be connected to manholes unless approved by City Engineer for special conditions such as cul-de-sacs, etc. Connection shall be to gravity sewer pipe in an approved manner. Service laterals shall be new PVC Tees with manufactured bends (Wyes) to the main as shown on the standard details. A clean-out is required on the service lateral in the public right-of-way or easement in accordance with the standard detail. An additional clean-out must be provided at least every 100 feet on the private lateral portion as per the Uniform Plumbing Code.
- 3.11 For pipe placed on slopes steeper than 15%, restrained joint pipe or joint restraint devices shall be installed.
- 3.12 Sewers shall be located in the right-of-way at the street centerline or within 5 feet from centerline, but outside of the traveled wheel lane. Location of sewers skewed across streets where disruption of curbs, gutter or sidewalks would be required for future exposure of the main is prohibited. Sewers in easements will only be allowed after all reasonable attempts to place mains in the right-of-way have been exhausted. Sewer easements shall be a minimum of 15 feet wide with wider easements required for sewers greater than 8 feet deep such that a 1:1 theoretical slope from pipe centerline would daylight within the easement.
- 3.13 Manholes
- 3.13.1 Manholes shall be spaced no greater than 400 feet apart, and shall be provided at every change in grade or alignment, every change in pipe size, at every intersection or junction, and at the upper end of a sewer lateral. Curved sewers are not allowed.
- 3.13.2 No manhole shall be placed where future maintenance access cannot be assured. A hard all-weather surface (AC, concrete, or gravel) capable of supporting a 48,000 pound truck shall be constructed (ex.: bikepath) to provide access to manholes in common areas or parks.
- 3.13.3 Clean-outs will not be substituted for manholes. An exception may be when a section of pipe is extended less than 250 feet to serve 5 or fewer single-family dwellings and no potential for future extension exists. In this case, a permanent clean-out may be provided at the end of the pipe. The pipe may also be 6-inch diameter. Such installations will only be allowed in special cases upon prior approval from the City Engineer.

- 3.13.4 Manhole channels shall be designed for self-cleaning with a minimum drop of 0.2 feet (2.4 inches) from invert in to invert out along a smooth flow channel. Channel width and depth shall be equal to the pipe diameter.
- 3.13.5 Intersecting sewers and connections shall be designed to avoid backup into the smaller sewer. For intersecting unequal sized sewers in manholes, the water surface elevation at 0.8 of full depth of flow in each sewer pipe shall match. Manhole base channels shall be formed to ensure smooth flow without head-on intersection of opposing flows.
- 3.13.6 Free fall of sewage into a manhole shall not exceed 24 inches without a special drop manhole. Standard manholes without free fall are preferred although drop manholes may be considered when a considerable amount of additional excavation would be required to construct pipes/manholes without drop.
- 3.13.7 Where future extensions are planned or likely, stub-outs shall be provided with watertight rubber-gasketed plugs adequately braced against air test pressures. Stub-outs shall be adequately sized as approved. Stub-outs shall be sufficiently long to extend to the limits of new construction or surface improvements. A temporary cleanout shall be installed on the stub-out at the phasing line unless otherwise approved by City Engineer.
- 3.13.8 Manholes shall be located outside the normal wheel travel lanes. Manhole lids are not permitted within designated or future bike lanes. Manholes shall not be located in the curb or gutter. Manholes in sidewalks are not allowed unless otherwise approved by the City.
- 3.13.9 Watertight manhole covers shall be used when the cover is below the 100-year flood plain or in a location where overland runoff could enter the manhole. Locking, tamper-proof covers are required in easements and off street areas. Must have adaptation for manhole lid pullers.
- 3.14 Pump Stations and Force Mains
- 3.14.1 Sewage pump stations shall only be provided when gravity service cannot be practically provided. Prior approval from the City is required.
- 3.14.2 Pump stations shall have concrete wetwells with approved self-cleaning bottom designs. Pumps shall be submersible type with stainless steel rails and hoist for easy removal. EPA Class I reliability is required, including a standby generator. A separate check valve and flow meter vault(s) is required. A heated and ventilated building or approved enclosure shall be included for the controls and electrical equipment. At a minimum, a covered and fenced area shall be provided to protect standby generator from the elements.
- 3.14.3 Design shall be in accordance with DEQ guidelines and as directed by the City. A pre-design report is required and shall be approved by the City. Following City approval, the pre-design report must be approved by DEQ.

- 3.14.4 Force mains shall be 4-inch minimum and designed to provide a minimum velocity of 3 feet per second. Force mains shall terminate at an approved location and in an approved manner. Surge control measures may be required.
- 3.14.5 Telemetry and SCADA systems are required at pump stations. Telemetry systems must be compatible with existing City systems or of an approved design that will allow compatibility with future or planned systems.
- 3.14.6 Coordinate with the City for specific requirements and approved materials and equipment prior to commencing with pre-design report.
- 3.15 Individual Grinder Pump Installations
- 3.15.1 Individual buildings may include individual grinder pump stations when gravity service cannot be made available and a public pump station is not warranted or required by the City. Such installations will generally be limited to fewer than 4 single family dwellings within a development and may only be allowed upon prior approval upon a determination that gravity service is not possible.
- 3.15.2 Each pump shall be its own individual pressure line from the pump to the public gravity main. Pressure line shall be PVC or HDPE with a 200 psi pressure rating. Connection to gravity main shall be made with an approved saddle, ball check and corporation stop as directed by the City. Connections to manholes are not allowed unless approved by the City Engineer. Pressure mains shall have a minimum of 18-inch vertical separation under all water lines. Pipe size shall be 1¼-inch or as recommended and designed by the pump manufacturer.
- 3.15.3 Grinder pump systems will be owned and maintained by the private property owner.
- 3.16 Septic Tank Effluent Pumping (STEP) and Septic Tank Effluent Gravity (STEG) systems are not permitted within the City Limits unless otherwise approved.
- 3.17 Oil/Water Separators are required for all facilities (gas stations, parking structures, etc.) where there is the potential for discharge of oily, contaminated waters in the sewer system. No grease, oil, sand, liquid waste containing grease or flammable material or other harmful ingredients shall be discharged into any public sewer. Location shall be on private property. Installation, operation and maintenance shall be by the property owner. Design shall be approved by the City with documentation of maintenance schedule to be submitted to the City.
- 3.18 Grease Interceptors are required for all commercial buildings with kitchen and/or cafeteria facilities or other facilities where excessive discharge of animal fats or vegetable oils can occur. Sizing of the interceptor shall be in accordance with the latest edition of the Uniform Plumbing Code and as approved by the City prior to installation. Location shall be on private property. The owner of the grease generating establishment shall install, operate and maintain the properly sized and designed grease interceptor tank. The interceptors shall be regularly pumped or cleaned out and maintained to ensure that they operate properly.

- 3.18.1 See Uniform Plumbing Code – Grease Interceptor Sizing Worksheet.
- 3.19 All details shall conform to the Standard Detail Drawings. Required items or installations for which no detail drawing exists, applicant's engineer shall submit sufficient design data and drawings for City approval. All such submitted drawings may require modification prior to approval for use.
- 3.20 Eleventh month inspection is required. Eleven months after the project is completed, all facilities constructed as part of the project will be inspected. Developer and/or Developer's Engineer shall be present. All gravity sewer lines will be video inspected per Section 11. All defects will be corrected at the Developer's expense.

Section 4 – Construction Provisions

- 4.1 All work within the public right-of-way shall be conducted by a licensed and bonded contractor. This requirement shall be stated on the construction drawings and in the project specifications.
- 4.2 City shall be notified at least 3 working days in advance prior to commencing construction work exception shall be made for emergency repairs.
- 4.3 Traffic control shall be signed, flagged and conducted in a manner conforming to ODOT standards (Manual of Uniform Traffic Control Devices, MUTCD) and approved by City. If road closures or detours are anticipated, prior approval from City and/or ODOT, must be obtained, as appropriate.
- 4.4 Safety Requirements. The contractor is responsible for observing the safety of the work and all persons and property coming into contact with the work. The contractor shall conduct his work in a manner complying with the requirements prescribed by OSHA.
- 4.5 Progress. Construction shall proceed in a systematic manner to minimize public inconvenience and disruption of services. All excavations, embankments, stockpiles, waste areas, etc. shall be kept protected. All roads, ditches, etc. shall be kept free from debris and shall be continually cleaned during the work. Dust control measures shall be employed as required and directed by the City.
- 4.6 Protection of Existing Improvements. Contractor shall contact the Utility Notification Center at least 48 hours in advance of digging operations to get approximate locations for buried utilities. Exact locations of buried facilities may not be known or shown and contractor is responsible to pot-hole carefully in advance of the work to avoid such facilities. Contractor shall coordinate with all utilities and notify them immediately in the event of any damage. Contractor shall protect, repair, and replace any damaged utilities as directed by the persons responsible for such utility. All landscape, grass, shrubs, signs, pavements, mail boxes, driveways, culverts, gravel surfacing, fencing, etc. shall be protected from damage and returned to conditions as good, or better than existed prior to construction. All costs for protection, repair, and replacement of all existing items shall be borne entirely by the contractor. Contractor shall obtain a release from any property owners for any claims of injury or property damage prior to final acceptance of the work by the City.

- 4.7 All existing survey monuments and control shall be protected, including individual property corner stakes. Any such monuments destroyed or altered during construction shall be restored by the contractor or developer in accordance with ORS.
- 4.8 Any temporary disruption to water or sewer service must be coordinated with, and approved by the City and kept to the minimum length of time necessary. City shall be notified at least 2 working days in advance of when an approved shut-down is desired as necessary to make tie-ins.
- 4.9 Trench foundation grades shall be constructed to within 0.1 feet of the grade shown in the plans. Surface tolerances shall be within 0.02 feet of plan elevation at any one point.
- 4.10 For pipelines, vertical deviation from true grade shall not exceed 0.02 feet (0.24 inch). Horizontal tolerance for deviation from line shall be 0.03125 feet (3/8 inch). Depressions or bellies which create the potential for solids deposition are not allowed.
- 4.11 Compaction testing equipment (nuclear gauge) shall be furnished and operated by the contractor or an independent testing firm shall be retained by the contractor or developer to perform compaction testing. Testing shall conform to the ODOT Manual of Field Testing Procedures (MFTP). Compaction testing shall be conducted in the presence of the City's inspector. Sufficient tests will be taken to ensure that the materials and compaction efforts being used are adequate to obtain the required density. Several tests shall be taken on each lift placed during the first day of backfill operations. Additional tests will be taken periodically during the work. At minimum, 2 compaction tests shall be taken for each trenchline (manhole to manhole). Alternate materials or methods will be required if adequate compaction is not being obtained. In no case shall pipe laying continue if inadequate compaction results until a resolution is provided.
- 4.12 Construction staking will be provided by the Developer's Engineer for establishing the location of the system. Offset stakes shall be placed at no more than 100 foot intervals along the mainline at each manhole. Each lateral location shall be staked.
- 4.13 Open trench length at any time shall not exceed 100 feet unless otherwise approved. Related resurfacing shall be completed within 800 feet of the open trench limit.

Section 5 – Sanitary Sewer System Materials

- 5.1 All materials shall be manufactured in the USA and be newly manufactured. No rebuilt, reconditioned or used material will be allowed.
- 5.2 Oregon Standard Specifications (OSS) – Means the 2002 Oregon Standard Specifications for Construction produced by ODOT and APWA, including latest revisions.
- 5.3 Concrete shall conform to OSS Section 00440, Commercial Grade Concrete. Compressive field strength shall not be less than 3,000 psi at 28 days. Maximum aggregate size shall be 1½-inches. Slump shall be between 2 and 4 inches.
- 5.4 Non-Shrink Grout. Grout shall be Sika 212, Euco N-S, Five Star, or approved equal nonmetallic cementitious commercial grout exhibiting zero shrinkage per ASTM C827. Grout shall not be amended with cement or sand and shall not be reconditioned with

water after initial mixing. Nonshrink grout shall be placed and packed only with the use of an approved commercial bonding agent. Unused grout shall be discarded after 20 minutes.

- 5.5 Manholes shall conform to ASTM C478-03 with yard permeability tests passing ASTM C497-03 prior to delivery. Manhole steps shall be plastic with ½" grade 60 steel reinforcing bar encapsulated with injection molded copolymer polypropylene with serrated surfaces. Preformed gaskets shall be Ram-Nek, Kent-Seal No. 2, or approved equal.
- 5.6 Trench Backfill Materials
- 5.6.1 Foundation Stabilization: 3"-0 to 6"-0 aggregate base rock meeting OSS Sections 00641 and 02630. Required when native trench foundation material contains groundwater, or is unsuitable to provide a firm foundation in the opinion of the City Engineer or City representative.
- 5.6.2 Pipe Bedding and Zone: ¾"-0 dense-graded aggregate, uniformly graded from coarse to fine and meeting OSS Section 02630.10.
- 5.6.3 Class A Backfill: Native or common excavated material, free from organic or other deleterious material, free from rock larger than 3-inches, and which meets the characteristics required for the specific surface loading or other criteria of the backfill zone in the opinion of the City Engineer or City representative. If stockpiled material becomes saturated or unsuitable, Class B, C or D Backfill shall be substituted.
- 5.6.4 Class B Backfill: ¾"-0 dense graded aggregate, uniformly graded from coarse to fine and meeting OSS Section 02630.10.
- 5.6.5 Class C Backfill: Clean sand with no particles larger than ¼-inch.
- 5.6.6 Class D Backfill: Pit run or bar run material, well graded from coarse to fine, with maximum aggregate size of 3 inches.
- 5.6.7 Class E Backfill (CLSM): Controlled Low-Strength Material (cement slurry) conforming to OSS Section 00442.
- 5.6.8 Compaction: Material (except Class E Backfill) shall be compacted in multiple lifts (6-inch maximum lift) to obtain 95% of the maximum dry density as determined by AASHTO T-99.
- 5.6.9 All Backfill within public right-of-ways or within 5 feet of a traveled surface shall be Class B Backfill, except where Class E Backfill is required under pavements by City or State requirements.
- 5.7 Sewer Pipe Materials
- 5.7.1 PVC gravity pipe, 4- through 15-inch nominal diameter shall be rubber gasketed, SDR35 minimum, conforming to all requirements of ASTM D3034 in

accordance with ASTM D1784. Pipe shall incorporate integral wall-thickened bells with bonded-in elastomeric gaskets meeting ASTM F477.

- 5.7.2 PVC gravity pipe, 18- through 27-inch nominal diameter shall be rubber gasketed, SDR35 minimum, conforming to all requirements of ASTM F679 in accordance with ASTM D1784. Pipe shall incorporate integral wall-thickened bells with bonded-in elastomeric gaskets meeting ASTM F477. Larger diameter pipes to be approved by the City Engineer or City representative on a case by case basis.
- 5.7.3 Force Mains. PVC pipe, 4- through 12-inch nominal diameter shall be rigid PVC made from class 12454-A or B compounds as defined in ASTM D1784. Pipe shall be Class 150 meeting DR18, minimum, conforming to all requirements of AWWA C900. Pipe shall incorporate integral wall-thickened bells with bonded-in elastomeric gaskets meeting ASTM F477.
- 5.7.4 Ductile iron pipe shall be Class 50 minimum thickness (Class 51 for 14-inch and larger) manufactured in accordance with ANSI/AWWA C151/A21.51 under method of design outlined in ANSI/AWWA C150/A21.50. Pipe interior shall have a lining suitable for septic sewer service such as Protecto 401 or similar approved lining. External pipe coating shall be an asphaltic coating in accordance with ANSI/AWWA C151/A21.51. Use only where approved by City.
- 5.7.5 Small diameter pipe for individual grinder pumps shall be Class 200 / SDR 21 PVC pipe meeting ASTM D2241, or PE3408 HDPE / SDR 7, IPS size as required. Proper pack joints and stiffeners required with HDPE pipe.
- 5.8 Fittings
 - 5.8.1 PVC fittings for gravity pipe shall be rubber gasketed sewer fittings meeting ASTM D3034, SDR 35, ASTM F477, and ASTM D3212.
 - 5.8.2 Joints for ductile iron pipe and C900 pipe shall be ductile iron mechanical joint (force mains) or push-on type (gravity). Fittings shall conform to ANSI/AWWA C110/A21.10 Standard (full body) or ANSI/AWWA C153/A21.53 (compact), with 250 psi minimum working pressure rating. All gray and ductile iron fittings shall be lined with a coating suitable for septic sewer service such as Protecto 401 or as approved. Exterior of fittings shall have an asphaltic coating in accordance with ANSI/AWWA C110/A21.10. Joints and gaskets for fittings shall conform to ANSI/AWWA C111/A21.11 Standard.
 - 5.8.3 Joint restrainers for MJ fittings shall be Megalug by EBAA Iron, or approved equal, specifically designed for the type of pipe material used.
 - 5.8.4 Service laterals shall be made by the use of new PVC in-line tees with manufactured bends (Wyes) to the main.
 - 5.8.4.1 Connections to the pipe shall be made with GPK in-line fittings, GPK saddle wyes or "Inserta-Tee" as manufactured by Fowler Manufacturing

- or approved equal. Installation shall be as manufactures recommendations. PVC Tee Saddle manufactured in accordance with ASTM D3034 with neoprene rubber gasket seal and ASTM F477 lateral pipe seal gasket. Stainless steel bands, series 300, 9/16-inch wide minimum.
- 5.8.4.2 Cast ductile iron saddle with virgin SBR rubber gasket and adjustable 3½-inch wide stainless steel strap. Romac Style "CB" or approved equal. Not allowed with plastic sewer pipe except C900.
- 5.8.4.3 Where existing pipe is damaged, interfering joints exist, or other conditions necessitate, or when directed by the City, cut in a regular pipe wye with pipe spools and Fernco type couplings.
- 5.8.4.4 All taps or connections to the existing main shall be made in the presence of the City Engineer or City representative.
- 5.8.5 Couplings for gravity sewer piping shall be flexible rubber type with stainless steel bands. Fernco or approved equal. Use only where approved. Rotate so that 'size' and 'type' information is turned upward to allow for inspection.
- 5.8.6 Manhole Connections
- 5.8.6.1 Connections to precast manhole sections shall be accurately core-drilled and shall utilize a properly sized flexible rubber boot providing a watertight seal. Adapter shall be factory tested for watertightness up to 10.8 psi. Kor-N-Seal as manufactured by NPC, Inc. or approved equal.
- 5.8.6.2 Connections to cast-in-place concrete shall be made with a rubber waterstop grouting ring. Ring shall clamp to pipe with stainless steel clamp and have waterstop ribs. Waterstop Grouting Ring by Press-Seal Gasket Corp., or approved equal.
- 5.9 Manhole Frames and Covers. Casting shall be tough, close-grained gray iron, smooth and clean, free from blisters, blowholes and all defects and conforming to ASTM A48, Class 30. All bearing surfaces shall be planed, ground or machined to ensure flat, true surfaces. Watertight frames and covers shall be installed at all locations subject to flooding or ponding. Tamperproof frames and covers required in off-street areas and easements. Cap screws for bolt-down covers shall be stainless steel with 60,000 psi minimum tensile strength conforming to ASTM A453.
- 5.10 Cleanouts. Cleanouts shall be constructed of the same PVC material as used to construct the mainline collection system piping. Cleanout size, fittings, and cleanout covers shall be as shown in the City's standard detail drawings. Cleanouts shall not be installed in mainline or substituted for manholes.

Section 6 – Sanitary Sewer Pipe Installation

- 6.1 Prepare trench in accordance with the standard detail in a safe manner. Place and compact foundation stabilization materials as required. Notify City to allow for inspection of the trench bottom.
- 6.2 Place and compact pipe bedding material before placing pipe in the trench. Dig depression for pipe bells to provide uniform bearing along the entire pipe length. Thoroughly compact bedding material to prevent future bellies.
- 6.3 Prior to lowering pipe into the trench, the Engineer and City representative will check for damage to the pipe. The Contractor shall repair or replace, as directed, all damaged or flawed pipe prior to installation.
- 6.4 Thoroughly clean inside the pipe before laying. Prevent foreign material from entering the pipe while it is being placed in the trench. Remove all foreign material from the inside of the pipe and joint before the next pipe is placed. Keep debris, tools, rags or other materials out of the pipe at all times. When pipe laying is not in progress, cover the exposed end of the pipe using a watertight expanding plug, or by other approved means to prevent entry of trench water or other foreign materials into the pipe.
- 6.5 Lay pipe with bell ends facing the direction of laying. For lines on an appreciable slope, face bells up-grade unless otherwise directed by the City. Thoroughly clean the ends of the pipe to remove all foreign matter from the pipe joint. Lubricate the bell and spigot ends with approved pipe lubricant, as recommended by the manufacturer.
- 6.6 PVC pipe shall be installed and handled in accordance with the Uni-Bell Plastic Pipe Association standards UNI-B-3, these specifications and the manufacturer's installation guide. The Contractor shall have on site all proper tools and equipment to properly and safely install the pipe.
- 6.7 Place materials in the pipe zone in layers not greater than 6 inches thick and in a manner that equalizes the pressure on the pipe and minimizes stress. As required under the haunches of pipe and areas not accessible to mechanical tampers or to testing, compact with hand methods to ensure thorough contact between the material and the pipe. Before placing the pipe zone material, condition, aerate, or wet the material so that the moisture content of each layer is within minus 4% to plus 2% of optimum moisture content.
- 6.8 Provide proper Backfill Class material as required. Backfill the trench above the pipe zone in successive lifts. Do not allow the backfill to free-fall into the trench until at least 3 feet of cover is provided over the top of the pipe. Modify the compaction as necessary to protect the pipe. Compact each lift to not less than 95% of the maximum density.
- 6.9 If the specified compaction is not obtained, contractor shall remove material, modify compaction procedures, and/or reduce the thickness of lifts as required. Do not proceed with additional excavation or pipe laying until the backfill can be compacted to the satisfaction of the City.
- 6.10 CLSM. When CLSM Backfill is required, backfill above pipe zone with CLSM material. If the CLSM is to be used as a temporary surfacing, backfill to top of the trench and

strike off to provide a smooth surface. If CLSM is not to be used as a temporary surface, backfill to bottom of the proposed resurfacing. Use steel plates to protect the CLSM from traffic a minimum of 24 hours.

- 6.11 Provide concrete thrust blocking at all bends, valves, tees and other fittings in accordance with the standard details, as required to prevent movement due to thrust. Mechanical joint restraints shall also be installed.
- 6.12 Where new water pipe is installed near existing or new sanitary sewer lines, all provisions of current OAR 333-61-050 (Crossings – Sanitary sewers and waterlines), regarding placement of pipe near, under, or over sanitary sewer lines shall be followed.
- 6.13 Restore all surfaces after backfill is complete. Base rock, asphalt paving and concrete paving methods and materials shall conform to Oregon Standard Specifications as approved by the City and/or ODOT, as appropriate.
- 6.14 Pressure pipe shall be installed and tested in accordance with City of Adair Village Standards contained in this Manual.
- 6.15 Tolerance. For gravity pipelines, vertical deviation from true grade shall not exceed 0.02 feet (0.24 inch). Horizontal tolerance for deviation from line shall be 0.03125 feet (3/8 inch). Depressions or bellies which create the potential for solids deposition are not allowed.
- 6.16 Testing. After installation, sewer system shall be tested for exfiltration allowances and defects according to the following Sections. All lines shall also be video inspected in the presence of City representative at Owner/Developers expense, for bellies and defects. Prior to acceptance all pipe sections including laterals and all manholes shall pass the acceptance criteria. All items not passing tests shall be repaired or replaced as required.

Section 7 – Low-Pressure Air Testing of Gravity Sewers (per UNI-B-6-98 / ASTM F1417)

- 7.1 The Contractor shall furnish all equipment, materials and personnel required for properly conducting all required low-pressure air testing under observation of the Engineer. Pressure gauge shall have 0.10 psi increments and an accuracy of 0.0625-psi. Testing equipment must include a pressure relief device designed to relieve pressure at a maximum of 9 psi and must allow continuous monitoring of the test pressure to avoid excessive pressure. All air used shall pass through a single control valve. Only qualified personnel shall be permitted to conduct the test. The Time Pressure Drop Method shall be used.
- 7.2 Testing shall be done in the presence of a City representative. Testing shall be conducted after backfilling and compaction has been completed to finish grade. Notify City at least 2 working days in advance.
- 7.3 Initial Test – A test shall be conducted on the first section of pipe laid by each crew to establish that the pipeline installation is capable of preventing excessive infiltration. The section of pipeline tested shall be at least 300 feet in length. If the test indicates exfiltration exceeding the amount hereinafter specified, all defective materials and/or workmanship shall be corrected and the test rerun until leakage is within the specified limits.

- 7.4 If, in the opinion of the City, the water tightness of the pipe is in question during installation, the City may require the Contractor to test the pipe sections in question. Such testing shall not be considered adequate for final pipe testing, performed after the pipe is installed, backfilled, compacted and cleaned. Thereafter all sewer pipe shall be tested as provided herein.
- 7.5 The Contractor may desire to make air tests prior to complete backfilling, for his own purposes; however, acceptance air test shall be made only after installation of all laterals and backfilling has been completed and compacted. It is recommended that testing be completed and accepted prior to paving in the event that some piping may require excavation for repair of deficiencies.
- 7.6 It is extremely important that all plugs, including end of service laterals, be installed and braced such that blowouts are prevented (ex. 250 lbs force is exerted on an 8" plug at 5 psig). Exercise care to prevent excessive pressures. Keep workers out of manholes until pressure is released.
- 7.7 Testing Procedure
- 7.7.1 Immediately following pipe cleaning, the pipe installation shall be tested with low pressure air. Each pipe section between manholes shall be tested. Service laterals from the main to the property line shall be included in the test.
- 7.7.2 Check the average height of ground water over the pipe invert. The test pressure required below shall be increased 0.433 psi for each foot of average water depth over the pipe (ex. If groundwater is 2.8 feet above pipe invert, add 1.2 psig to test pressures). Method used to determine groundwater depth shall be acceptable to the City.
- 7.7.3 Air shall be slowly supplied to the plugged pipe until internal air pressure reaches 4.0 psi greater than the average back pressure of any ground water that may submerge the pipe. Do not exceed a total pressure of 9.0 psig.
- 7.7.4 After the internal test pressure is reached, at least two minutes shall be allowed for the air temperature to stabilize. After the stabilization period, disconnect the air supply.
- 7.7.5 The continuous monitoring pressure gauge shall then be observed while the pressure is decreased to no less than 3.5 psig (greater than average backpressure of any groundwater over the pipe). At a reading of 3.5 psig, or any convenient pressure between 3.5 psig and 4.0 psig (above groundwater pressure), timing shall commence with an accurate stopwatch.
- 7.7.6 Acceptance - The tested section shall be considered acceptable if the required testing time has elapsed before a 1.0 psig pressure drop has occurred. If the pressure drops 1.0 psig before the minimum length of time has elapsed, the air loss rate is considered excessive and the section of pipe has failed the test.

- 7.7.7 Acceptance criteria is based on an allowable air loss of $Q=0.0015$ cfm per ft^2 of internal pipe surface area less than 625 ft^2 . This results in a total allowable loss of $625Q = 0.94$ cfm. The shortest time (T), in seconds, allowed for the air pressure to drop 1.0 psig is calculated with the following formula:

$$T = 0.085 (DK/0.0015)$$

$K = 0.000419DL$ but not less than 1.0, D = pipe I.D. in inches, and L = length of pipe tested in feet.

- 7.7.8 Contractor shall record and document the testing procedure and results during the testing process. The UNI-Bell "Air Test Data Sheet" or similar approved equal shall be used and submitted to the Engineer. Record the diameter (in), length (ft), start and end manhole numbers, time, date, pressure drop, and groundwater level on inspection form. Submit to City.

Minimum Specified Time Required for 1.0 PSIG Pressure Drop

Pipe ø (in)	T_{\min} (min:sec)	L for T_{\min} (ft)	T for longer L (sec)	Specification Time for Length (L) Shown (min:sec)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	.380L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	.854L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15

If no pressure drop (0 psig) has occurred after 1 hour, test may conclude and section passes

- 7.7.9 Service laterals shall be included in test. However the length of service laterals may be ignored and the length of main line only used in the above table. If desired, length of service laterals included in test section may be included in the calculation by following the method outlined in UNI-B-6-98 Section 9.4.

Section 8 – Hydrostatic Testing of Pipe

- 8.1 Contractor shall provide all hose, temporary piping, approved pipe plugs, tank trucks, and other equipment, labor and material required to make the hydrostatic tests, and shall pay for the water used, unless otherwise approved by the City. Testing of the pipe shall be conducted in the presence of a City representative. Testing shall be conducted after backfilling and compaction has been completed to finish grade. Notify City at least 2 working days in advance.
- 8.2 Prior to making exfiltration leakage tests, contractor may fill the pipe with clear water to permit normal absorption into the pipe walls; provided however, that after filling the

pipe, leakage testing shall be completed within twenty-four (24) hours after filling. When under test, allowable leakage shall comply with the following requirements:

Leakage shall not exceed 0.04 gallons per hour per inch diameter per one hundred (100) feet of sanitary sewer pipe, with a minimum test pressure of six (6) feet of water column above the highest section of pipe (including service laterals), or above the active ground water table, whichever is higher as determined by the City. The length of pipe tested shall be limited so that the pressure on the invert of the lower end of the section tested shall not exceed 28 feet of water column, and in no case shall be greater than 500 feet. All service connection footage shall be taken into account in computing allowable leakage. Test duration shall be at least 2 hours. Methods of imposing the water column and measuring the water loss shall be acceptable to the City.

Section 9 – Vacuum Testing of Manholes (per ASTM C1244)

- 9.1 Precast concrete manholes shall be tested in accordance with the following procedure. Manhole installations which fail the testing shall be repaired or replaced until passing results are obtained. If flexible joint sealant is pulled out during testing, it shall be repaired.
- 9.2 Testing shall be done in the presence of a City representative. Notify City at least 2 working days in advance. Use Report Form approved by City.
- 9.3 All manholes shall be tested for acceptance after the trench has been backfilled, compaction requirements have been met, road base rock has been installed, paving is complete, and concrete manhole collars have been installed. If manhole has passed test and the castings have later been disturbed, manhole shall be re-tested.
- 9.4 Thoroughly clean all manholes prior to testing. Remove all debris and do not allow foreign material to enter downstream piping.
- 9.5 Contractor shall provide all necessary equipment and personnel to conduct the testing, including vacuum equipment and indicating devices.
- 9.6 Procedure
 - 9.6.1 Plug all pipes entering manhole. Secure all plugs to prevent movement while vacuum is being drawn.
 - 9.6.2 Testing shall include the joint between the manhole cone or riser ring(s) and the manhole cover frame.
 - 9.6.3 Installation and operation of vacuum equipment and indicating devices shall be in accordance with the manufacturer's specifications and instructions.
 - 9.6.4 Withdraw air from the manhole until a measured vacuum of 10-inches of mercury (10" Hg = 4.9 psi) is established in the manhole interior.

- 9.6.5 Record the time it takes for the vacuum to drop to 9-inches of mercury (9" Hg = 4.4 psi). Acceptance standards are based on this 1-inch of mercury change in negative pressure. Time measured for the 1" Hg (1" Hg = 0.5 psi) pressure change shall be equal to or greater than the values in the following table:

Vacuum Testing Requirements (minimum test times, seconds)

Manhole Depth (ft)	Manhole Diameter (in)				
	42"	48"	54"	60"	72"
8' or less	17	20	23	26	33
10	21	25	29	33	41
12	25	30	35	39	49
14	30	35	41	46	57
16	34	40	46	52	67
18	38	45	52	59	73
20	42	50	53	65	81
22	46	55	64	72	89

- 9.6.6 Hydrostatic testing of manholes may be allowed. Test shall be in accordance with ASTM C497 as modified here. Test will consist of plugging all inlets and outlets and filling the manhole with water to the rim. Leakage in each manhole shall not exceed 0.2 gallons per hour per foot of head above the invert. Leakage will be determined by refilling to the rim using a calibrated or known volume container. Testing duration shall be at least 2 hours. Testing results shall be recorded on a form approved by the City.

Section 10 – Deflection Testing for Flexible Pipe

- 10.1 In addition to air or hydrostatic testing, the contractor shall conduct deflection tests of sanitary sewers constructed of flexible pipe. Testing will consist of pulling an approved mandrel through the completed pipeline after backfill and compaction to finish grade is complete. Testing shall be conducted in the presence of a City representative.
- 10.2 Diameter of the mandrel shall be at least 95% of the pipe internal diameter. Mandrel shall have at least 6 vanes.
- 10.3 Testing shall be done from manhole to manhole. Pipe shall be thoroughly cleaned and flushed prior to pulling the mandrel. Mandrel shall pass smoothly through the pipe without excessive effort.
- 10.4 Testing shall be conducted only after at least 30 days have elapsed after backfill and compaction was completed. May be conducted concurrently with video inspection.

Section 11 – Video Inspection of Gravity Systems

- 11.1 All gravity sewer lines constructed as part of the project shall be televised and taped at the end of construction prior to acceptance. Taping shall be conducted after all backfill and compaction, but prior to final surface restoration. All pipes shall be thoroughly flushed by the Contractor immediately prior to the video inspection. The video shall be

recorded in color on VHS or DVD format. Sufficient light shall be provided to show detail. Camera speed shall not exceed 3 feet per second. Camera shall have a swivel (pan and tilt) head capable of looking up each service connection. A copy of the video tape and a written TV Inspection Report shall be furnished to the City. Any sections of sewer pipe not meeting specifications or exhibiting defects shall, at the Contractor's expense, be corrected to meet specification. Repaired sections shall be re-televised. All repairs must be completed before acceptance of the project.

- 11.2 The sanitary sewer lines constructed as part of the project will also be video inspected near the end of the one-year or two-year warranty period as appropriate to determine if any defects exist in the system. The warranty video inspection will be conducted during a season of high groundwater as close to the end of the warranty period as possible. The warranty period will continue to be in effect, regardless of duration, until all video recordings are received and approved. All defects in the system will be corrected at the developer's or contractor's expense.
- 11.3 Video inspection and taping costs will be borne by the contractor or developer unless otherwise approved.
- 11.4 All video inspection and tapping shall be conducted in the presence of a City representative.

Guidelines for Development Sanitary Sewer Designs Standards Manual:

Testing and Data Sheets

Pipe Air Test Data Sheet
Gravity Pipe Hydrostatic Test
Manhole Vacuum Test
Manhole Hydrostatic Test

Testing Procedure

- 1) Immediately following pipe cleaning, the pipe installation shall be tested with low pressure air. Each pipe section between manholes shall be tested. Service laterals from the main to the property line shall be included in the test.
- 2) Check the average height of ground water over the pipe invert. The test pressure required below shall be increased 0.433 psi for each foot of average water depth over the pipe (ex. If groundwater is 2.8 feet above pipe invert, add 1.2 psig to test pressures). Method used to determine groundwater depth shall be acceptable to the City.
- 3) Air shall be slowly supplied to the plugged pipe until internal air pressure reaches 4.0 psi greater than the average back pressure of any ground water that may submerge the pipe. Do not exceed a total pressure of 9.0 psig.
- 4) After the internal test pressure is reached, at least two minutes shall be allowed for the air temperature to stabilize. After the stabilization period, disconnect the air supply.
- 5) The continuous monitoring pressure gauge shall then be observed while the pressure is decreased to no less than 3.5 psig (greater than average backpressure of any groundwater over the pipe). At a reading of 3.5 psig, or any convenient pressure between 3.5 psig and 4.0 psig (above groundwater pressure), timing shall commence with an accurate stop watch.
- 6) Acceptance - The tested section shall be considered acceptable if the required testing time has elapsed before a 1.0 psig pressure drop has occurred. If the pressure drops 1.0 psig before the minimum length of time has elapsed, the air loss rate is considered excessive and the section of pipe has failed the test.
- 7) Acceptance criteria is based on an allowable air loss of $Q=0.0015$ cfm per ft^2 of internal pipe surface area less than $625 ft^2$. This results in a total allowable loss of $625Q = 0.94$ cfm. The shortest time (T), in seconds, allowed for the air pressure to drop 1.0 psig is calculated with the following formula:

$$T = 0.085 (DK/0.0015); K = 0.000419DL \text{ but not less than } 1.0, D = \text{pipe I.D. in inches, and } L = \text{length of pipe tested in feet.}$$

- 8) Contractor shall record and document the testing procedure and results during the testing process. The UNI-Bell "Air Test Data Sheet" or similar approved equal shall be used and submitted to the Engineer. Record the diameter (in), length (ft), start and end manhole numbers, time, date, pressure drop, and groundwater level on inspection form. Submit to City.

Minimum Specified Time Required for 1.0 PSIG Pressure Drop

Pipe ϕ (in)	T_{min} (min:sec)	L for T_{min} (ft)	T for longer L (sec)	Specification Time for Length (L) Shown (min:sec)								
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft	
4	3:46	597	.380L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46	
6	5:40	398	.854L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24	
8	7:34	298	1.520L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24	
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24	22:40	99	13.674L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33	
27	25:30	88	17.306L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48	
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If no pressure drop (0 psig) has occurred after 1 hour, test may conclude and section passes

- 9) Service laterals shall be included in test however the length of service laterals may be ignored and the length of main line only used in the above table. If desired, length of service laterals included in test section may be included in the calculation by following the method outlined in UNI-B-6-98 Section 9.4.

Vacuum Testing of Manholes (per ASTM C1244)

- A. Precast concrete manholes shall be tested in accordance with the following procedure. Manhole installations which fail the testing shall be repaired or replaced until passing results are obtained. If flexible joint sealant is pulled out during testing, it shall be repaired.
- B. Testing shall be done in the presence of a City representative. Notify City at least 48 hours in advance. Use Report Form approved by City.
- C. All manholes shall be tested for acceptance after the trench has been backfilled, compaction requirements have been met, road base rock has been installed, paving is complete, and concrete manhole collars have been installed. If manhole has passed test and the castings have later been disturbed, manhole shall be re-tested.
- D. Thoroughly clean all manholes prior to testing. Remove all debris and do not allow foreign material to enter downstream piping.
- E. Contractor shall provide all necessary equipment and personnel to conduct the testing, including vacuum equipment and indicating devices.
- F. Procedure
 1. Plug all pipes entering manhole. Secure all plugs to prevent movement while vacuum is being drawn.
 2. Testing shall include the joint between the manhole cone or riser ring(s) and the manhole cover frame.
 3. Installation and operation of vacuum equipment and indicating devices shall be in accordance with the manufacturer's specifications and instructions.
 4. Withdraw air from the manhole until a measured vacuum of 10-inches of mercury (10" Hg) is established in the manhole interior.
 5. Record the time it takes for the vacuum to drop to 9-inches of mercury (9" Hg). Acceptance standards are based on this 1-inch of mercury change in negative pressure. Time measured for the 1" Hg pressure change shall be equal to or greater than the values in the following table:

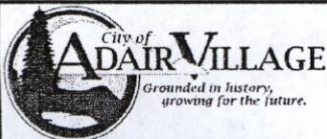
Vacuum Testing Requirements (minimum test times, seconds)

Manhole Depth (ft)	Manhole Diameter (in)				
	42"	48"	54"	60"	72"
8' or less	17	20	23	26	33
10	21	25	29	33	41
12	25	30	35	39	49
14	30	35	41	46	57
16	34	40	46	52	67
18	38	45	52	59	73
20	42	50	53	65	81
22	46	55	64	72	89

SEWER SYSTEM

STANDARD DETAIL DRAWINGS INDEX

- S-050: STANDARD UTILITY LOCATIONS
- S-100: TYPICAL SEWER TRENCH DETAIL
- S-105: STREET CUT STANDARD DETAIL
- S-150: PIPE ANCHOR / TRENCH CUT-OFF WALL DETAIL
- S-200: STANDARD MANHOLE
- S-205: FLAT-TOP MANHOLE
- S-210: MANHOLE BASE STANDARD DETAILS
- S-220: STANDARD INSIDE DROP MANHOLE
- S-225: STANDARD OUTSIDE DROP MANHOLE
- S-250: MANHOLE COVER AND FRAME DETAILS
- S-260: MANHOLE FRAME GRADE ADJUSTMENT
- S-300: STANDARD SERVICE CONNECTION AND LATERAL
- S-400: TYPICAL PIPE CASING DETAIL



City of Adair Village
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Adair Village, Oregon 97330
(541) 745-5507 Fax: (541) 745-5530

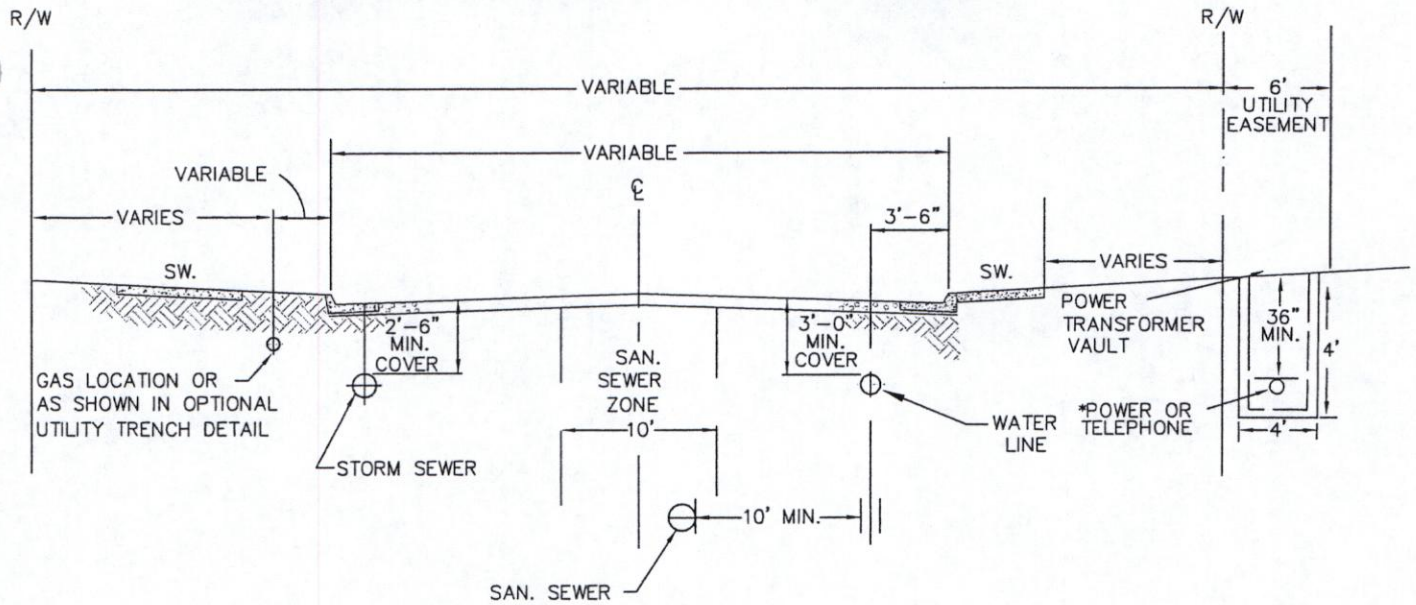
STANDARD DETAIL DRAWING INDEX

DETAIL NO.

S-010

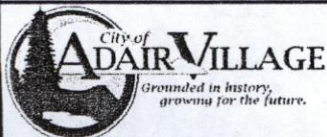
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SEE DWG. T-050 FOR STANDARD STREET WIDTHS AND SECTIONS



NOTES:

1. WATER LOCATED 3'-6" INSIDE FROM FACE OF CURB OR AS OTHERWISE DIRECTED.
2. 10' HORIZONTAL SEPARATION BETWEEN WATER AND SEWER WHERE POSSIBLE. COMPLY WITH SEPARATION REQUIREMENTS OF OAR 333-061-050.
3. WATER DISTRIBUTION MAINS SHALL HAVE 36" MINIMUM COVER OR AS OTHERWISE DIRECTED.
4. SEWER MAINS SHALL HAVE 5.25' (63") MINIMUM COVER UNLESS OTHERWISE APPROVED TO AVOID CONFLICTS WITH WATER AND OTHER UTILITIES.
5. WATER MAINS SHALL BE LOCATED ON NORTH OR EAST SIDE OF STREET WHEN PRACTICAL.
6. WATER, SEWER, STREET AND DRAINAGE SYSTEMS ARE SUBJECT TO CITY STANDARDS.
7. MANHOLE LIDS SHALL NOT BE LOCATED DIRECTLY IN NORMAL WHEEL PATH.
8. ALL LAYOUTS AND LOCATIONS ARE SUBJECT TO CITY APPROVAL.



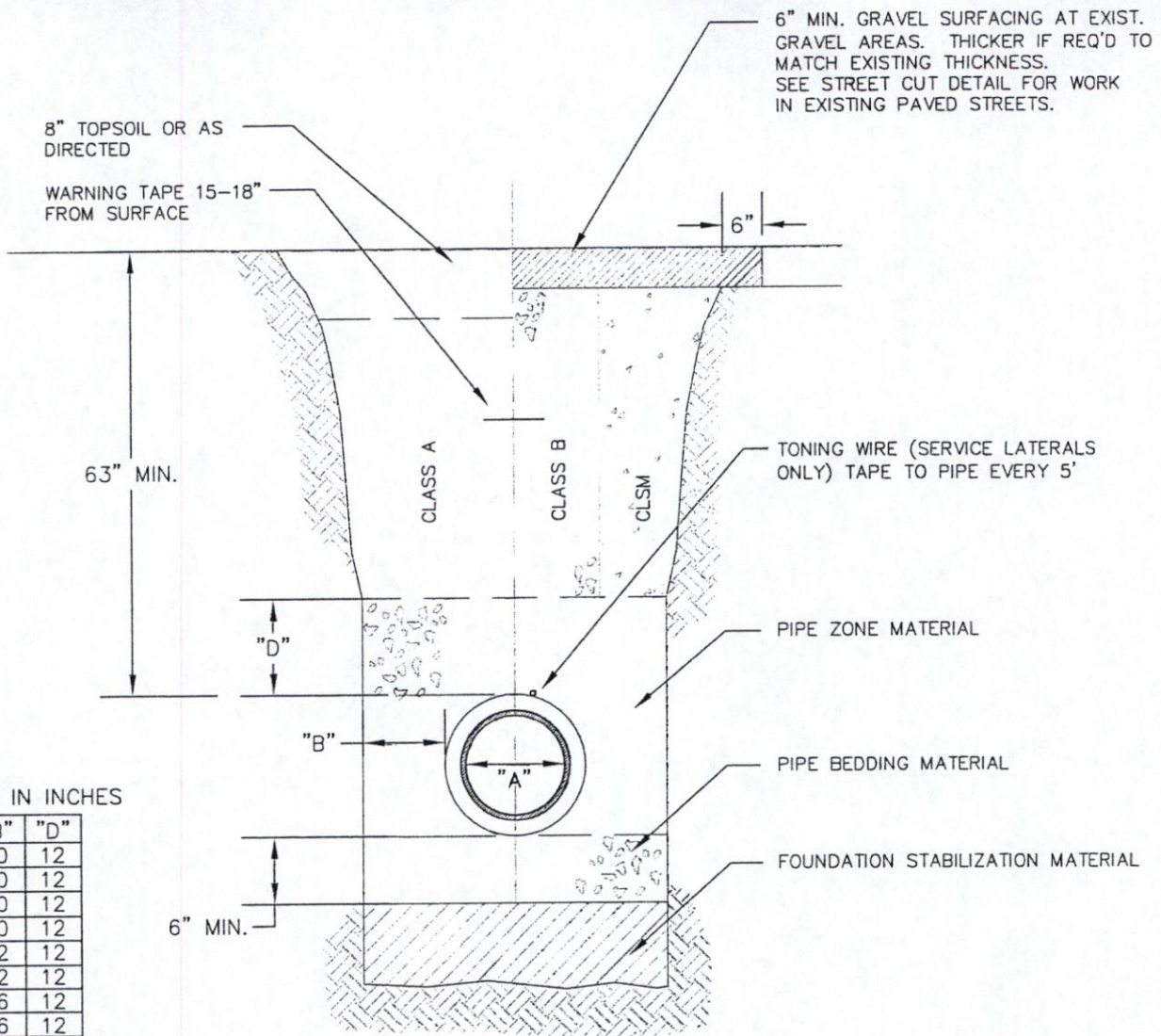
City of Adair Village
 6030 NE William R Carr St.
 Adair Village, Oregon 97330
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STANDARD UTILITY
 LOCATIONS

DETAIL NO.

S-050

04/29/2009

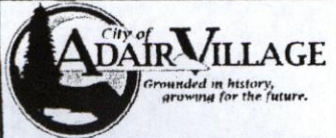


DIMENSIONS IN INCHES

"A"	"B"	"D"
4	10	12
6	10	12
8	10	12
10	10	12
12	12	12
15	12	12
18	16	12
21	16	12
24	18	12
30	18	12
36	24	14

NOTES:

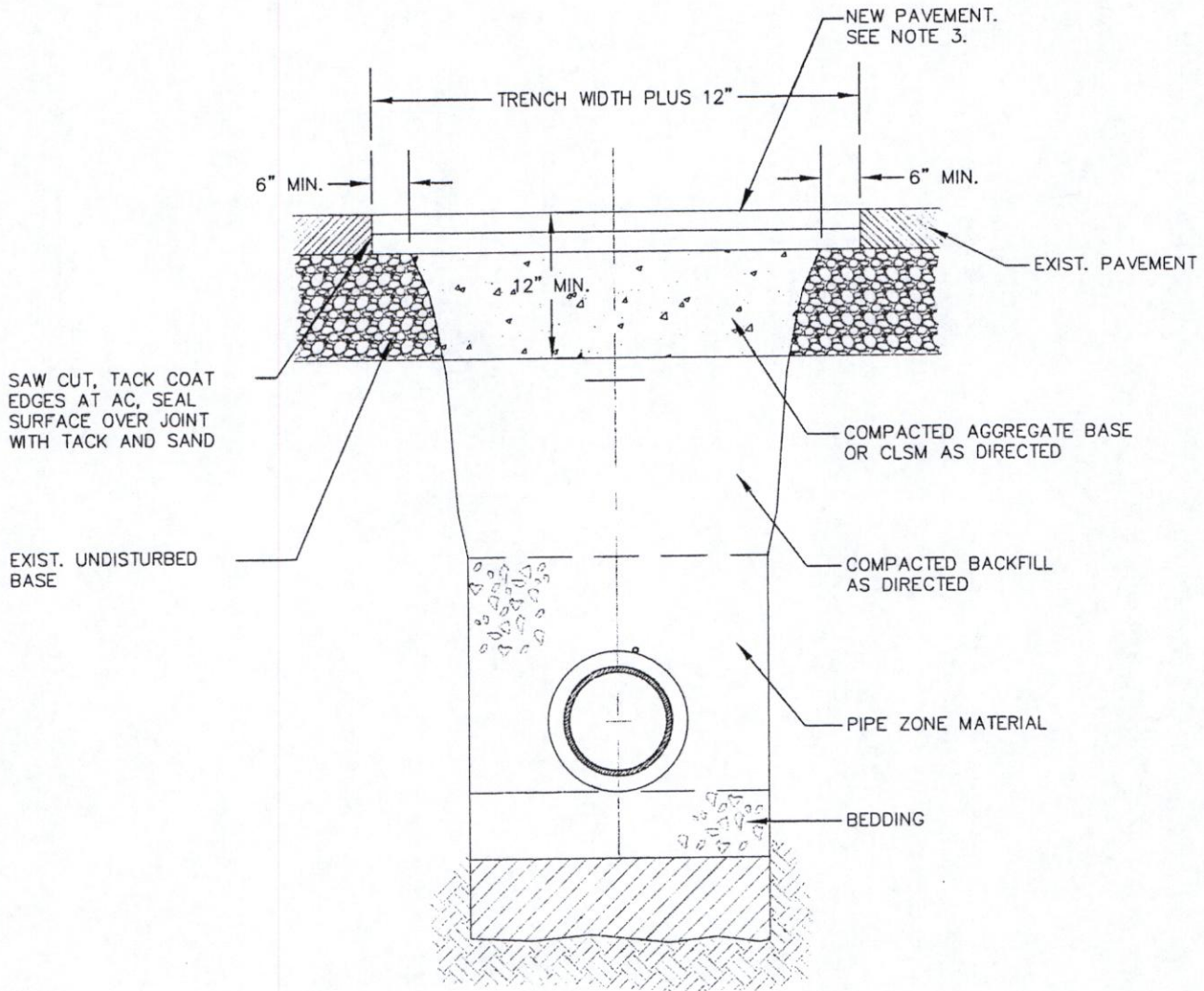
1. TRENCH EXCAVATION SHALL BE CONDUCTED IN A SAFE MANNER WITH ALL NECESSARY BRACING AND SHORING PROVIDED FOR COMPLIANCE WITH OSHA.
2. FOUNDATION STABILIZATION SHALL BE PROVIDED WHEN MATERIAL AT BOTTOM OF TRENCH IS UNSUITABLE IN THE OPINION OF THE CITY TO PROVIDE A STABLE TRENCH BASE.
3. CONSTRUCTION IN PUBLIC RIGHT-OF-WAY SHALL COMPLY WITH CITY STANDARDS.
4. CLASS B BACKFILL REQUIRED IN ALL ROADWAYS AND TRAFFIC PATHS EXCEPT WHERE CLSM BACKFILL IS REQUIRED BY COUNTY, ODOT, OR CITY.
5. TONING WIRE REQUIRED AT SERVICE LATERALS. WIRE SHALL BE 12 GA. MINIMUM SOLID COPPER WIRE WITH GREEN 30 MIL THICK HDPE INSULATION RATED FOR DIRECT BURY. USE APPROVED WATERPROOF SPLICE AT ALL CONNECTIONS.
6. WARNING TAPE SHALL BE 6" WIDE, 4 MIL THICK, APWA GREEN, READING "CAUTION SEWER LINE BURIED BELOW".
7. MATERIALS SHALL BE IN ACCORDANCE WITH THE CITY SANITARY SEWER DESIGN STANDARDS MANUAL.
8. COMPACT ALL FILL AS SPECIFIED.



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TYPICAL TRENCH DETAIL
 SANITARY SEWER

DETAIL NO.
S-100
04/29/2009



NOTES:

1. ALL EXISTING AC OR PCC PAVEMENT SHALL BE SAWCUT IMMEDIATELY PRIOR TO REPAVING.
2. CONCRETE PAVEMENT SHALL BE REPLACED WITH CONCRETE TO A MINIMUM THICKNESS OF 6 INCHES OR TO THE THICKNESS OF REMOVED CONCRETE PAVEMENT, WHICHEVER IS GREATER.
3. PLACE AC MIX TO A MINIMUM THICKNESS OF 4 INCHES OR THE THICKNESS OF REMOVED PAVEMENT, WHICHEVER IS GREATER. COMPACT AS DIRECTED. AC PAVEMENT SHALL BE PLACED IN AT LEAST TWO 2" LIFTS.
4. COMPLY WITH THE REQUIREMENTS OF THE AGENCY HAVING JURISDICTION OVER THE ROAD IN WHICH THE STREET CUT OCCURS.



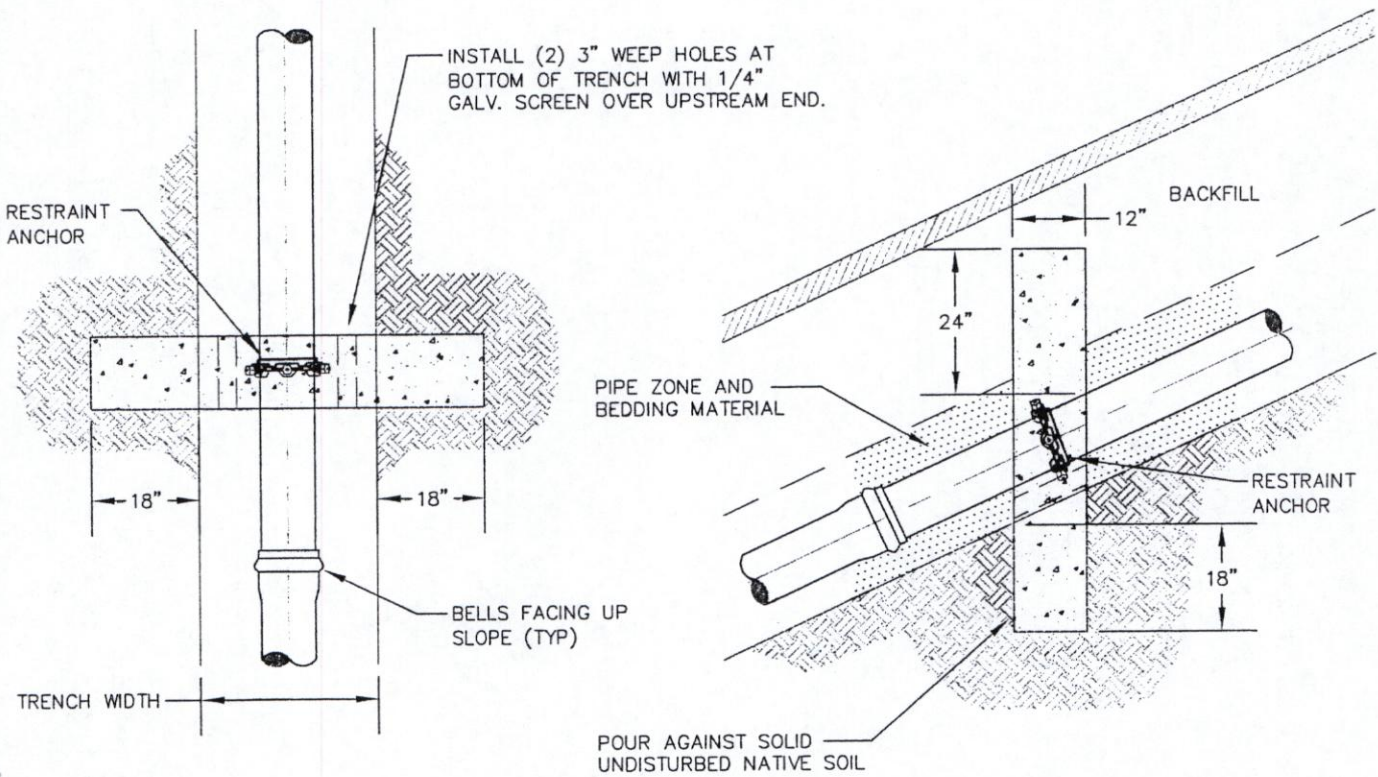
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STREET CUT
 STANDARD DETAIL

DETAIL NO.

S-105

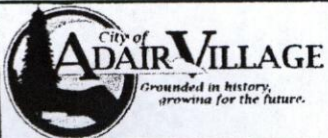
04/29/2009



NOTES:

1. CUT-OFF WALLS REQ'D AT ALL PIPELINES WHERE SLOPE EXCEEDS 20%.
2. RESTRAINED JOINT PIPE REQUIRED AT SLOPES BETWEEN 15% AND 20%.
3. WALLS SHALL BE FORMED WITHIN TRENCH. REMOVE FORMS PRIOR TO BACKFILLING.
4. CONCRETE SHALL HAVE 3000 PSI COMPRESSIVE STRENGTH MIN. (CLASS 3000).
5. SPACING OF WALLS SHALL BE:

SLOPE	SPACING
20-34%	35 FEET
35-50%	25 FEET
51-+%	15 FEET



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PIPE ANCHOR / TRENCH
 CUT-OFF WALL DETAIL

DETAIL NO.

S-150

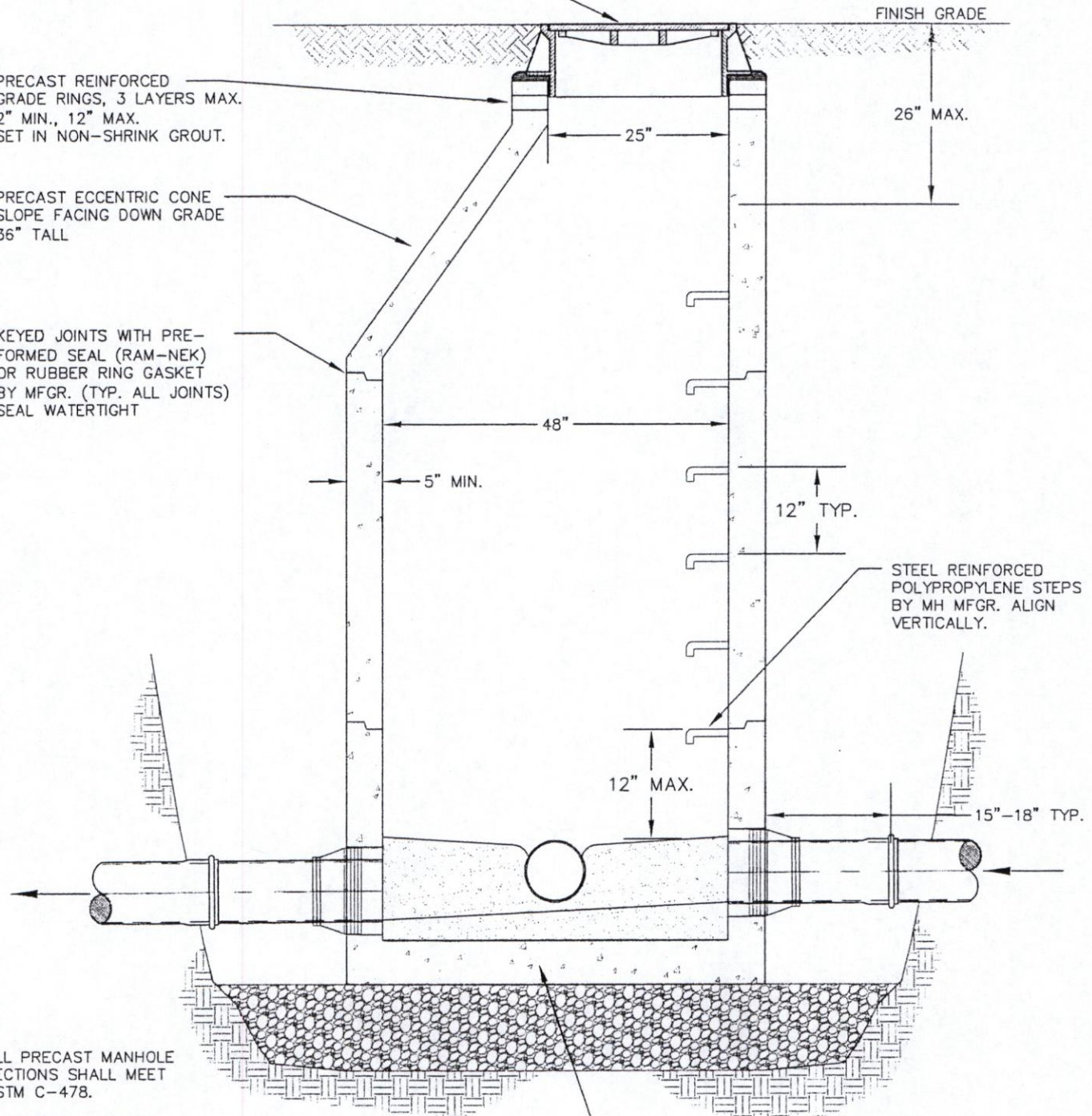
04/29/2009

CAST IRON (H-20 RATED)
MANHOLE COVER AND FRAME=
SET FRAME IN NON-SHRINK GROUT
SEE MANHOLE COVER & FRAME
STANDARD DETAIL (S-250)

PRECAST REINFORCED
GRADE RINGS, 3 LAYERS MAX.
2" MIN., 12" MAX.
SET IN NON-SHRINK GROUT.

PRECAST ECCENTRIC CONE
SLOPE FACING DOWN GRADE
36" TALL

KEYED JOINTS WITH PRE-
FORMED SEAL (RAM-NEK)
OR RUBBER RING GASKET
BY MFR. (TYP. ALL JOINTS)
SEAL WATERTIGHT

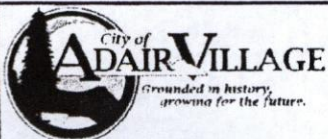


ALL PRECAST MANHOLE
SECTIONS SHALL MEET
ASTM C-478.

FLAT-TOP MANHOLE
REQUIRED WHEN DEPTH
FROM FINISH GRADE TO
INVERT IS LESS THAN
6 FEET.

INTERIOR DROPS EXCEEDING 24"
REQUIRE DROP MANHOLE.

SEE MANHOLE BASE
STANDARD DETAIL (S-210)



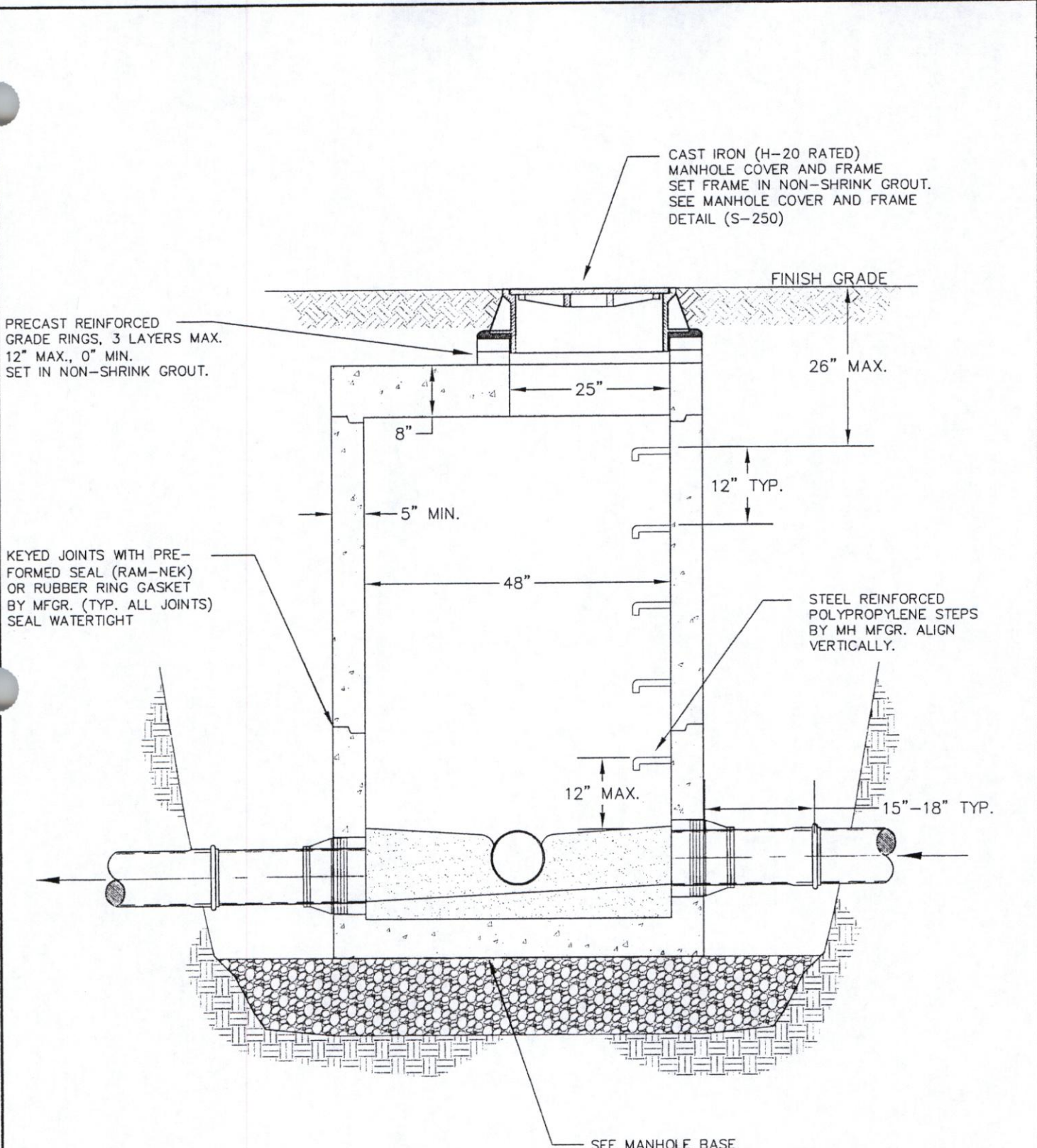
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STANDARD MANHOLE PIPES LESS THAN 24" DIAM.

DETAIL NO.

S-200

04/29/2009



CAST IRON (H-20 RATED)
MANHOLE COVER AND FRAME
SET FRAME IN NON-SHRINK GROUT.
SEE MANHOLE COVER AND FRAME
DETAIL (S-250)

PRECAST REINFORCED
GRADE RINGS, 3 LAYERS MAX.
12" MAX., 0" MIN.
SET IN NON-SHRINK GROUT.

KEYED JOINTS WITH PRE-
FORMED SEAL (RAM-NEK)
OR RUBBER RING GASKET
BY MFR. (TYP. ALL JOINTS)
SEAL WATERTIGHT

STEEL REINFORCED
POLYPROPYLENE STEPS
BY MH MFR. ALIGN
VERTICALLY.

SEE MANHOLE BASE
STANDARD DETAIL (S-210)

NOTE:

- 1) ALL PRECAST MANHOLE SECTIONS SHALL MEET ASTM C-478.
- 2) STANDARD MANHOLE REQUIRED WHEN DEPTH FROM FINISH GRADE TO INVERT IS 6 FEET OR MORE.



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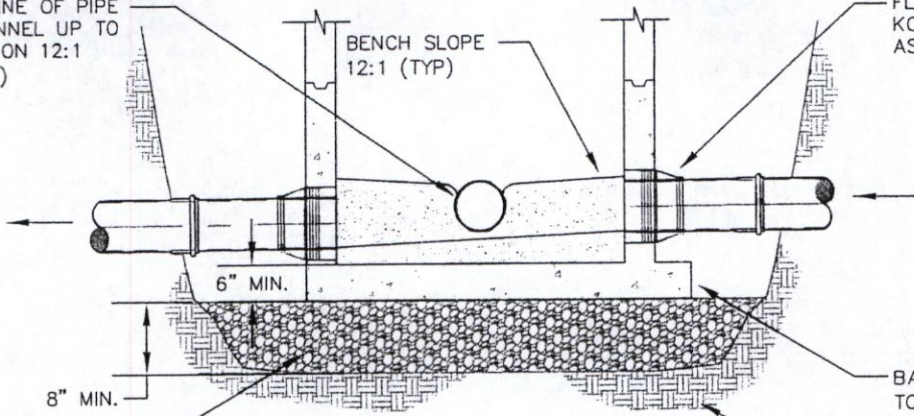
FLAT-TOP MANHOLE
PIPES LESS THAN 24" DIAM.

DETAIL NO.
S-205
04/29/2009

AT SPRING LINE OF PIPE
EXTEND CHANNEL UP TO
CROWN LINE ON 12:1
BATTER (TYP)

BENCH SLOPE
12:1 (TYP)

FLEXIBLE RUBBER BOOT
KOR-N-SEAL OR EQUAL
AS APPROVED.



3/4"-0 CRUSHED
ROCK BASE (TYP)

PRECAST BASE

PRECAST BASE HEIGHT
SUFFICIENT TO AVOID
JOINT AT PIPE PENETRATIONS

BASE EXTENSION AS REQ'D
TO PREVENT UPLIFT (TYP)

UNDISTURBED EARTH OR
COMPACT SELECT MATERIAL
AS REQ'D (95%) (TYP)

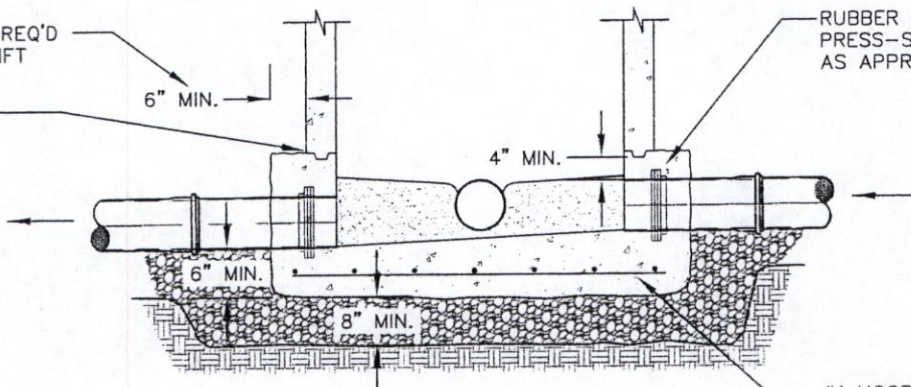
OR GREATER AS REQ'D
TO PREVENT UPLIFT

RAM-NEK SEAL

6" MIN.

RUBBER WATERSTOP GROUT RING
PRESS-SEAL GASKET OR EQUAL
AS APPROVED.

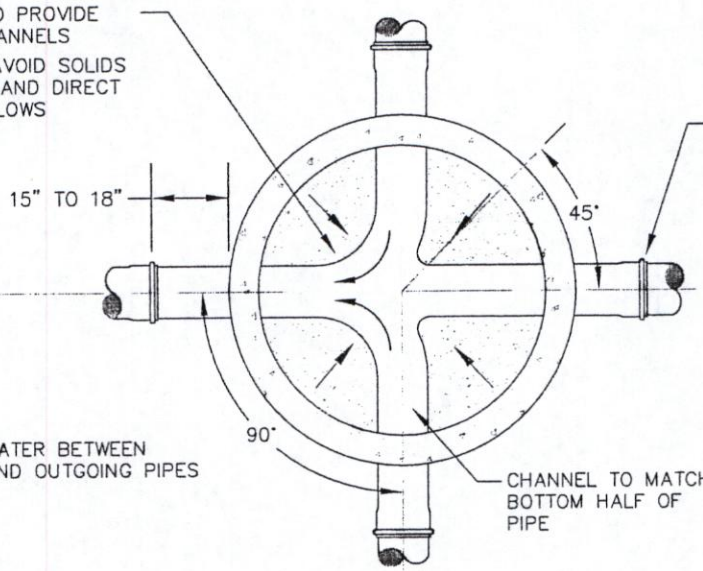
4" MIN.



#4 HOOP AND #4 @ 12" E.W.
#5 BARS WHEN DEPTH
EXCEEDS 15'

CAST-IN-PLACE BASE

CONTOUR TO PROVIDE
SMOOTH CHANNELS
SHAPE TO AVOID SOLIDS
DEPOSITION AND DIRECT
HEAD-ON FLOWS



PIPE JOINT
FLEXIBLE COUPLING
WHERE CONNECTING
TO EXIST. PIPE

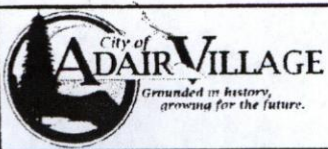
90° OR GREATER BETWEEN
INCOMING AND OUTGOING PIPES

CHANNEL TO MATCH
BOTTOM HALF OF
PIPE

PRECAST OR CAST-IN-PLACE
BASE AT CONTRACTOR'S
OPTION OR AS DIRECTED.

ALL FIELD PLACED CONCRETE
SHALL BE TYPE II PCC WITH
3000 PSI MIN. STRENGTH

MIN. 0.2 FT. INVERT DROP
ACROSS INLET AND OUTLET
PIPES.



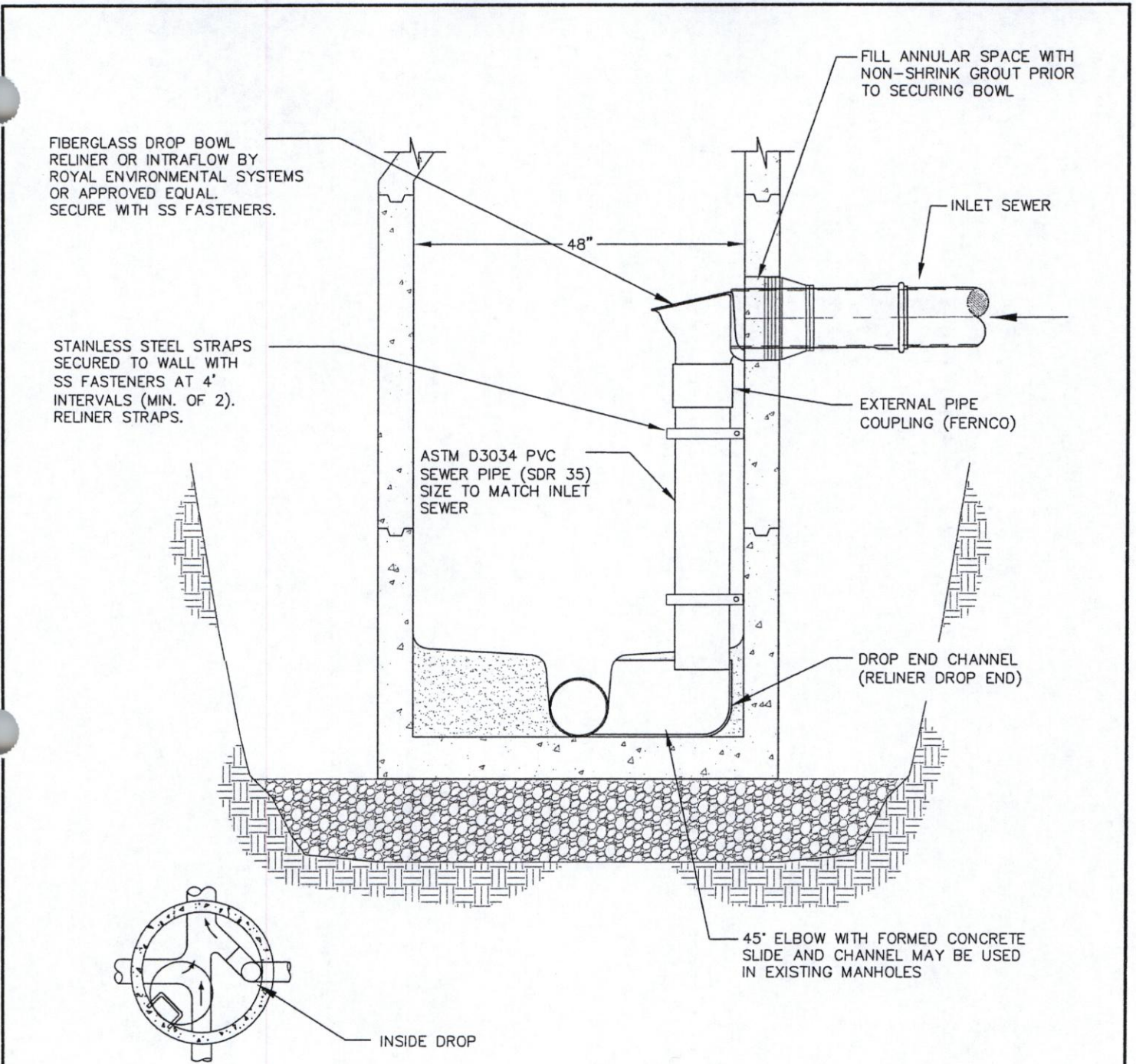
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MANHOLE BASE STANDARD DETAILS

DETAIL NO.

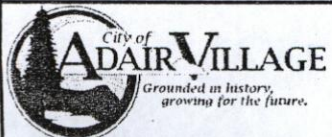
S-210

04/29/2009



NOTES:

1. DROP MANHOLES SHALL ONLY BE USED WITH PRIOR APPROVAL FROM CITY OF COOS BAY.
2. RELINER DROP BOWL, 8" OUTLET (B8) FOR 8" INLET SEWERS. B10 FOR 10" SEWERS. CONSULT CITY ENGINEER FOR LARGER SIZES.
3. EXTEND INLET SEWER PIPE 2" INTO MANHOLE. CUT "V" NOTCH IN BOTTOM OF PIPE PROTRUSION. FOLLOW RELINER INSTRUCTIONS.
4. INTRAFLOW INSIDE DROP SYSTEM ACCOMODATES 6" TO 12" SEWERS. INTRAFLOW SECTIONS SHALL BE AT LEAST 4" WIDER THAN INLET SEWER. OUTLET ELBOW TO MATCH INLET SEWER SIZE.
5. ONLY ONE DROP ASSEMBLY ALLOWED PER MANHOLE.



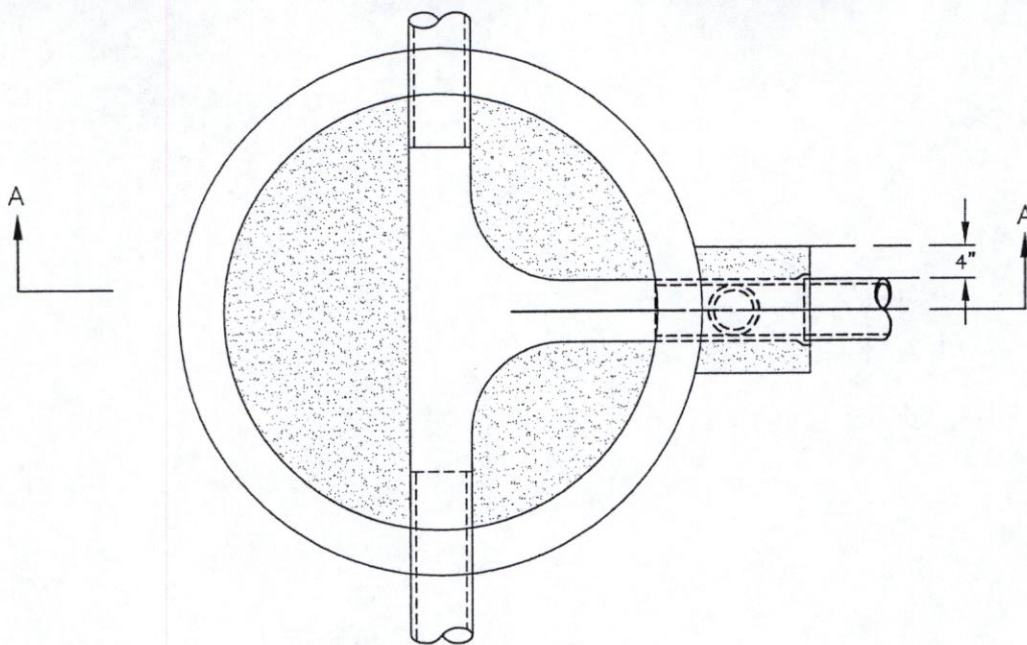
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**STANDARD INSIDE DROP
 MANHOLE**

DETAIL NO.

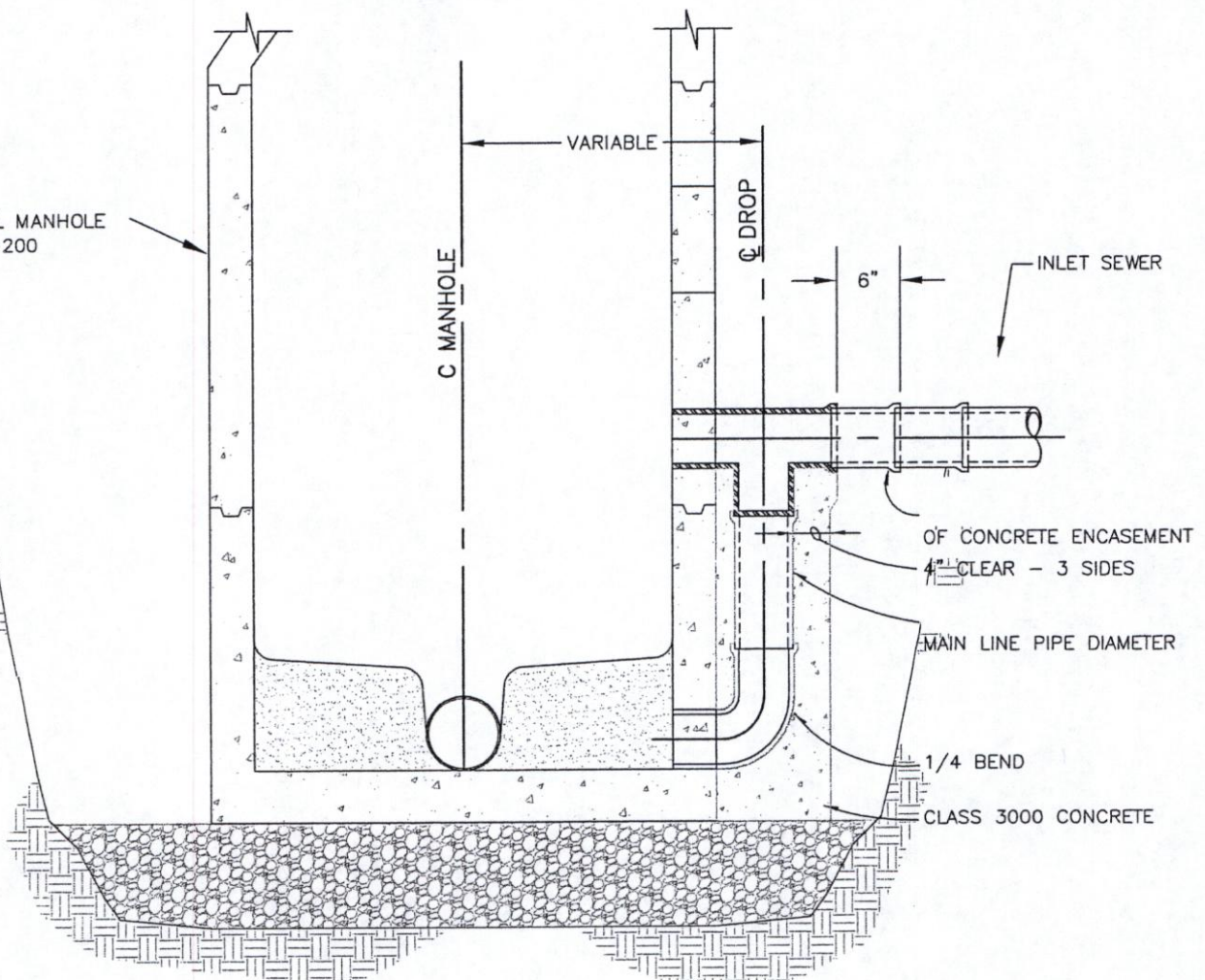
S-220

04/29/2009

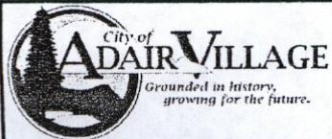


PLAN

TYPICAL MANHOLE
SEE S-200



SECTION A-A



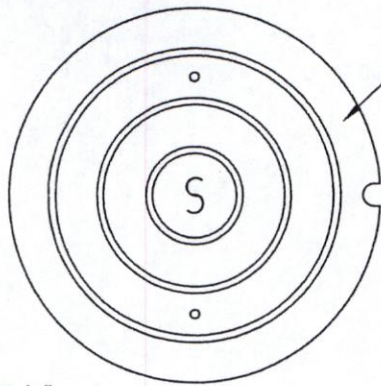
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6030 NE William R Carr St.
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STANDARD OUTSIDE DROP
MANHOLE

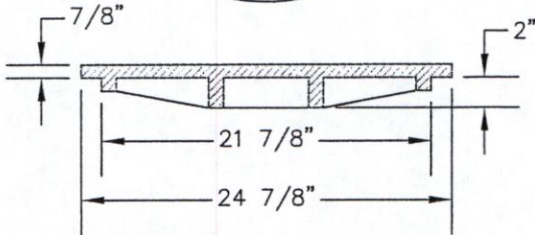
DETAIL NO.

S-225

04/29/2009



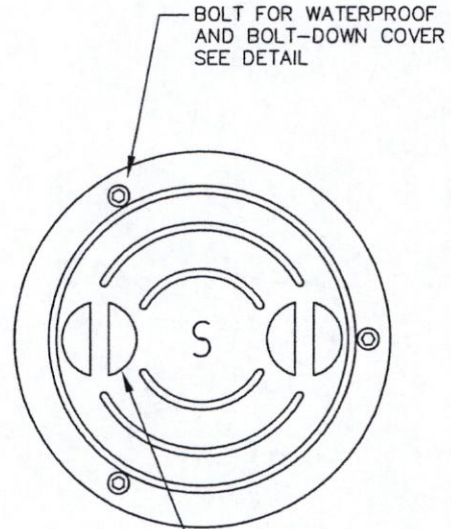
TWO HOLE 'S' COVER STANDARD
NO VENT HOLES IN WATERTIGHT
COVERS



COVER (150 LBS)

(OLYMPIC FOUNDRY MH26S, OR APPROVED EQUAL)

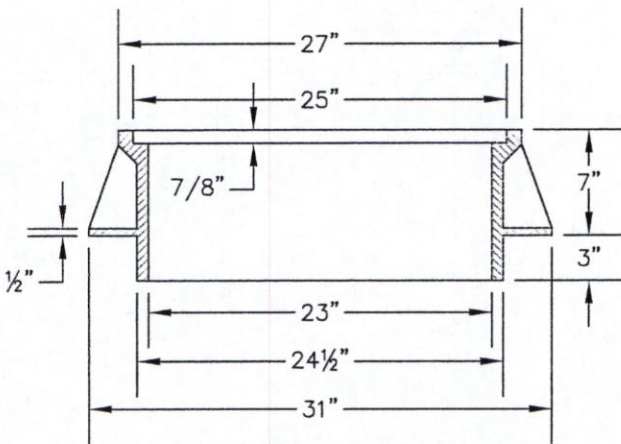
WATERPROOF/BOLT-DOWN COVER
REQUIRED IN ALL EASEMENT AND
OFF STREET AREAS.



BOLT FOR WATERPROOF
AND BOLT-DOWN COVER
SEE DETAIL

DEPRESSED HANDLE

(OLYMPIC FOUNDRY MH26WT, OR APPROVED EQUAL)



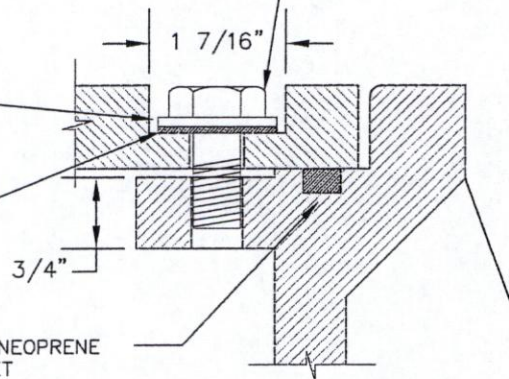
FRAME (237 LBS)

(OLYMPIC FOUNDRY MH26A, OR APPROVED EQUAL)

1/2" - 13 NC X 1 1/2" HEX
HEAD STAINLESS STEEL
CAP SCREW, 3 REQ'D.

1 1/4" OD STAINLESS STEEL
WASHER, 3/32" THICK
3 REQ'D

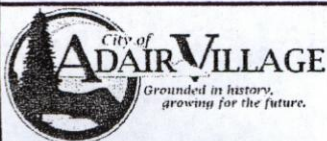
FLAT RUBBER WASHER
3 REQ'D



BOLT DOWN DETAIL

NOTE:

- 1) TAMPER PROOF FRAME AND COVER REQUIRED OUTSIDE OF RIGHT OF WAY OR IN UNDEVELOPED AREAS.
- 2) MANHOLE FRAMES AND COVER SHALL HAVE H-20 RATING

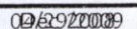


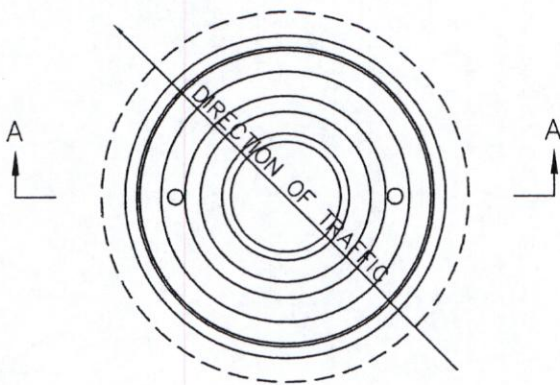
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**MANHOLE COVER AND
FRAME DETAILS**

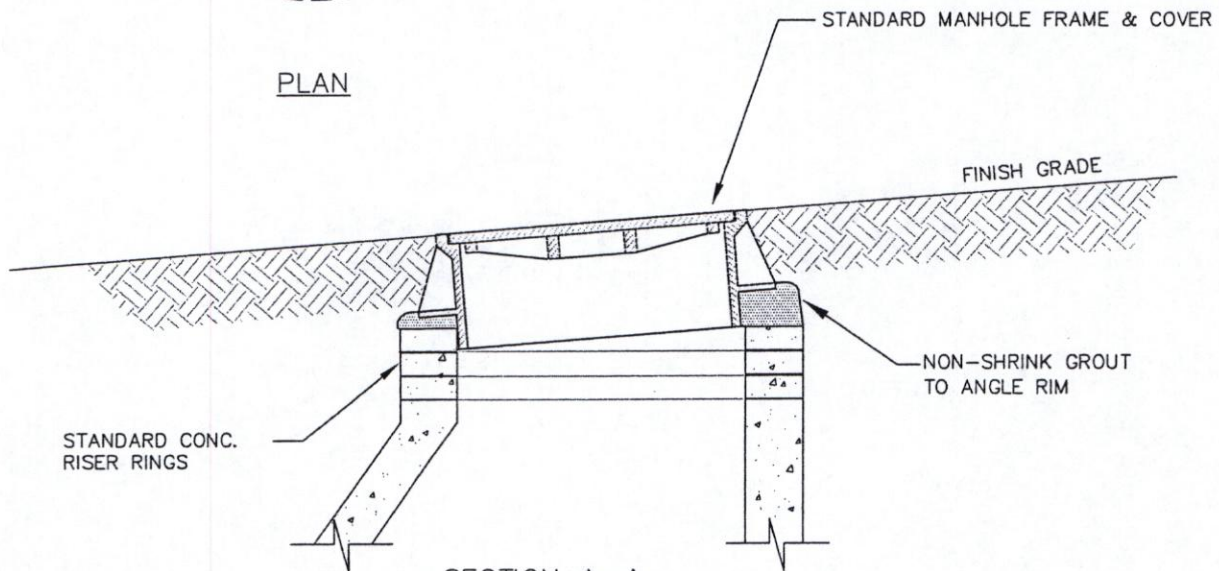
DETAIL NO.

S-250

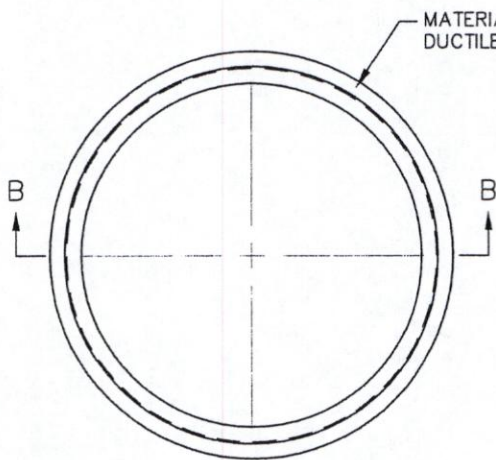




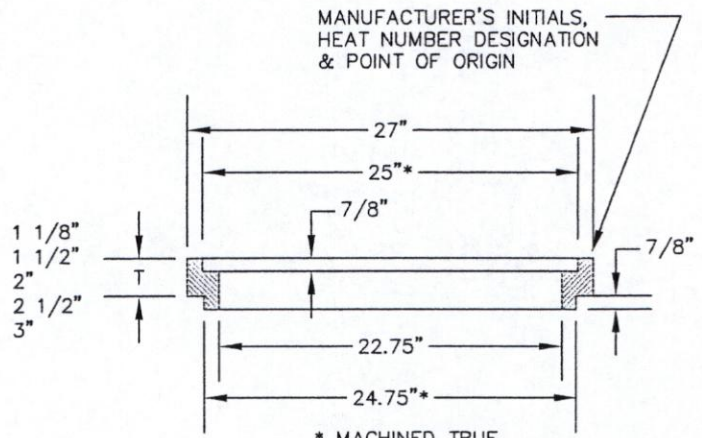
PLAN



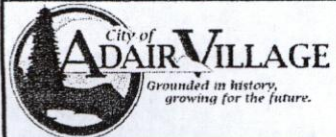
SECTION A-A
TYPICAL MANHOLE GRADE ADJUSTMENT IN STREET



MANHOLE ADJUSTMENT RINGS
FOR RESURFACING



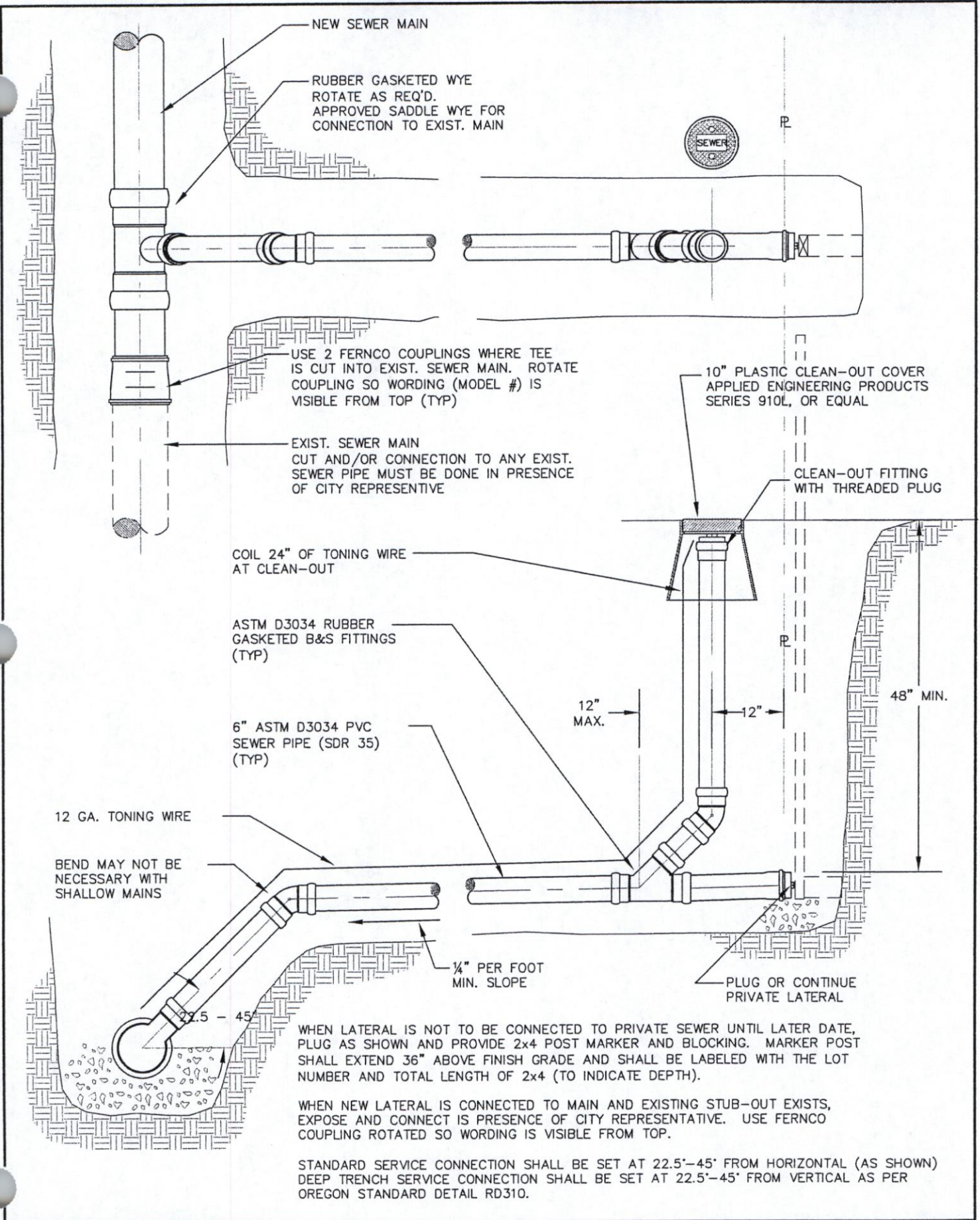
SECTION B-B



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MANHOLE FRAME
GRADE ADJUSTMENT

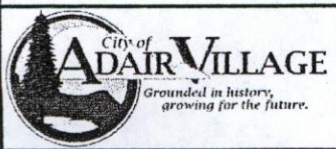
DETAIL NO.
S-260
04/29/2009



WHEN LATERAL IS NOT TO BE CONNECTED TO PRIVATE SEWER UNTIL LATER DATE, PLUG AS SHOWN AND PROVIDE 2x4 POST MARKER AND BLOCKING. MARKER POST SHALL EXTEND 36" ABOVE FINISH GRADE AND SHALL BE LABELED WITH THE LOT NUMBER AND TOTAL LENGTH OF 2x4 (TO INDICATE DEPTH).

WHEN NEW LATERAL IS CONNECTED TO MAIN AND EXISTING STUB-OUT EXISTS, EXPOSE AND CONNECT IN PRESENCE OF CITY REPRESENTATIVE. USE FERNCO COUPLING ROTATED SO WORDING IS VISIBLE FROM TOP.

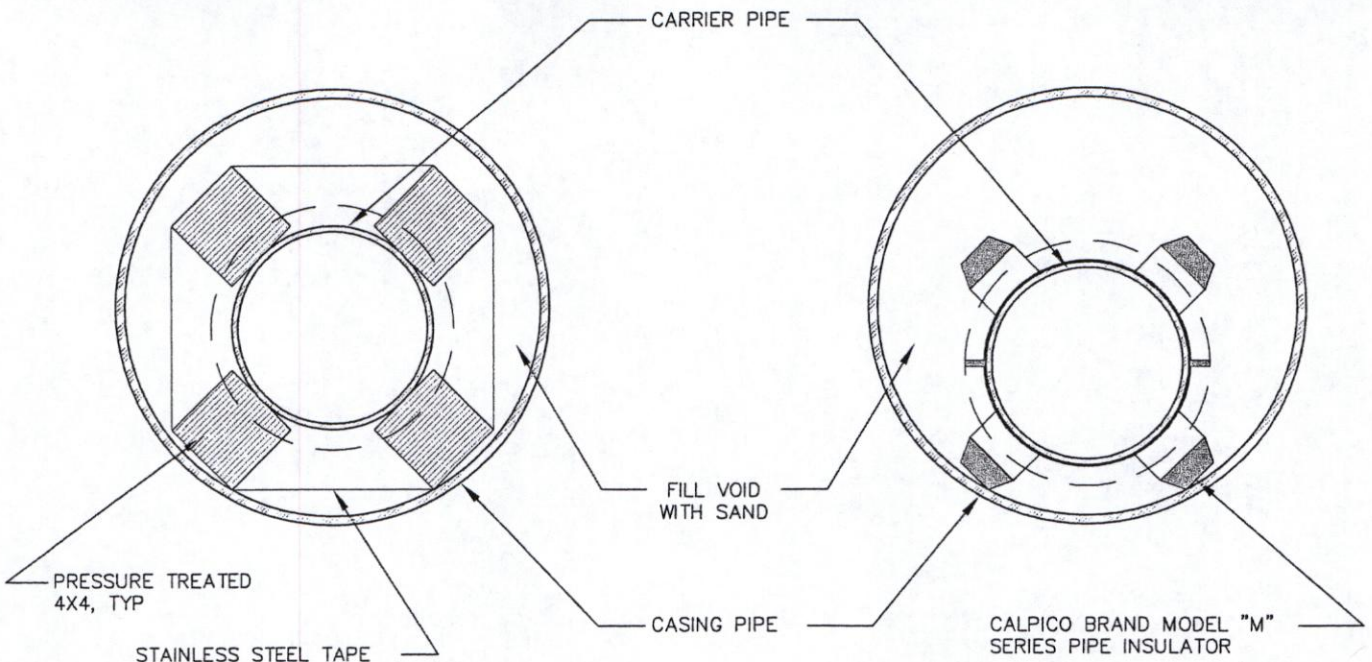
STANDARD SERVICE CONNECTION SHALL BE SET AT 22.5'-45' FROM HORIZONTAL (AS SHOWN) DEEP TRENCH SERVICE CONNECTION SHALL BE SET AT 22.5'-45' FROM VERTICAL AS PER OREGON STANDARD DETAIL RD310.



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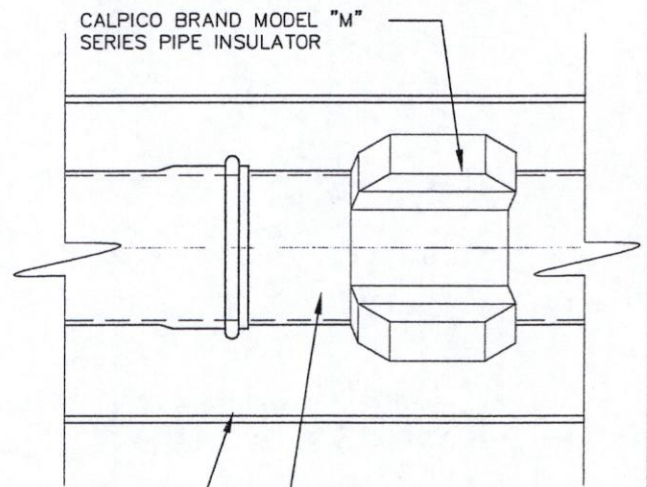
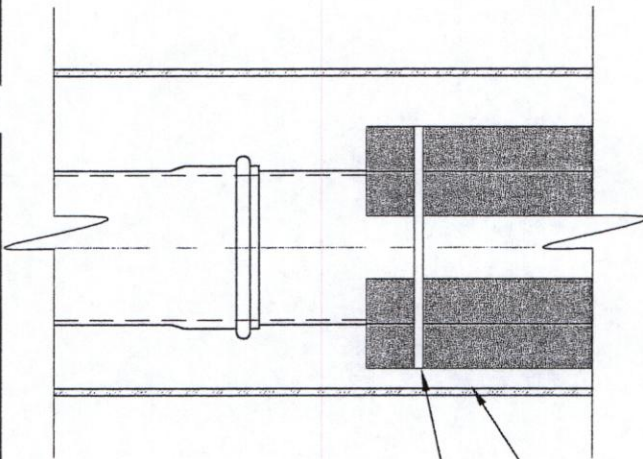
STANDARD SERVICE CONNECTION AND LATERAL

DETAIL NO.
S-300
04/29/2009



CARRIER PIPE WITH PRESSURE TREATED INSULATOR

CARRIER PIPE WITH CALPICP MODEL "M" INSULATOR



PRESSURE TREATED 4X4 TO BE 4' LONG AND STRAPPED WITH STAINLESS STEEL TAPE AT BOTH ENDS

CASKING PIPE SHALL BE SMOOTH STEEL PIPE CONFORMING TO AWWA C 201 WITH MINIMUM WALL THICKNESS 3/8"

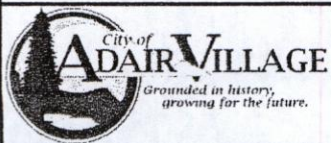
4" MIN. CLEAR SPACE BETWEEN CARRIER PIPE BELL AND CASKING

PROFILE OF CARRIER PIPE WITH PRESSURE TREATED INSULATOR

PROFILE OF CARRIER PIPE WITH CALPICP MODEL "M" INSULATOR

NOTES:

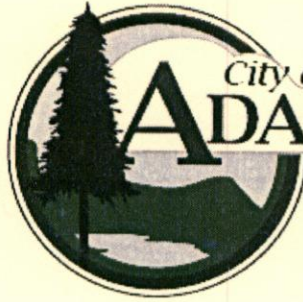
- 1) CARRIER PIPE SHALL HAVE A MINIMUM OF 2 PRESSURE TREATED INSULATORS OR 3 CALPICO MODEL "M" SERIES PER SECTION OF PIPE.
- 2) CASKING PIPE WALL THICKNESS MAY VARY DUE TO APPLICATION AND MUST BE APPROVED BY CITY ENGINEER
- 3) SAND IS TO BE BLOWN IN TO FILL VOIDS BETWEEN CASKING PIPE AND CARRIER PIPE.



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TYPICAL PIPE CASING
DETAIL

DETAIL NO.
S-400
04/29/2009



City of
ADAIR VILLAGE

*Grounded in history,
growing for the future.*

BENTON COUNTY, OREGON

DIVISION 3:
STREET AND TRANSPORTATION SYSTEM
DESIGN STANDARDS MANUAL
Guidelines for Development

Effective: July 1, 2009

Section 1 – General Design Requirements

- 1.1 The purpose of this manual is to set standards for the design and construction of streets, sidewalks, and general transportation system improvements to serve new and future development. This manual may be updated periodically and the design engineer shall ensure that the latest version is being utilized.

Section 2 – Design Plan Format

- 2.1 Engineering plans and specifications shall be prepared for all public works improvements. Plans shall be clear and legible and show all improvements in sufficient detail to allow for determination of compliance with City standards, and proper field construction. City engineer may require additional detail if deemed necessary.
- 2.2 Plan shall show the location, stationing, and geometry of all sidewalks, paved streets, cul-de-sacs, and other transportation infrastructure. The location of existing and new sewer, water, and storm infrastructure components shall also be shown, where applicable. Matchlines shall be used when continuing to other sheets.
- 2.3 Profile view with stationing and elevation shall be provided for street improvements. The existing grade and finished grades, at a minimum, will be shown on the profile.
- 2.4 Detail drawings shall be provided for sidewalk ramps, signage, standard road sections, and others as required.
- 2.5 Refer to the City's "Engineering Policy – Guidelines for Development" document for additional requirements and submittal procedures.

Section 3 – Street and Transportation System Design Requirements

- 3.1 Creation of Streets
- 3.1.1 No development may occur unless the development has frontage on or approved access to a public street currently open to traffic. A currently non-opened public right-of-way may be opened by improving it to City Standards.
- 3.1.2 Streets are to be created in a pattern of interconnection to reduce travel distance, provide multiple travel routes, and promote the use of alternative modes.
- 3.1.3 Streets (including alleys) within and adjacent to a development shall be improved to City Standards. In addition any new street or additional street width planned as a portion of an approved street plan shall be dedicated and improved in accordance with this article.
- 3.1.4 Streets are usually created through the approval of a subdivision or partition plat. However, the City Council may also approve the creation of a street by acceptance of a deed.
- 3.1.5 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 turnaround. Reserve

strips and street plugs may be required to preserve the objectives of street extensions. Typically, the maximum allowable length of a temporary dead-end without a turnaround will be limited to 300-feet, unless otherwise approved by the City Engineer.

3.1.6 Creation of access easements.

A. In general, the creation of access easements between property owners is discouraged. However, there are some instances where an access easement is the only viable method of providing access to a developable lot. An access easement may be approved when the following criteria are satisfied:

1. No more than two parcels or uses are to be served by the proposed access easement;
2. There is sufficient room for public right-of-way due to topography, lot configuration, or placement of existing buildings, and,
3. The City Engineer has determined that there is not a need for a public street with regard to the subject development and location.

3.2 Street Geometry - General

3.2.1 The location, width, and grade of streets shall be considered in their relation to existing and planned streets, topographical conditions, and the planned use of the land to be served by the streets.

3.2.2 Grades, tangents, curves, and intersection angles shall be appropriate for the traffic to be carried, considering the terrain.

3.2.3 As far as practical, streets other than minor streets shall be in alignment with existing streets by continuations of the centerlines thereof. Staggered street alignment resulting in 'T' intersections shall, whenever practical, leave a minimum distance of 200 feet between the centerlines of streets having approximately the same direction, and otherwise shall not be less than 100 feet long.

3.2.4 Whenever possible, local streets will be aligned in the same direction as or parallel to the existing streets in the City to maintain the same "grid" layout. A variation of not more than 25 degrees may be allowable upon approval by the City Engineer.

3.2.5 Intersections

A. 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.

B. Where not practicable, the right-of-way and street paving within the acute angle shall have a minimum of 30 feet centerline radius where such an angle is not less than 60 degrees.

- C. 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.
 - D. Other streets, except alleys, shall have at least 50 feet of tangent adjacent to the intersection unless topography requires a lesser distance.
 - E. Intersections which contain an acute angle of less than 80 degrees or which include an arterial street shall have a minimum corner radius sufficient to allow for a roadway radius of 20 feet and maintain a uniform width between the roadway and the right-of-way line.
 - F. On State highways, ODOT standards shall supersede City Standards.
- 3.2.6 Symmetrical street cross sections are preferred, with opposing curbs at the same grades.
- 3.2.7 Tilted, warped, super-elevated, or other cross sections are only allowed under specialized cases and as approved by the City Engineer.
- 3.2.8 All driveways must be located the maximum distance which is practical from a street intersection and in no instance shall the distance from an intersection be closer than the following as measured from the nearest curb return radius:
- A. Arterial Street 40 feet
 - B. Collector Street 20 feet
 - C. Local Street 10 feet
- 3.3 Cul-de-sacs
- 3.3.1 A cul-de-sac shall be as short as possible and no more than 400 feet long or serving more than 18 dwelling units. Wherever possible, a connection to a parallel side street should be used instead of a cul-de-sac.
- 3.3.2 Each cul-de-sac shall have a circular end with a minimum diameter of right-of-way width for emergency equipment turnaround and paved to the widths discussed later in this section and as shown on the standard detail drawings.
- 3.3.3 Cul-de-sacs are to be graded so that surface water is shed to the outer curbs and gutters. The finished pavement grade from the center point of the cul-de-sac to the gutter line shall be at least 2-percent (negative).
- 3.4 Grades and Curves
- 3.4.1 Grades on streets shall not exceed 6% on arterials, 10% on collector streets, or 12% on any other street.

- 3.4.2 Centerline radii of curves shall not be less than 300 feet on major arterials, 200 feet on collectors, and continuing residential streets, and 100 feet on other streets and alleys and shall be rounded to an even 10 feet.
- 3.4.3 Where existing conditions, particularly topography, make it otherwise impractical to develop buildable lots, the City may accept steeper grades and sharper curves, but only upon review and approval.
- 3.4.5 In flat areas, street grades shall have a minimum slope of 0.25 percent with curb and gutter and 0.4 percent with a full depth standard curb.
- 3.5 Alleys
- 3.5.1 Alleys shall be provided in commercial and industrial districts, unless other permanent provisions for access to off-street parking and loading facilities are approved by the City.
- 3.5.2 Corners of the alley intersection shall have a radius of not less than 12 feet.
- 3.5.3 The City may require adequate and proper alleys to be dedicated to the public by the land divider of such design and in such location as necessary to provide for the access needs of the subdivision, development, or partitions.
- 3.5.4 Width of right-of-way and paving design for alleys shall not be less than 20 feet. Slope easements shall be dedicated as required by the City.
- 3.5.5 Where two alleys intersect, 10 feet corner cut-offs shall be provided.
- 3.5.6 Grades shall not exceed 21% on alleys and centerline radii on curves shall not be less than 100 feet.
- 3.6 Right-of-Way and Roadway Widths
- 3.6.1 All street width requirements shall be reviewed on a case-by-case basis by the City Engineer.
- 3.6.2 The width and classification of all streets must conform to any approved transportation master plan or recorded subdivision plat.
- 3.6.3 Unless otherwise indicated in an approved Master Plan or subdivision plat, the minimum design widths shall be as shown in the following table:

**Table 3.6.3A
Typical Design Widths**

Type of street	Minimum ROW Width (ft)	Minimum Paving Width Curb-to-Curb				Sidewalk Curb (ft)
		Motor Vehicle Travel Lane	Median or Center Turn Lane	On-Street Parking	Bike Lane	
Arterial						
3-lane (a)	90'	2@12'	14'	2 @ 8'	2 @ 5'-6'	2 @ 6'-6"
2-lane	50'	2@12'	-	-	2 @ 5'-6'	2 @ 6'-6"
Commercial (a)	86'	2@12'	14'	2 @ 8'	2 @ 5'-6'	2 @ 6'-6"
Local Residential						
Serving 20 or more Dwelling units (a)	66'	2@10'	-	2 @ 8'	2 @ 5'-6'	2 @ 5'-6"
Serving 20 or less Dwelling units	50'	2@10'	-	2 @ 8'	-	2 @ 5'-6"
Dead End (b)	50'	2@10'	-	2 @ 8'	-	2 @ 5'
Cul de Sac	50'	2@10'	-	(c)	-	1 @ 5' (d)
Alley						
1-way	20'	12'	-	-	-	-

- (a) The minimum right of way width includes the option of two 6 ft. wide landscape strips for three lane arterials or two 4 ft. wide strips for commercial streets or local streets serving 20 or more dwelling units.
- (b) A dead end must be less than 300 feet in length
- (c) No parking is permitted at the end of cul de sac which must have adequate space for emergency equipment turn around, typically a 45 ft. unobstructed radius.
- (d) At the end of the cul-de-sac, a 5 ft. sidewalk is required along the perimeter adjacent to the development.
- (e) A variance is required for right of way widths narrower than the standard.

3.6.4 Standard roadway designs and standard details can generally be used for residential streets and collectors streets. Standard sections are only to be considered minimum designs as actual soil conditions may require thicker base rock or pavement installations.

3.7 Design Capacities and Design Speeds

3.7.1 For the purposes of classifying and defining the design capacities of the various street types, the following table shall be used:

**Table 3.7.1
Typical Design Capacities and Speeds**

Type of Street	Design Capacity, Vehicles per Day	Design Speed, mph
Arterial	32,000	40-50
Collector	10,000	35
Commercial/Industrial other than Arterials	12,000	30
Local Streets serving 20 or More Dwellings	7,000	30
Local Streets serving 20 or less Dwellings	1,200	25
Cul-de-sacs	200	NA

3.8 Curb and Gutter

- 3.8.1 Curb tops shall be set slightly below adjacent ground so as to receive surface drainage.
- 3.8.2 Three-inch diameter weep holes shall be provided through the curbs with inverts one inch above gutter line, at the following locations:
 - A. Opposite existing or anticipated roof downspouts (minimum two per lot).
 - B. At 16 foot on center along low areas where curb top is above adjacent ground.
 - C. At 16 foot on centers adjacent to bank areas to receive ground water.
- 3.8.3 Curb shape to conform to standard details. No “glue-down” extruded curbs shall be allowed in the public right-of-way.
- 3.8.4 Machine extruded curbs, as well as formed and poured curbs, shall require a minimum of 2-inches of $\frac{3}{4}$ ” minus crushed rock base.
- 3.8.5 Maximum allowable tolerance for finished curbs shall be $\frac{1}{2}$ ” on alignment, and $\frac{1}{4}$ ” on grade at any point, providing a “bird bath” does not occur.
- 3.8.6 Provide drop curbs for driveways, curb radii, and ambulatory ramps with original curb pour when locations can be determined in advance.
- 3.8.7 No intruding structures, including, but not limited to, manholes, valves, and junction boxes shall be located within two feet of the curb or gutter, unless otherwise approved by City Engineer.
- 3.8.8 Type ‘C’ concrete curbs may be used on partial street sections or in special circumstances when approved by the City Engineer.
- 3.8.9 Valley gutters are not to be used except for in alleys or other special conditions and only upon approval by the City Engineer.
- 3.8.10 Curb Return Radii
 - A. A WB-67 design vehicle shall be used when designing curb radii for all truck routes. A WB-50 vehicle may be used for some local and residential routes as indicated later in this section.
 - B. Unless otherwise required, or approved by the City Engineer, all other curb radii at public street intersections shall be designed in accordance with Table 3.8.10:

TABLE 3.8.10
Minimum Radii and Design Vehicles for Determining Curb Radii

Primary Street Classification	Secondary Street Classification	Zoning	Minimum Radii (ft)	Design Vehicle
Local	Local	Residential	25	Emergency
Local	Local	Non-Residential	25	Emergency
Collector	Local	Residential	25	Emergency
Collector	Local	Non-Residential	25	WB-50
Collector	Local	Residential	25	Emergency
Collector	Collector	Residential	25	WB-50
Minor Arterial	Collector	All	35	WB-67
Minor Arterial	Minor Arterial	All	35	WB-67

3.9 Driveways

3.9.1 Driveways shall conform to the Standard Details.

3.9.2 Driveways may be deferred until lots are built upon, if approved by the City Planning Commission or City Council.

- A. If the developer chooses to delay the installation of a driveway approach, additional repair of curb and gutter, sidewalk, and other facilities may be required when the driveway is installed.
- B. The cost of installing a driveway approach and the associated repairs to curb and gutter, sidewalk, and other facilities will be borne, solely, by the developer.

3.9.3 Any driveway(s) serving property which is used for purposes other than single family residential or duplexes shall be designed as and built to the standards of a commercial driveway.

3.9.4 A concrete alley apron serving public right-of-way or alley shall be built to the standards of a commercial driveway.

3.9.5 Residential Driveway Approach Standards

- A. A residential driveway approach shall be constructed of Portland cement concrete, minimum of 6-inches in thickness, 3,000 psi field strength, with 2-inches (minimum) compacted $\frac{3}{4}$ "-0" crushed rock base. No rebar or wire mesh is required for residential approaches.
- B. Transition flares shall also be constructed to the same standard as residential driveway approaches.

3.9.6 Commercial Driveway Approach Standards

- A. A commercial driveway approach shall be constructed of Portland cement concrete, minimum 8-inches in thickness, 3,500 psi field strength, with 2-inches (min) compacted $\frac{3}{4}$ "-0" crushed rock base, and placed with No. 4 rebar on 12-inch centers both ways at 2-inches above the bottom of the slab, or place 2 layers of 6x6x10 welded wire mesh at 2-inches above the bottom of the slab.
- B. Transition flares shall be constructed to the same standards for commercial driveway approaches.

3.9.7 No driveway approach slope shall exceed 15-percent.

3.10 Access Ramps

- 3.10.1 All pedestrian ramps shall conform to the current Americans with Disabilities Act (ADA) federal regulations and to the current Oregon Department of Transportation requirements.
- 3.10.2 Where applicable, ramp approaches shall be aligned with and be wholly contained within, the crosswalk markings.
- 3.10.3 Ramp approaches shall not be positioned directly in the path of catch basin grates.
- 3.10.4 Ramp approaches shall be directly aligned with one another with no offset through the intersection.
- 3.10.5 Ramp approaches shall be as close as possible to perpendicular to the street they are crossing in order to minimize the crossing distance.
- 3.10.6 Ramps shall be aligned to point directly to the ramp across the road that is intended to receive the pedestrian.
- 3.10.7 Obstructions including, but not limited to, mail boxes, water meters, valves, junction boxes, manholes, utility poles, trees, benches, fire hydrants, signs, and bus stops shall not be located within the ramp area or the flares.
- 3.10.8 Ramp flares may extend beyond the crosswalk markings.
- 3.10.9 Two ramps shall be provided at each curb radius to allow direct access from the ramps into the street.
- 3.10.10 At local residential street "T" intersections, driveway approaches designed and constructed to ADA standards may be used to provide pedestrian access provided they are constructed with no lip at the gutter bar.

3.11 Sidewalks

- 3.11.1 All development for which land use applications are required must include sidewalks adjacent to public streets. This requirement also applies to new single-family houses and duplexes if they are located on arterial or collector streets or on curbed local streets if there is an existing sidewalk within 500 feet on the same side of the street.
- 3.11.2 In the case of arterial or collector streets, sidewalks shall be built during their construction and considered during their reconstruction or rehabilitation. This provision shall apply also to local streets that serve commercial and multi-family development.
- 3.11.3 The provision of sidewalks may be waived where the street serves a use or combination of uses which generate fewer than fifty trips a day (based on ITE standards) and cannot be continued or extended to other properties. A waiver shall only be granted upon review and approval of the City Engineer.
- 3.11.4 Sidewalks are required on both sides of all streets.
- 3.11.5 Design, Width, and Location
- A. The required width for a sidewalk on an arterial or commercial street is six (6) feet. This width may be reduced to (5) feet if the sidewalk is separated from the curb by a landscaped planter strip at least six (6) feet in width for a three lane arterial street and four (4) feet for a commercial street for those instances when there is inadequate right-of-way.
 - B. In all cases, the right-of-way remaining outside of the sidewalk is to be landscaped and maintained by the adjoining property owner.
 - C. Sidewalks along residential and other local streets must be a minimum of five (5) feet in width. Sidewalk design may be setback or integral as determined by the developer, City Engineer, or funding agency.
 - D. If a setback sidewalk design is selected, a planter strip at least six (6) feet wide shall separate the sidewalk from the street (curb). If trees are to be planted in the planter strip, they must be of an approved variety.
 - D. Regardless of other provisions in this standard, any sidewalk project less than 200 feet in length and connects on either end to an existing sidewalk may be designed to match the existing pattern with the approval of the City Engineer. Generally, sidewalks shall be consistent with the existing sidewalk design in the same block. Transitions should be made at intersections whenever possible.
 - E. Where obstructions existing or are proposed (including, but not limited to mail boxes, utility poles, trees, planters, fire hydrants, signs, benches, bus stops, etc.), provisions must be made to maintain a minimum of four feet of unobstructed sidewalk width on local streets, and five feet on collector and arterial streets.

- F. Maintenance of sidewalks and planter strips shall be the continuing obligation of the adjacent property owner except where the lot backs onto an arterial street.
- G. Sidewalks shall be designed to parallel streets in line and grade and shall avoid unnecessary meandering from the curb line and elevation changes except as necessary to avoid significant trees or traverse topographic barriers.
- H. All sidewalks are to be a minimum of four (4) inches thick Portland cement concrete placed on a minimum of two (2) inches compacted $\frac{3}{4}$ "-0" crushed rock base.

3.12 Bikeways

- 3.12.1 Where bikeways are required or planned, bikeways should be separated from other modes of travel, including pedestrian.
- 3.12.2 Minimum widths for bikeways shall be five (5) feet where adjacent to a curb (one-way) and ten feet when not on the roadway (2-way).

3.13 Utilities

- 3.13.1 Except for sanitary and storm sewers all utilities shall be located outside of the paved area if at all possible to avoid future street cuts.
- 3.13.2 On all phased (interim) street improvements, the necessary utilities shall be stubbed across the interim improvements to insure that cuts are not necessary when the road is expanded to its full width.
- 3.13.3 Except for sanitary sewer, storm sewer, and water, underground utilities intended to provide direct service to adjacent properties with future connections shall not be located in the full-width paved section of a street to be constructed. If all service connections are existing and extend beyond the full-width section of a partially improved (or interim) street, underground utilities can be located in the future paved section of the street, if approved by the City Engineer.
- 3.13.4 Underground utilities being constructed along newly paved streets shall not be located under the existing pavement unless approved by the City Engineer.
- 3.13.5 Underground utilities that must cross an existing paved street shall not be installed by any method which cuts the pavement or undermines the aggregate base of the street unless approved by the City Engineer.
- 3.13.6 All underground utilities shall be installed at a minimum bury depth of thirty (30) inches as measured from the finished grade to the top of utility.
- 3.13.7 When new curbing is being placed, (in conjunction with new utility mains or service laterals), a stamp shall be placed in the top of the curb to mark the located where each water and/or sewer service crosses the curb. The method of marking

the curb shall be approved by the City Engineer and noted on the approved construction plans. An imprinting stamp is preferred that is capable of leaving an impression directly into the curing concrete. A "W" shall be used for a water service and an "S" shall be used to designate a sewer service. The stamped impressions should be a minimum of two (2) inches in height, placed on the top of the curb.

3.14 Pavement Markings

3.14.1 All pavement traffic markings for lane stripping, railroad crossings, crossings and stop bars shall be thermoplastic and shall conform to the Manual of Uniform Traffic Control Devices, (MUTCD) regulations alternative markings will not be allowed without prior approval from the City Engineer or representative.

3.15 Street Lighting

3.15.1 All new developments and subdivisions are required to provide street lighting systems. Complete wiring diagrams, including spacing of luminaries or the street lighting system must be submitted to the City at the time of plane review, if the system is to be dedicated to the City.

3.15.2 The system will only be transferred to the City after the City has completed its final inspection and the system has been signed off by the City Engineer and after installation is complete.

3.16 Trenching and Street Cuts

3.14.1 The City will not allow, without prior approval from the City Engineer, any street cuts on newly paved or resurfaced streets (paved within the past 12 months).

3.14.2 All approved street cuts in streets of higher functional classification than local residential shall be backfilled with Controlled Density Fill (CDF or CLSM as specified in OSS Section 00442) meeting the material requirements of the supplier. However, the City Engineer may require CDF on residential local streets if conditions warrant.

Section 4 – Construction Provisions

4.1 All work within the public right-of-way shall be conducted by a licensed and bonded contractor. This requirement shall be stated on the construction drawings and specifications.

4.2 City shall be notified at least 3 working days in advance prior to commencing construction work.

4.3 Traffic control shall be signed, flagged and conducted in a manner conforming to ODOT standards (Manual of Uniform Traffic Control Devices, MUTCD) and approved by Benton County, where appropriate. If road closures or detours are anticipated, prior approval from City, ODOT, and County officials must be obtained, as appropriate.

- 4.4 Safety Requirements. The contractor is responsible for observing the safety of the work and all persons and property coming into contact with the work. The contractor shall conduct his work in a manner complying with the requirements prescribed by OSHA.
- 4.5 Progress. Construction shall proceed in a systematic manner to minimize public inconvenience and disruption of services. All excavations, embankments, stockpiles, waste areas, etc. shall be kept protected. All roads, ditches, etc. shall be kept free from debris and shall be continually cleaned during the work. Dust control measures shall be employed as required and directed by the City.
- 4.6 Protection of Existing Improvements. Contractor shall contact the Utility Notification Center (1-Call) at least 48 hours in advance of digging operations to get approximate locations for buried utilities. Exact locations of buried facilities may not be known or shown and contractor is responsible to pot-hole carefully in advance of the work to avoid such facilities. Contractor shall coordinate with all utilities and notify them immediately in the event of any damage. Contractor shall protect, repair, and replace any damaged utilities as directed by the persons responsible for such utility. All landscape, grass, shrubs, signs, pavements, mail boxes, driveways, culverts, gravel surfacing, fencing, etc. shall be protected from damage and returned to conditions as good, or better than existed prior to construction. All costs for protection, repair, and replacement of all existing items shall be borne entirely by the contractor. Contractor shall obtain a release from any property owners for any claims of injury or property damage prior to final acceptance of the work by the City.
- 4.7 All existing survey monuments and control shall be protected, including individual property corner stakes. Any such monuments destroyed or altered during construction shall be restored by the contractor or developer in accordance with ORS.
- 4.8 Any temporary disruption to water or sewer service must be coordinated with, and approved by the City and kept to the minimum length of time necessary. The City shall be notified at least 2 working days in advance of when an approved shut-down is desired. Contractor shall not operate any valves or hydrants without City approval.
- 4.9 Compaction testing equipment (nuclear gauge) shall be furnished and operated by the contractor or an independent testing firm shall be retained by the contractor or developer to perform compaction testing. Testing shall conform to the ODOT Manual of Field Testing Procedures (MFTP). Compaction testing shall be conducted in the presence of the City's inspector. Sufficient tests will be taken to ensure that the materials and compaction efforts being used are adequate to obtain the required density. Several tests shall be taken on each lift placed during the first day of backfill operations. Additional tests will be taken periodically during the work. Alternate materials or methods will be required if adequate compaction is not being obtained.
- 4.10 Construction staking will be provided by the Developer's Engineer for establishing the alignment and grade of the transportation system to be constructed. Offset stakes shall be placed at no more than 100-foot intervals along the alignment. Grade staking, stationing, and other field layout shall be as required.

Section 5 – Street and Transportation System Materials

- 5.1 All materials shall be newly manufactured. No rebuilt, reconditioned or used material will be allowed.
- 5.2 Oregon Standard Specifications (OSS) – Means the 2002 Oregon Standard Specifications for Construction produced by ODOT and APWA, including latest revisions. In general, all paving materials, workmanship, and technical data shall conform to the OSS if not specified otherwise.
- 5.3 Portland Cement Concrete Pavement
- 5.3.1 Concrete shall conform to OSS Section 00440, Commercial Grade Concrete. Compressive field strength shall not be less than 3,500 psi at 28 days.
- 5.3.2 Maximum aggregate size shall be 1½-inches.
- 5.3.3 Slump shall be between 2 and 4 inches and shall not exceed 5 inches.
- 5.3.4 Prior to constructing a roadway or street using Portland cement concrete, the mix design for the concrete shall be provided to the City Engineer for review and acceptance. Included in the mix design will be a description of the proportions for the ingredients of the mix, including:
- A. Air entraining admixtures.
 - B. Chemical admixtures.
 - C. Each size of aggregate.
 - D. Fly ash.
 - E. Other admixtures
 - F. Water
- 5.3.5 Concrete used for public street construction will, generally, meet the requirements of Oregon Standard Specifications for Construction (ODOT-OSS), 2002 Edition, Section 2001.
- 5.4 Asphalt Concrete Pavement
- 5.4.1 Asphalt concrete pavement used for public street improvement projects shall meet or exceed the requirements of OSS Edition 2002, Section 00744.
- 5.4.2 AC pavement on all projects within the City shall be Level 2 HMAC mixtures with qualities typical of what has traditionally be designated a Class B asphalt concrete mix.
- 5.4.3 In the case of an overlay or if patching materials are required, a finer asphalt mix (commonly referred to as Class C) may be utilized.

- 5.4.4 For areas of higher traffic volume, heavy traffic (weight) ratings, or other special traffic loading, a specific pavement design will be required to be submitted to the engineer for review and approval.
- 5.5 Base Rock and Surfacing Rock
- 5.5.1 Base rock used to construct a foundation for AC pavement construction shall be 1"-0 crushed rock or crushed gravel conforming to the requirements of OSS Edition 2002, Section 00640.
- 5.5.1 Base rock used for gravel surfacing, shoulders, and other surfacing shall be 1"-0 crushed rock or crushed gravel conforming to the requirements of OSS Edition 2002, Section 00640.
- 5.6 Overlay Fabric
- 5.6.1 An engineering geotextile fabric shall be utilized for all overlays. The fabric shall be needle-punched, non-woven polypropylene fabric, fused on one side only and having the following minimum physical properties:
- | | |
|------------------------------------|------|
| Weight, oz/sq. yd. | 3.8 |
| Tensile strength (per ASTM D-1682) | 90 |
| Elongation at break, % | 55 |
| Asphalt retention, gal/sq yd | 0.25 |
| Min. melting temp, °F, | 350 |
- 5.7 Asphalt Tack Coat
- 5.7.1 Tack coat shall meet the requirements of OSS, 2002, Section 00730.
- 5.7.2 Acceptable tack products include CSS-1, CSS-1h, CMS-2, CMS-2S, CMS-2h, CRS-1, CRS-2, HFRS-2, or HFMS-2.
- 5.7.3 The Contractor shall provide a submittal to the City Engineer, for approval, of the type of tack material to be utilized on the project.
- 5.8 Pavement Markings
- 5.8.1 Thermoplastic pavement markings shall be Type B (preformed fused thermoplastic film) as specified in Section 00850 of the latest addition of ODOT Standard Specifications for highway Construction.
- 5.9 Street Lighting
- 5.9.1 All new luminaries shall be Holophane Refractopack or RSL-200 Series lighting. Decorative lighting and other systems may be acceptable if submitted to and approved by the City. A 5-year warranty and replacement period will be required by the City for lighting systems used other than that as specified above.

- 5.9.2 Poles for new street lighting systems shall be galvanized metal poles mounted on concrete bases. Other poles such as spun aluminum and fiberglass may be acceptable if submitted and prior approval is given by the City.
- 5.9.3 Heights of new luminaries shall be 25 feet for residential and collector streets and 30 feet for arterial and commercial streets.
- 5.9.4 All wiring for the street lighting systems shall be located within the street right of way or easement and shall be placed underground in conduit.
- 5.9.5 Luminaries Sizing
- | | |
|---------------------|--------------|
| Residential Streets | 100 watt HPS |
| Collector Streets | 200 watt HPS |
| Arterial Street | 400 watt HPS |

Section 6 – Street and Transportation System Installation (Workmanship)

- 6.1 All excavation, grading/fill within the city limits of Adair Village shall comply with the City's Standards, the Oregon Structural Specialty Code Appendix J and DEQ Erosion Control Standards.
- 6.1.1 When Grading/Fill Permits may be Required
- A. An excavation that is more than two (2) feet in depth or creates a cut slope greater than five (5) feet in height and steeper than one (1) unit vertical in one in one half (1 ½) units horizontal.
 - B. A fill of more than one (1) foot in depth and placed on natural terrain with a slope greater than one (1) unit vertical in five (5) units horizontal.
 - C. A fill greater than three (3) foot in depth.
 - D. A fill intended to support structures.
 - E. A fill that exceeds fifty (50) cubic yards on any lot.
 - F. Placement of fill obstructs a natural drainage course.
 - G. Grading in an area that may create danger to private or public properties.
 - H. Grading/Fill permits are required if changes to the existing topology and landscaping are completed prior to the review and issuance of building permits.
- 6.1.2 Required Elements of Grading
- A. Grading of less than 5,000 cubic yards and do not have any special conditions or hazards, as determined by the City Engineer or representative shall be considered "regular grading".
 - B. Grading in excess of 5,000 cubic yards shall be performed in accordance with the approved grading plans shall be designated as "engineered grading" and shall be prepared by a Professional Engineer (PE) licensed in the State of Oregon.
 - C. Professional inspection and testing may be required by a soils engineer when it is determined that geological factors may be involved, the grading/fill will conform to the requirements of the geotechnical report and engineered plans.

- D. Each application for a development permit shall be accompanied by a grading / fill plan of sufficient clarity to indicate the nature and extent of the proposed work.
- 6.1.3 A Heavy Haul permit may be required when excavated material is being transferred offsite to another disposal site.
- 6.2 Clearing and Grubbing
- 6.2.1 Clear improvement area of all surface vegetation, stumps, roots, downed timber, brush, weeds, grasses, and deleterious matter necessary to accommodate permanent construction.
- 6.2.2 Protect existing utilities, street surfaces, landscaping, adjacent private development, and survey monuments from damage unless approved by the City Engineer. Any damage to existing infrastructure shall be repaired immediately.
- 6.2.3 Dispose of clearing and grubbing waste off project site at a location approved by the City Engineer. Clearing debris cannot be utilized as fill on the project site.
- 6.2.4 Grub areas under new street sections, curbs, sidewalks and driveways to remove all stumps, roots, buried vegetation, and debris to a depth of at least 8-inches below subgrade. Larger debris that may affect the integrity of the finished road should be removed regardless of depth or as directed by the City Engineer.
- 6.3 Earthwork and Embankment
- 6.3.1 Excavate to subgrade lines and grades as required by the approved plans.
- 6.3.2 Advise and coordinate earthwork with utility companies prior to beginning excavation to confirm utility locations and depths and potential conflicts or minimum cover issues. Required relocation of utilities shall be identified during design.
- 6.3.3 Protect existing utilities from damage during excavations. Any utilities damaged during excavation not designated for removal shall be replaced "in kind" at the developer's expense.
- 6.3.4 Where excavation is required, along edges of pavement or trenches, any raveled or deteriorated pavement edges shall be saw cut clean and straight.
- 6.3.5 Over-excavate to remove soft or otherwise unsuitable subgrade material when directed by City Engineer. Backfill with imported base rock or approved native backfill at 95 percent of maximum density (AASHTO T99) as directed by the Engineer. City Engineer may require that a geotextile fabric be utilized to provide additional subgrade stabilization.
- 6.3.6 In street embankment areas, all sod, vegetative matter, and debris to be stripped away from under subgrade before embankment is placed.

- 6.3.7 Where rock excavation is required, efforts shall be made to remove rock without blasting whenever possible. If blasting is determined to be required, a blasting plan must be submitted to the City Engineer, for approval. The blasting plan must include a certificate of insurance for the blasting work, the amount of and type of explosives that are to be used, the methods for placement and ignition, planned safety precautions, and all other pertinent information. Blasting shall not commence until the City Engineer has provided written clearance for the use of explosives within the City Limits.
- 6.3.8 Approved excavated materials may be used directly in street embankment and site fill grading areas where provided for on the approved plans. Unsuitable material including broken pavement, rubble, large rocks, and debris shall be disposed of offsite by Contractor as approved by the City Engineer.
- 6.3.9 Topsoil should be selectively excavated and segregated to be used for curb backfill and planting strip area surfacing.
- 6.3.10 Shape and grade all cut and fill slopes. Final slopes shall be smooth, uniform, and compacted in conformance to lines and grades required by plans.
- 6.3.11 Rough grade subgrade prior to utility crossings to 0.20 foot vertical and 0.50 foot horizontal tolerance to design cross section and grades.
- 6.3.12 After utility crossings and curb installations, fine grade subgrade to within 0.10 feet vertically of design grade at any point.
- 6.3.13 All embankment material to be placed in compacted lifts, not to exceed 6-inches in thickness.
- 6.3.14 Condition fill material with water to attain optimum moisture content prior to placing in embankment. Additional sprinkling of subgrade may be required to achieve compaction and for dust control.
- 6.3.15 All subgrade, embankment, and backfill of over-excavation lifts shall be compacted to 95-percent of maximum density per AASHTO T-99 test method. City engineer shall approve the condition of subgrade and shall certify testing results prior to placing rock or base materials.
- 6.3.16 Place top soil backfill behind curbs and dress back disturbed planting strip area, smooth and uniform to the property lines. Compact until firm as evidenced by insignificant deflection under wheel or track loads.
- 6.4 Concrete Curb and Gutter
- 6.4.1 Top of curb stakes to be set at intervals not to exceed 50 feet and at critical radii and grade points, on offset line as required by the Contractor.
- 6.4.2 Form and poured curbs can be set on compacted subgrade or base rock. Machine laid curbs are required to have a minimum 2-inch lift of compacted base rock.

- 6.4.3 Concrete curb and gutters shall conform to the dimensions shown on the standard detail drawings.
 - 6.4.4 Construct drop curbs for driveways and bike paths where required or as directed by the City Engineer.
 - 6.4.5 Install curb weep-holes where required and in conformance with the standard details.
 - 6.4.6 Construction tolerance for curb and gutter is $\frac{1}{2}$ " on line and $\frac{1}{4}$ " on grade.
 - 6.4.7 Include $\frac{1}{2}$ " curb expansion joints at intervals not to exceed 45 feet, at radius points, and at all abutting concrete construction. Cold cutting curb joints on 10' intervals may be allowed in lieu of the above.
 - 6.4.8 Construct $\frac{1}{8}$ " minimum weakened plane contraction joints at intervals not to exceed 15 feet.
 - 6.4.9 Contractor shall notify City Engineer for form or grade inspection prior to pouring and allow 48 hours notice for inspection. Any curb or gutter found to be deficient by the City Engineer shall be removed and replaced at the Contractor's expense.
- 6.5 Sidewalks and Driveways
- 6.5.1 Expansion and contraction joints shall conform to the requirements of the OSS, 2002.
 - 6.5.2 Sidewalk edges shall be tooled with a $\frac{1}{4}$ " radius tool.
 - 6.5.3 A broom or burlap finish shall be applied in a workmanlike manner. An effort shall be made to match adjacent finishes of existing sidewalk if the finish meets the requirements of OSS, 2002.
 - 6.5.4 Sidewalks shall be sloped $\frac{1}{4}$ " per foot up and away from curb to facilitate water draining over the top of the curb.
 - 6.5.5 Sidewalks and driveways shall be laid on prepared subgrade, compacted to 95 percent of maximum density per AASHTO T-99 test method or on compacted $\frac{3}{4}$ "-0 rock fill.
 - 6.5.6 Rock base shall be placed and compacted to refill curb excavation where sidewalks are to be constructed adjacent to curbs.
 - 6.5.7 Sidewalks shall be constructed to within $\frac{1}{2}$ " on-line and $\frac{1}{4}$ " on grade tolerance for smooth, uniform alignment and grade.
 - 6.5.8 Driveways and sidewalks across driveways shall have a minimum concrete thickness of 6-inches. Normal sidewalks shall have a minimum thickness of 4-inches.

- 6.5.9 Install 3" diameter roof drain pipe under sidewalks where required in alignment with curb weep holes.
- 6.5.10 Restore top soil and dress back disturbed surfaces within planting strip in manner approved by the City Engineer.
- 6.6 Base Rock and Surfacing Rock
 - 6.6.1 Rocking shall not be performed prior to City Engineer approval of the subgrade conditions.
 - 6.6.2 Compact base rock to 95 percent of relative maximum density per AASHTO T-99.
 - 6.6.3 The maximum compacted thickness of each lift of base rock shall be 6-inches.
 - 6.6.4 Surfacing rock (shoulders, gravel streets, etc) shall be placed in a single lift with a minimum thickness of 2-inches compacted thickness.
 - 6.6.5 Soft or spongy subgrade shall be removed, and the excavation backfilled with approved subgrade materials or base rock compacted to 95-percent of maximum density per AASHTO T-99.
 - 6.6.6 Water shall be applied as necessary to facilitate compaction and aid in dust control.
- 6.7 AC Pavement
 - 6.7.1 Paving should only commence after City Engineer approved rock surface and compaction, the weather conditions are appropriate, and all other preparations have been made. Any AC pavement that is placed in less than ideal conditions or without City Engineer approval may not be accepted.
 - 6.7.2 Cut edges of existing pavement clean and straight and apply a tack coat where new pavement will join existing. When necessary, apply a thin layer of blow sand on tack joints to prevent them from being damaged or removed by vehicular traffic. Ragged, uneven, or wandering edges at the intersection of new and existing pavement will not be accepted.
 - 6.7.3 Apply a tack coat to manhole frames, valve boxes, catch basins, curbs, gutters, other pavements, or any other component that the new pavement should remain in contact with.
 - 6.7.4 Adjust all rims of manholes, catch basins, valve boxes, etc. to conform to finished pavement grade. No such structure shall be paved over.
 - 6.7.5 Finish pavement lines and grades shall conform accurately with lines and grades shown on plans and staked in field. Tolerance on grade is 3/8 inch on 16' straightedge at any point.

- 6.7.6 Finished pavement thickness shall be as specified on the approved plans. Minimum thickness of pavement shall be 4 inches (2 – 2” compacted lifts). Thinner sections may be approved by City engineer on a case by case basis.
- 6.7.7 Blend pavement to meet catch basin inlets, existing pavements, valve boxes, manholes, and similar structures.
- 6.7.8 Traffic should be kept off fresh pavement until it has adequately cooled and set up.
- 6.7.9 Maintain barricades, warning signs, and flaggers for safety during construction.
- 6.8 AC Pavement Overlays
 - 6.8.1 When an AC overlay is required, the surface of the existing road shall be cleaned of all loose debris, gravel, vegetation, or other.
 - 6.8.2 Cracks greater than 1/8” in width are to be filled with a bituminous sealing product meeting the requirements of ASTM D3405 and AASHTOM301 and as approved by the City Engineer.
 - 6.8.3 Patch existing AC pavement areas as required by and identified by the City Engineer. Excavation shall be required where identified or directed by the City Engineer. New base material and AC pavement to be placed in the repair areas per Section 6.6 of this specification.
 - 6.8.4 A tack coat shall be applied to assist the overlay to adhere to the existing surface. The application rate of the tack coat shall be, at a minimum, 0.25 gallons per square yard throughout the overlay area. Application of tack coat will be made by distributor equipment wherever possible, with hand spraying kept to a minimum.
 - 6.8.5 The temperature of the tack material shall be such to facilitate a uniform spray pattern as recommended by the manufacturer. Spray nozzles shall be kept clear and open to avoid “holidays” in the pattern.
 - 6.8.6 The width of the tack spray pattern shall be the width of the paving fabric role plus 6 inches on each side. Overspray, drools, or spills shall be removed from the road surface to avoid flushing, bleeding, or fabric movements.
 - 6.8.7 Adequate tack shall be applied to the road to saturate the fabric to form a membrane but shall not be excessive to cause a slippage plane or flushing of the overlay.
 - 6.8.8 The fabric is to be placed in the tack coating with a minimum of wrinkles prior to the sealant cooling. The fabric should be unrolled with the bearded or fuzzier side down. Excessive wrinkles should be cut and laid flat. The City Engineer shall observe the placement of the tack and fabric and approve the installation prior to the overlay placement.

-
- 6.8.9 Overlays of the fabric shall be minimized though an overlap of 6 to 8 inches is appropriate to insure full closure of a pavement joint. Transverse joints should be “shingled” in the direction of traffic to prevent edge pickup. Additional sealant may be required to secure these edges as necessary.
 - 6.8.10 Placement of the AC overlay should closely follow fabric lay-down. In the event that the tack coat bleeds through the fabric before the hot mix is placed, it may be necessary to blot the sealant by spreading sand or hot mix over the affected areas.
 - 6.8.11 AC Pavement should be machine laid and compacted per OSS, 2002 and Section 6.6 of this specification.
 - 6.8.12 Feather all AC pavement onto existing pavement not receiving overlay. Rake out coarse aggregate on payment feather. Surface of pavement shall be a smooth, well-sealed, tight mat.
- 6.9 Pavement Markings
- 6.9.1 Pavement markings shall be applied prior to allowance of public traffic on the freshly paved surfaces, unless prior approval from City Engineer.
 - 6.9.2 Pavement surface shall be free of dirt, grease, moisture or any other foreign material prior to placement of striping and pavement markings.
 - 6.9.3 Pavement markings shall be applied in accordance with manufactures recommendations. The ambient temperature shall be at least 10-C and rising.
- 6.10 Street Lighting
- 6.10.1 Luminaries shall be spaced at least 250 feet apart but at no time greater than 500 feet apart. Street lighting shall be placed within the street right of way at property lines whenever possible.
 - 6.10.2 Luminaries shall be installed following manufactures recommendations and guidelines.

STREET AND TRANSPORTATION SYSTEMS

STANDARD DETAIL DRAWINGS INDEX

- T-050: STANDARD PAVED STREET
- T-051: TYPICAL ROADWAY LAYOUT
- T-052: TYPICAL ROADWAY LAYOUT
- T-053: TYPICAL CUL-DE-SAC DETAIL
- T-054: STANDARD UTILITY LOCATIONS
- T-150: RESIDENTIAL DRIVEWAY APPROACH DETAIL
- T-151: COMMERCIAL DRIVEWAY APPROACH DETAIL
- T-201: PEDESTRIAN/BIKE PATH DETAIL
- T-210: STANDARD SIDEWALK DETAILS
- T-211: SIDEWALK AND RAMP DETAIL WITH PLANTER STRIP
- T-212: SIDEWALK AND RAMP DETAIL WITHOUT PLANTER STRIP
- T-213: RAMP AND TEXTURE DETAIL WITH PLANTER STRIP
- T-214: RAMP AND TEXTURE DETAIL WITHOUT PLANTER STRIP
- T-301: CURB AND GUTTER DETAIL
- T-302: VALLEY GUTTER DETAIL
- T-401: STANDARD STREET LIGHT DETAIL
- T-450: STANDARD SIGN DETAIL
- T-451: STREET SIGN AND LETTERING DETAILS
- T-501: STANDARD PERMANENT BARRICADE DETAIL



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STANDARD DETAIL
DRAWING INDEX

DETAIL NO.

T-010

04/29/2009



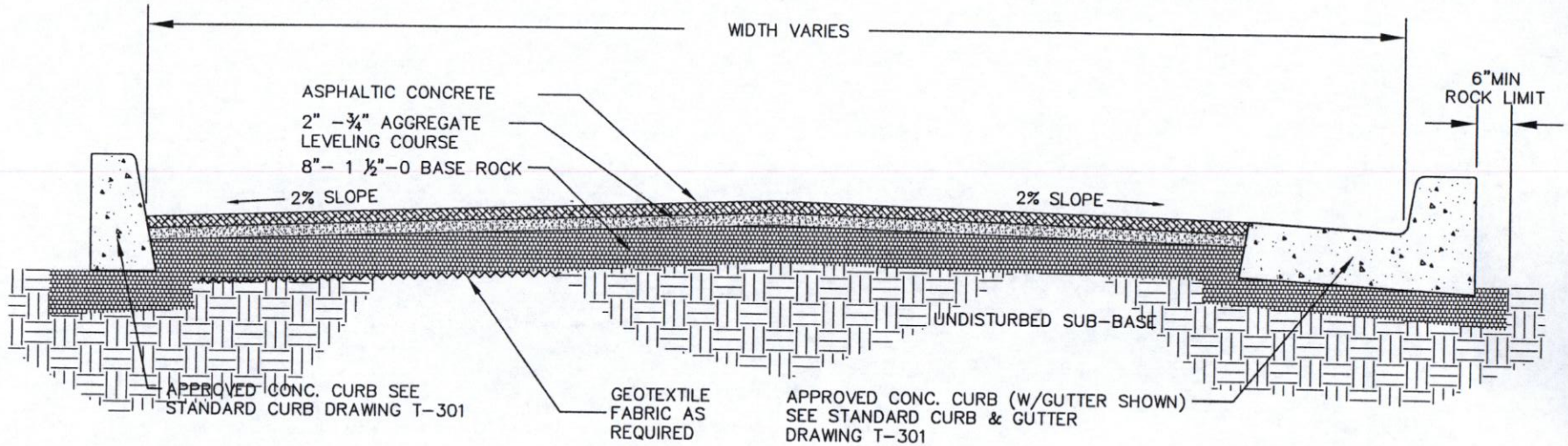
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STANDARD PAVED STREET

DETAIL NO.

T-050

04/29/2009



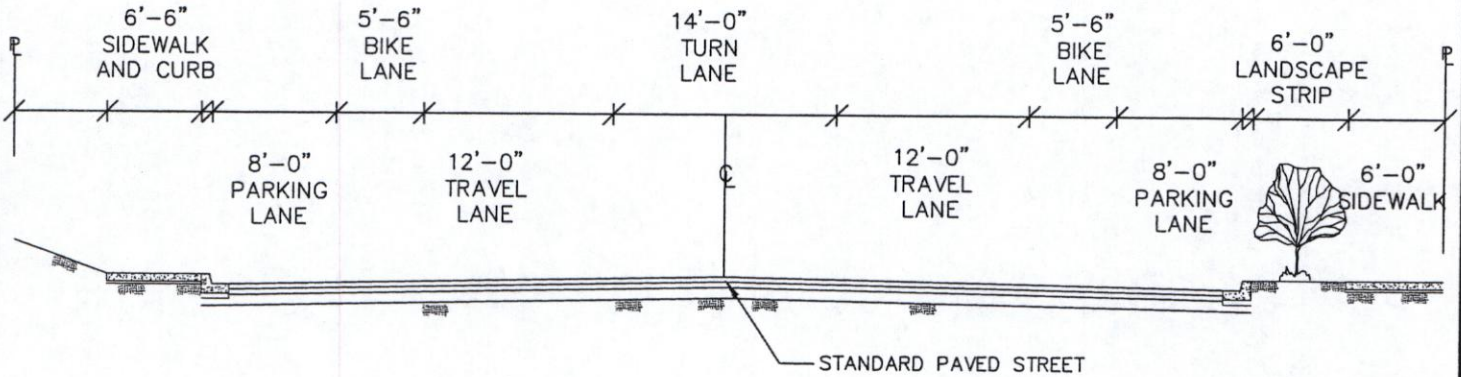
NOTES:

- 1) REFERENCE CITY OF ADAIR VILLAGE DEVELOPMENT STANDARDS FOR MATERIALS
- 2) STREETS SHALL BE PAVED AND CENTERED IN THE PUBLIC RIGHT OF WAY
- 3) DEVELOPER SHALL OBTAIN WRITTEN APPROVAL TO PAVE OVER ANY PUBLIC UTILITIES LOCATED WITHIN RIGHT OF WAYS, AS REQUIRED.
- 4) THE DEVELOPER SHALL OBTAIN A RIGHT OF WAY USE PERMIT AND SUBMIT A COMPLETE SET OF ENGINEERED DRAWINGS SHOWING THE PLAN AND PROFILE VIEWS OF EXISTING CONDITIONS AND PROPOSED WORK. WHEN PROJECT IS COMPLETE, THE DEVELOPER SHALL FURNISH THE CITY WITH A COMPLETE SET OF REPRODUCIBLE DRAWINGS AND CD SHOWING THE "AS CONSTRUCTED" CONDITIONS OF THE COMPLETED PROJECT.
- 5) SEE DESIGN STANDARDS MANUAL FOR COMPACTION OF MATERIALS AND TESTING.
- 6) ASPHALT CONCRETE PAVEMENTS PLACED WITHIN ARTERIAL & COMMERCIAL ROADWAYS SHALL BE PLACED TO A THICKNESS OF 4 INCHES (SET IN 2-2 INCH LIFTS) ASPHALT CONCRETE PAVEMENTS PLACED WITHIN LOCAL STREETS AND ALLEYS SHALL BE PLACED TO A THICKNESS OF 2 INCHES (SET IN A SINGLE LIFT) ALL UNLESS OTHERWISE SPECIFIED.

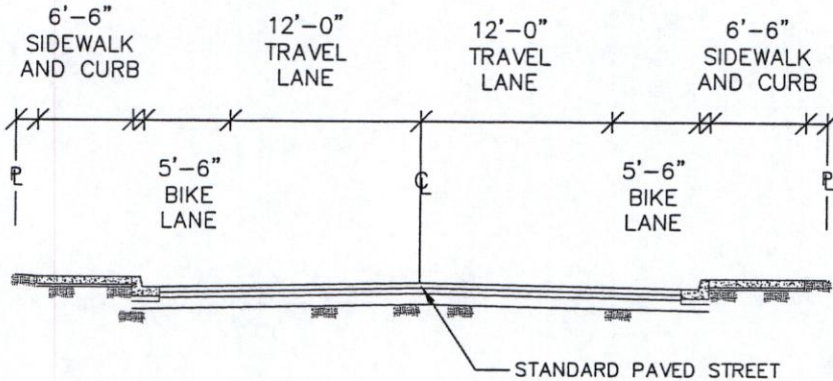
3 LANE ARTERIAL
STANDARD CURB & GUTTER WITH SIDEWALKS
90' right-of-way

W/O LANDSCAPE STRIP

W/LANDSCAPE STRIP



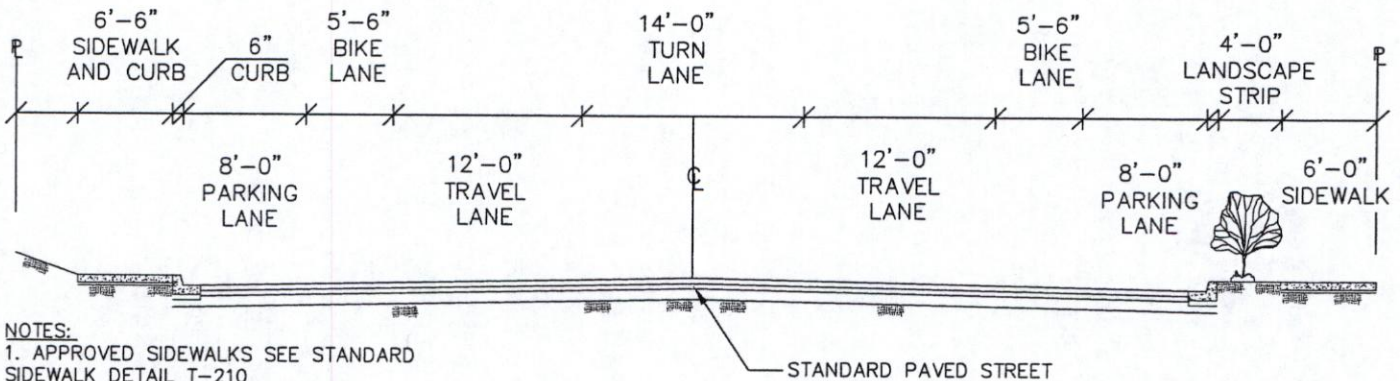
2 LANE ARTERIAL
STANDARD CURB & GUTTER WITH SIDEWALKS
50' right-of-way



COMMERCIAL ROADWAY
STANDARD CURB & GUTTER WITH SIDEWALKS
86' right-of-way

W/O LANDSCAPE STRIP

W/LANDSCAPE STRIP



NOTES:

1. APPROVED SIDEWALKS SEE STANDARD SIDEWALK DETAIL T-210
2. APPROVED CONCRETE CURB & GUTTER SEE STANDARD CURB & GUTTER DETAIL T-301

3. ALTERNATE STREET LAYOUT SYSTEMS MAY BE ACCEPTABLE IF SUBMITTED TO AND APPROVED BY THE CITY.



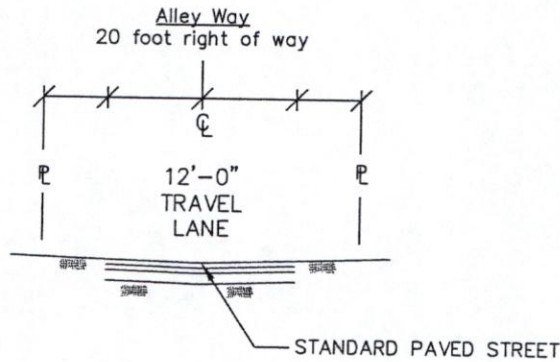
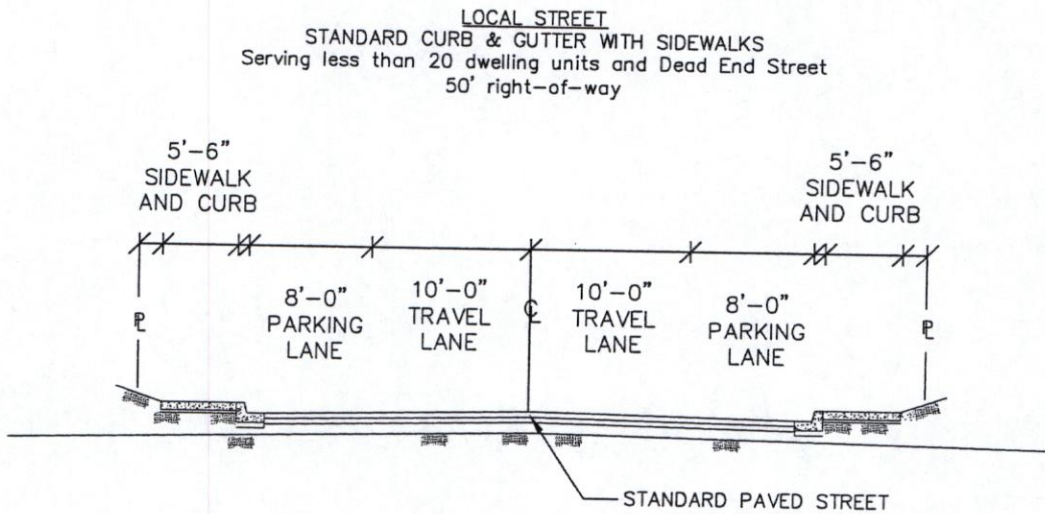
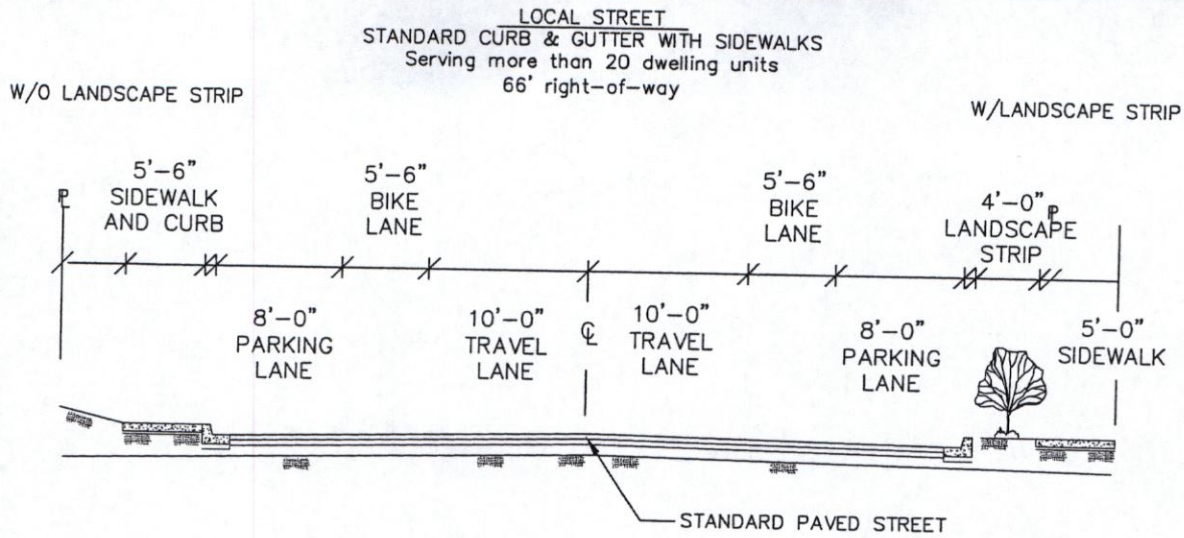
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**TYPICAL
ROADWAY LAYOUTS**

DETAIL NO.

T-051

04/29/2009



- NOTES:**
1. APPROVED SIDEWALKS SEE STANDARD SIDEWALK DETAIL T-210
 2. APPROVED CONCRETE CURB & GUTTER SEE STANDARD CURB & GUTTER DETAIL T-301
 3. ALTERNATE STREET LAYOUT SYSTEMS MAY BE ACCEPTABLE IF SUBMITTED TO AND APPROVED BY THE CITY.



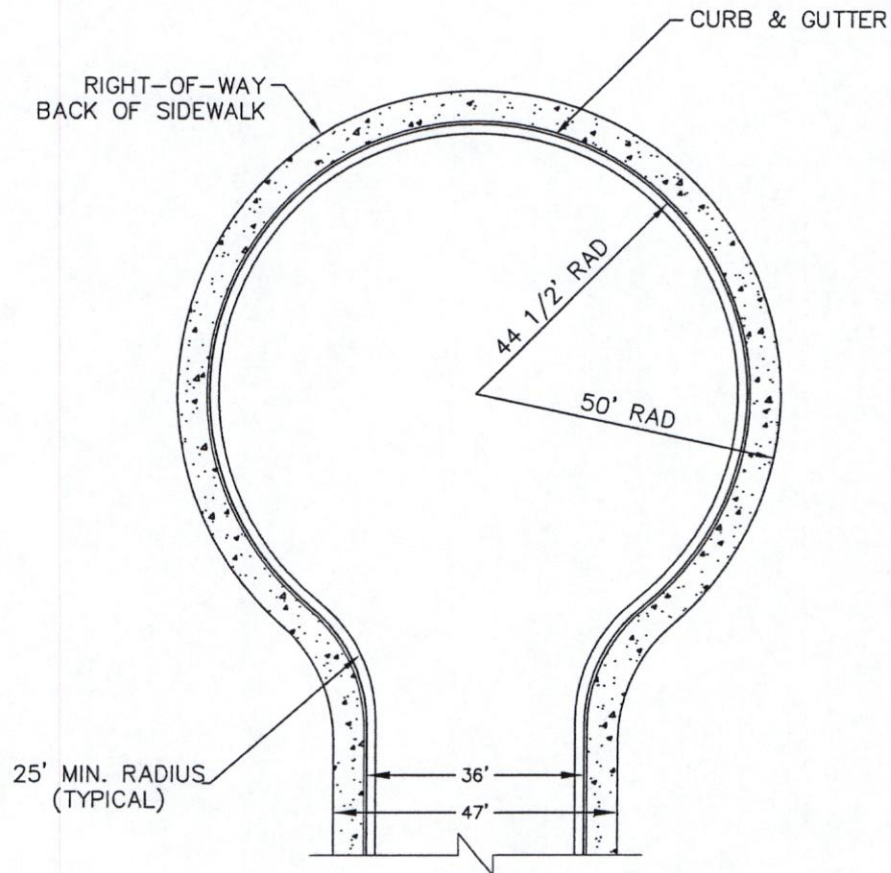
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TYPICAL ROADWAY LAYOUTS

DETAIL NO.

T-052

04/29/2009



NOTES:

1. MOUNTABLE CURBS ALLOWED IN CUL-DE-SAC UPON PRIOR APPROVAL.
2. CUL-DE-SAC GEOMETRY SHOWN DOES NOT ALLOW FOR ON-STREET PARKING. IF ON-STREET PARKING IS DESIRED, THE RADIUS TO THE FACE OF CURB MUST BE INCREASED TO ACCOUNT FOR A SINGLE PARKING LANE WIDTH. (MINIMUM 8 FEET)



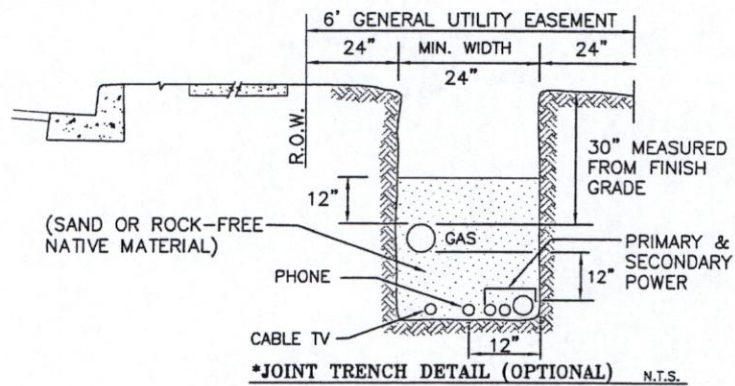
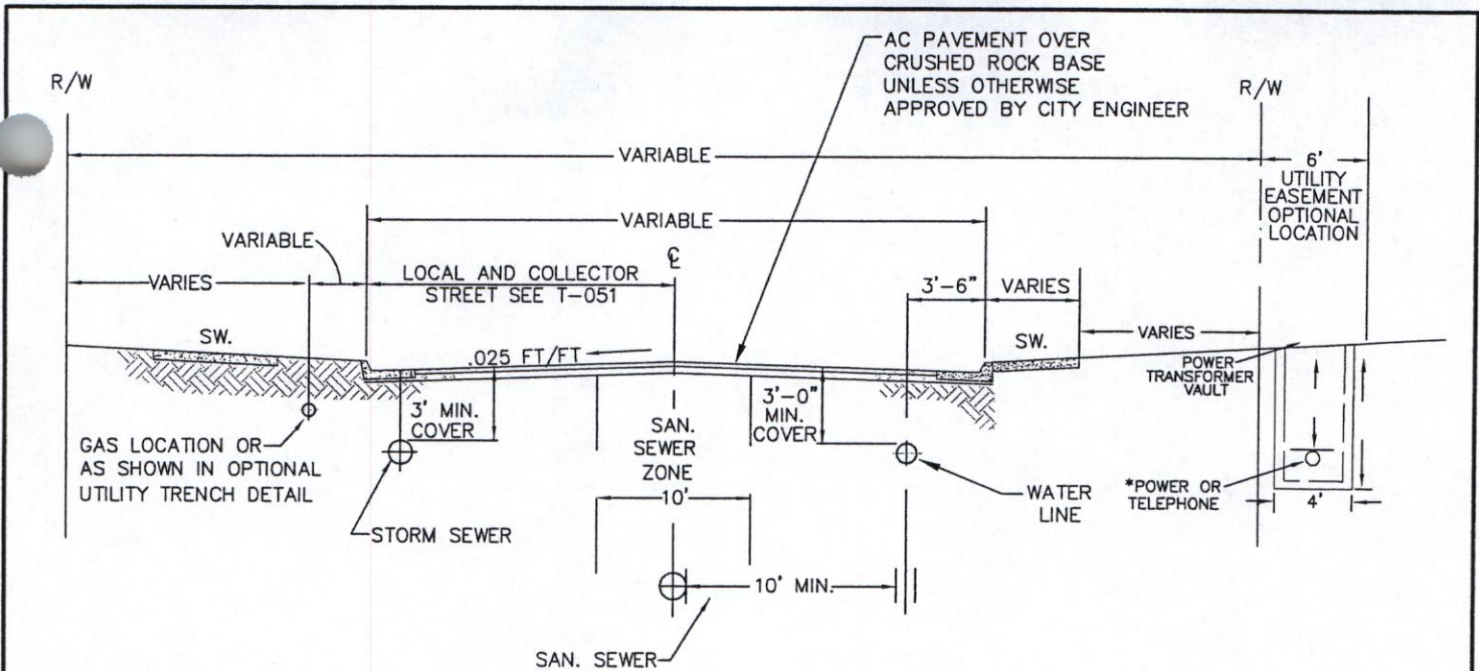
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TYPICAL CUL-DE-SAC DETAIL

DETAIL NO.

T-053

04/29/2009



NOTES:

1. WATER MAIN TO BE LOCATED 3'-6" INSIDE FROM FACE OF CURB OR AS OTHERWISE DIRECTED.
2. 10' HORIZONTAL SEPARATION BETWEEN WATER AND SEWER WHERE POSSIBLE. COMPLY WITH SEPARATION REQUIREMENTS OF OAR 333-061-050.
3. WATER DISTRIBUTION MAINS SHALL HAVE 36" MINIMUM COVER OR AS OTHERWISE DIRECTED.
4. SEWER MAINS SHALL HAVE 5.25' (63") MINIMUM COVER UNLESS OTHERWISE APPROVED TO AVOID CONFLICTS WITH WATER AND OTHER UTILITIES.
5. WATER MAINS TO BE LOCATED ON NORTH OR EAST SIDE OF STREET WHEN PRACTICAL.
6. WATER, SEWER, STREETS AND DRAINAGE SYSTEMS ARE SUBJECT TO CITY STANDARDS.
7. MANHOLE LIDS SHALL NOT BE LOCATED DIRECTLY IN NORMAL WHEEL PATH.
8. ALL LAYOUTS AND LOCATIONS ARE SUBJECT TO CITY APPROVAL.



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STANDARD UTILITY LOCATIONS

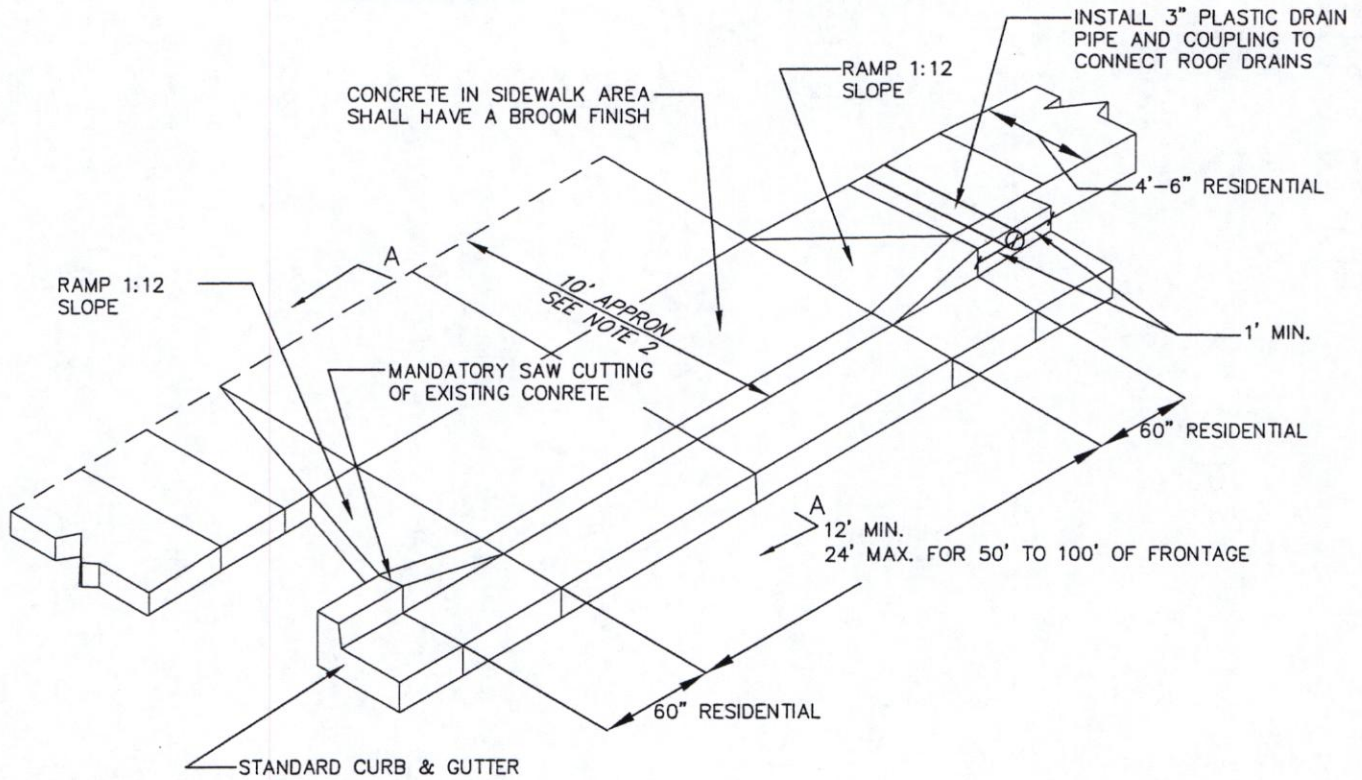
DETAIL NO.

T-054

04/29/2009

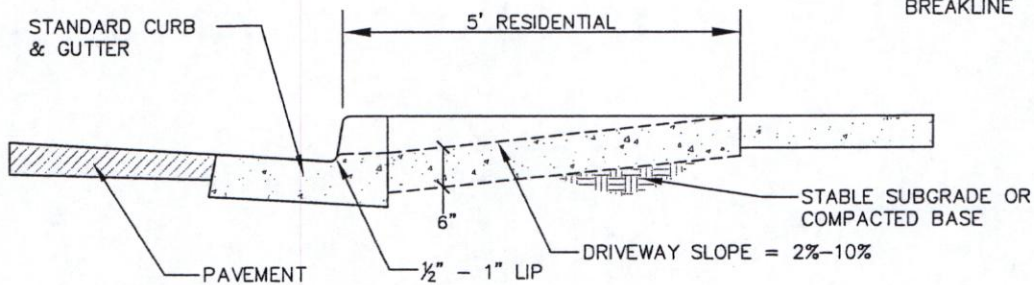
SIDEWALK ADJACENT TO CURB

NOT TO SCALE



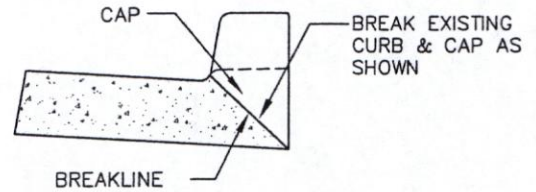
SIDEWALK AWAY FROM CURB

NOT TO SCALE



SECTION A-A

NOT TO SCALE



NOTES

- 1) CONCRETE SHALL HAVE A MINIMUM BREAKING STRENGTH OF 3500 PSI AFTER 28 DAYS, FOR ALL DRIVEWAY APRONS (6") AND DRIVEWAY EXTENTIONS (4")
- 2) 10' CONCRETE APRON REQUIRED FOR ALL DRIVEWAYS WHERE NO SIDEWALK IS CONSTRUCTED.
- 3) 4" THICKNESS OF CONCRETE FROM BACK OF SIDEWALK OR DRIVEWAY APRON TO PROPERTY LINE WHERE PRIVATE DRIVE IS CONCRETE
- 4) DRIVEWAY MUST MEET EXISTING STREET GRADE
- 5) CITY APPROVAL REQUIRED FOR DEVIATION FROM WIDTH STANDARDS
- 6) PERMITS AND INSPECTIONS ARE REQUIRED ON NEW AND EXISTING STRUCTURES. THE INSPECTION WILL BE MADE AFTER THE FORMS HAVE BEEN SET
- 7) FOR SIDEWALKS REFER TO STANDARD SIDEWALK DETAIL T-210
- 8) FOR CURB & GUTTER REFER TO STANDARD CURB & GUTTER DETAIL T-301



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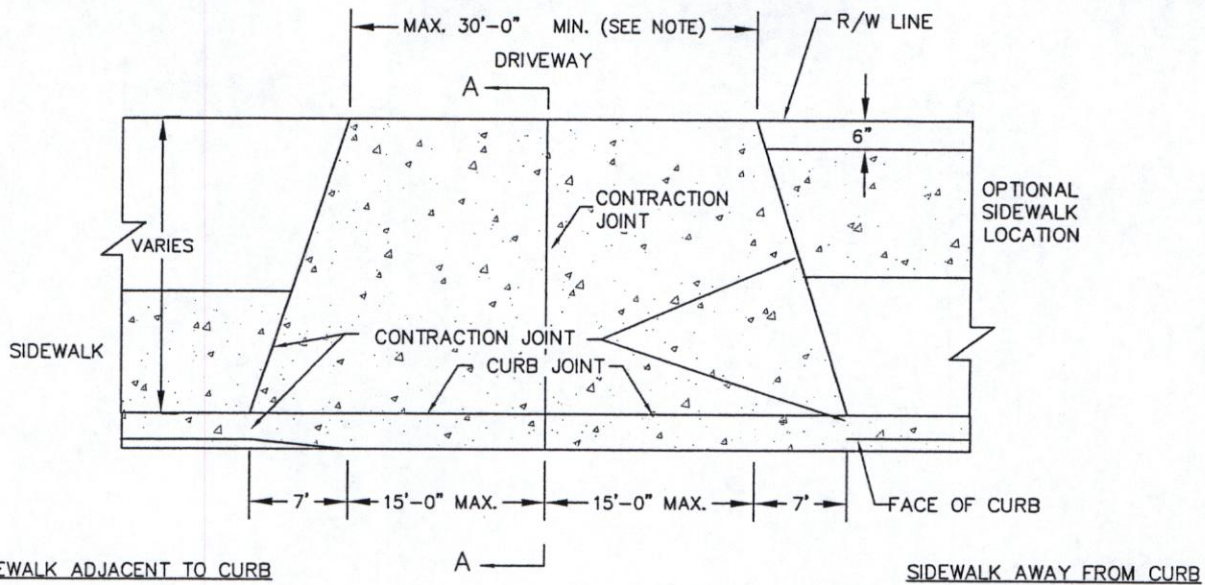
**RESIDENTIAL DRIVEWAY
APPROACH DETAIL**

DETAIL NO.

T-150

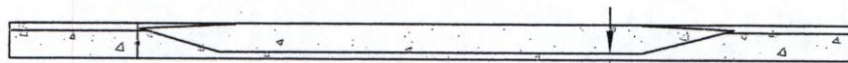
04/29/2009

PLAN

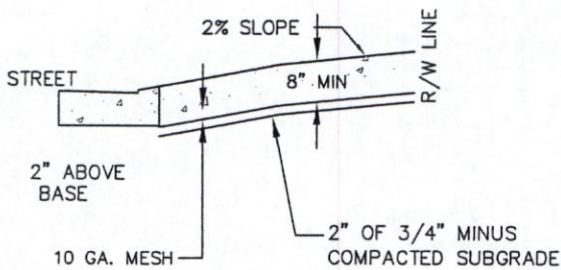


NOTE: ONE-WAY TRAFFIC - MIN. 15' DRIVEWAY
TWO-WAY TRAFFIC - MIN. 24' DRIVEWAY

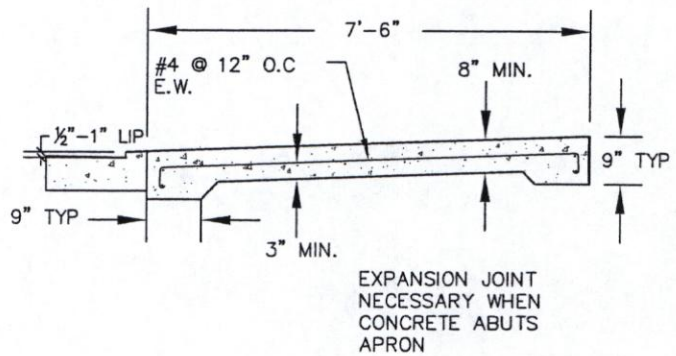
ELEVATION



1/2"-1" EXPOSURE
USE EXISTING CONTRACTION JOINT
OR SAWCUT AND PLACE COLD JOINT



SECTION A-A: WITH 10 GA. MESH



SECTION A-A: WITH REBAR

NOTES:

- 1) CONCRETE TO HAVE 28 DAY COMPRESSIVE STRENGTH OF 3500 PSI
- 2) SCORE MARKS ARE TO BE TOOLED INTO CONCRETE SURFACE TO FORM A SQUARE BUT NOT TO EXCEED 8' IN ANY DIRECTION
- 3) REINFORCING BAR IS TO BE HELD UP WITH NON-CORROSIVE MATERIALS(ROCK, CONCRETE) PRIOR TO CONCRETE BEING PLACED
- 4) CONCRETE IS TO RECEIVE A MEDIUM BROOM FINISHED. BROOMING IS TO BE PERPENDICULAR TO THE CURB LINE
- 5) CURB JOINT SHALL BE A TROWELED JOINT WITH A MIN. 1/2" RADIUS ALONG BACK OF CURB.
- 6) DRIVEWAY SHALL BE A MINIMUM 8" THICK
- 7) FOR SIDEWALKS REFER TO STANDARD SIDEWALK DETAIL T-210
- 8) FOR CURB & GUTTER REFER TO STANDARD CURB & GUTTER DETAIL T-301



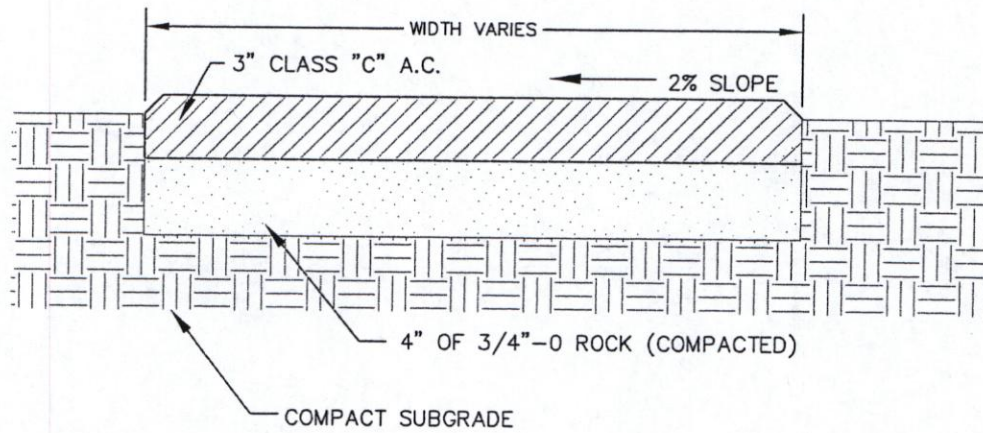
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COMMERCIAL DRIVEWAY
APPROACH DETAIL

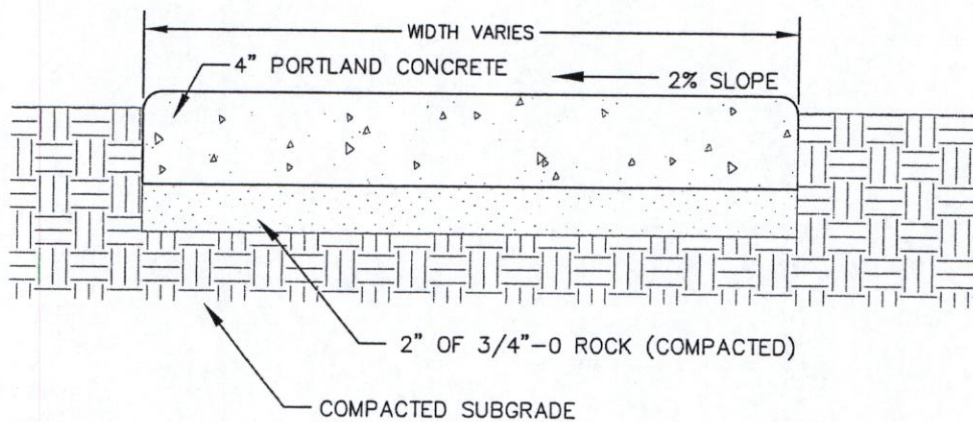
DETAIL NO.

T-151

04/29/2009



-OR-



NOTES

1. CONCRETE TO HAVE 28 DAY COMPRESSIVE STRENGTH OF 3500 PSI
2. SIDEWALK PANELS SHALL BE SQUARE, 3/4" DEEP SCRIBES AT JOINTS, EDGED ON 4 SIDES AND HAVE A LIGHT BROOM FINISH.
3. PEDESTRIAN PATH OR BIKEWAY SHALL HAVE A MINIMUM WIDTH OF 5 FEET (ONE WAY)
A MINIMUM WIDTH OF 10 FEET (TWO WAY)



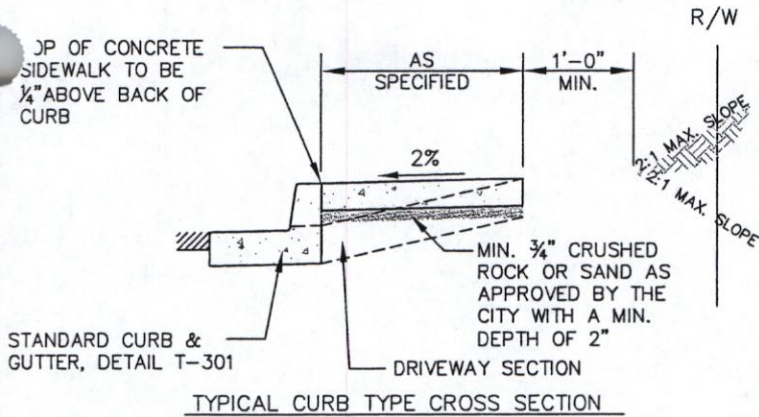
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PEDESTRIAN / BIKE PATH
DETAILS

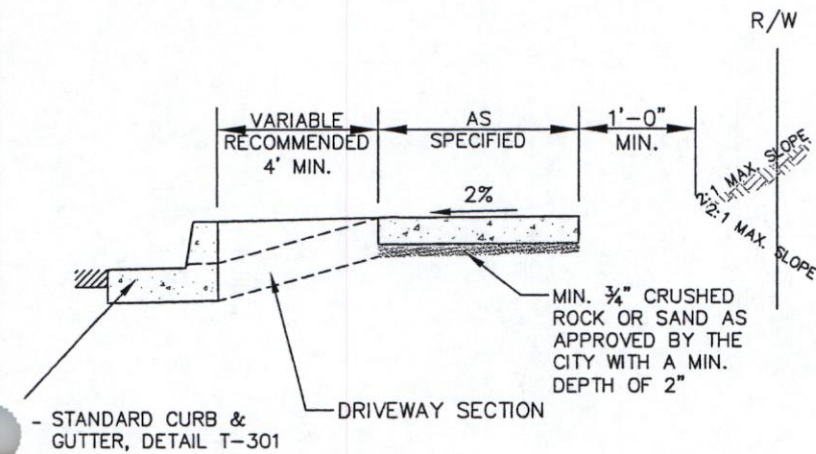
DETAIL NO.

T-201

04/29/2009



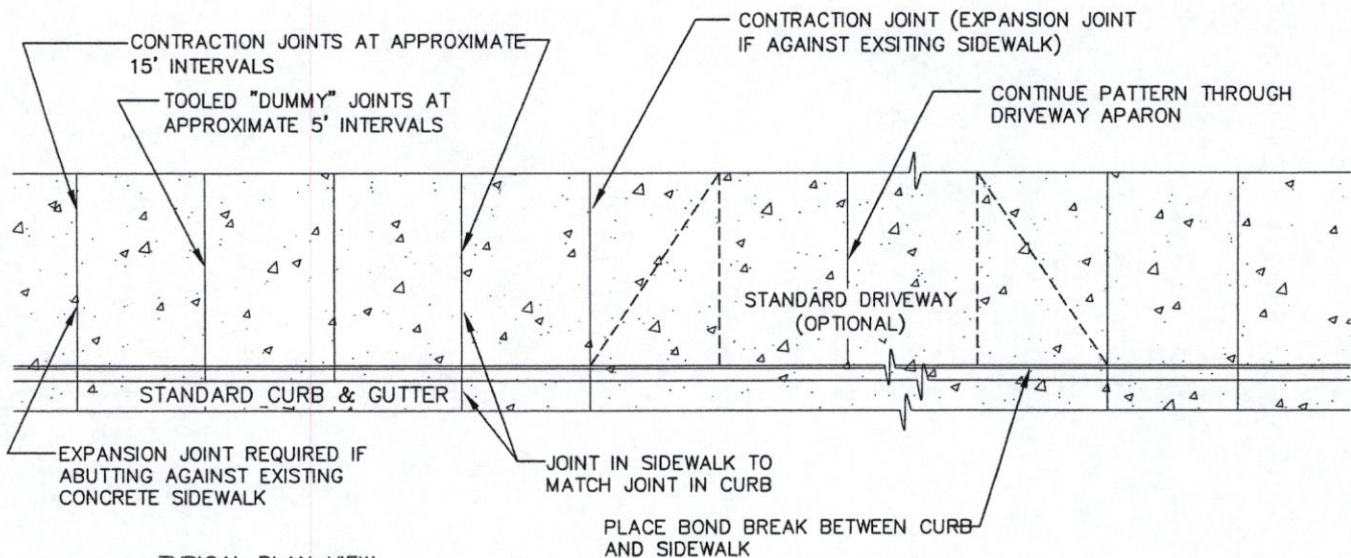
TYPICAL CURB TYPE CROSS SECTION



TYPICAL SETBACK TYPE CROSS SECTION

NOTES:

- 1) CONCRETE SHALL BE 3500 PSI IN 28 DAYS
- 2) STANDARD SIDEWALK CROSS SLOPE SHALL BE 2%. WHEN THE LOT IS BELOW THE TOP OF THE CURB AND SLOPE DOWN FROM CURB, A MINUS 2% SLOPE MAY BE REQUIRED
- 3) CONCRETE DEPTH FOR SIDEWALKS SHALL BE A NOMINAL 4" MIN. DRIVEWAY SECTIONS INCLUDING SIDEWALKS THROUGH DRIVEWAYS SHALL BE NOMINAL 6" MIN FOR LOCAL STREETS AND 8" FOR ARTERIALS AND COLLECTORS
- 4) CONTRACTION JOINTS SHALL BE INSTALLED AT APPROXIMATE INTERVALS OF 15' BY CUTTING AT LEAST 1/3 OF THE DEPTH OF THE CONCRETE. "DUMMY" JOINTS SHALL BE INSTALLED AT APPROXIMATE INTERVALS OF 5'. EXPANSION JOINTS WITH PREMOLDED FILLER SHALL BE INSTALLED BETWEEN DRIVEWAYS & SIDEWALKS AT THE DIRECTION OF THE ENGINEER, SEE DRIVEWAY STANDARD
- 5) INSTALL A BOND BREAKER OR ISOLATION JOINT BETWEEN BACK OF CURB & SIDEWALK, & AROUND ANY OBSTRUCTION WITHIN SIDEWALK AREA
- 6) DRAIN BLOCKOUTS IN THE CURB SHALL BE EXTENDED TO THE BACK OF THE SIDEWALK WITH A 3" DIA. PLASTIC PIPE AT A 2% SLOPE. A CONTRACTION JOINT SHALL BE PLACED OVER THE PIPE
- 7) SEE STANDARD WHEELCHAIR/BICYCLE RAMP DETAILS FOR SIDEWALK PATTERNS AT INTERSECTION CURB RETURNS
- 8) SEE, ALSO, STANDARD DETAILS FOR DRIVEWAYS, T-150, T-151
- 9) A MIN. SEPARATION OF 4' BETWEEN CURB & SIDEWALK IS RECOMMENDED FOR LANDSCAPE MAINTENANCE
- 10) SIDEWALKS 8' AND WIDER SHALL HAVE A LONGITUDINAL CONTRACTION JOINT AT THE MIDPOINT



TYPICAL PLAN VIEW



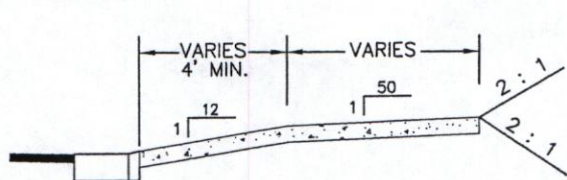
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STANDARD SIDEWALK
 DETAILS

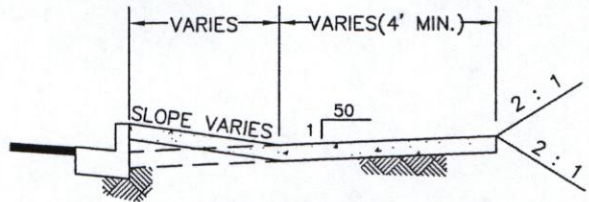
DETAIL NO.

T-210

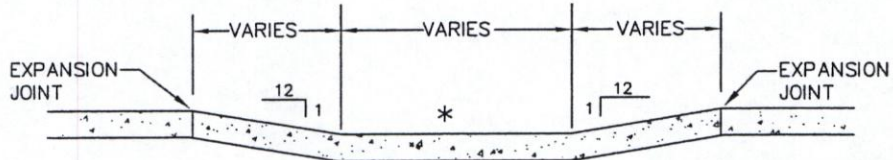
04/29/2009



SECTION A-A



SECTION B-B

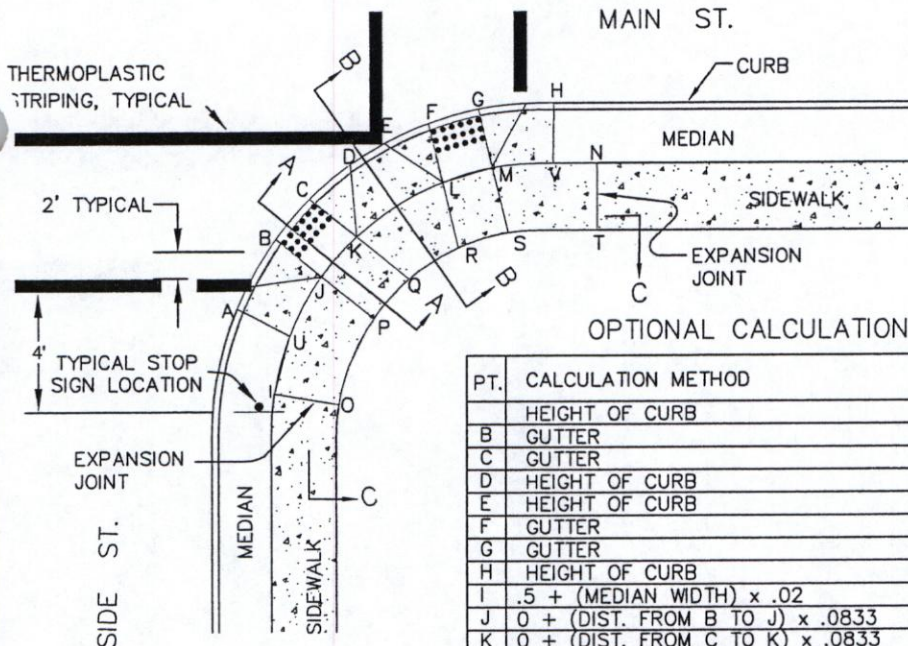


SECTION C-C

* SLOPE SIDEWALK TO PROVIDE POSITIVE DRAINAGE.

NOTE:

1. WHEELCHAIR RAMP GRADES SHALL MEET ADA STANDARDS. THE TABLE PROVIDED BELOW IS TO ASSIST THE DESIGNER AND CONTRACTOR WHO ELECT TO CALCULATE ELEVATIONS TO MEET THOSE STANDARDS.
2. ADDITIONAL INFORMATION REGARDING SLOPE AND RAMP TEXTURING IS PROVIDED ON CITY STANDARD DRAWING NO. T-213.
3. CURB INLET OR CATCH BASIN SHALL NOT BE ALLOWED BETWEEN PTS. B & C OR PTS. F & G.
4. PROVIDE STOP LINE ONLY ON SIDE STREET APPROACHES TO MAIN STREETS WITH CENTERLINE STRIPING. CROSSWALK LINES WHERE REQUIRED MUST BE AS PER STRIPING PLAN APPROVED BY THE CITY ENGINEER.
5. CONCRETE SHALL ATTAIN A MINIMUM COMPRESSIVE STRENGTH OF 3500 PSI IN 28 DAYS



PLAN

OPTIONAL CALCULATION TABLE FOR POINT ELEVATIONS

PT.	CALCULATION METHOD	* + FROM GUTTER ⊙ RIGHT ANGLE
	HEIGHT OF CURB	.5
B	GUTTER	0
C	GUTTER	0
D	HEIGHT OF CURB	.5
E	HEIGHT OF CURB	.5
F	GUTTER	0
G	GUTTER	0
H	HEIGHT OF CURB	.5
I	.5 + (MEDIAN WIDTH) x .02	*
J	0 + (DIST. FROM B TO J) x .0833	*
K	0 + (DIST. FROM C TO K) x .0833	*
L	0 + (DIST. FROM F TO L) x .0833	*
M	0 + (DIST. FROM G TO M) x .0833	*
N	.5 + (MEDIAN WIDTH) x .02	*
O	.5 + (MEDIAN WIDTH) + (DIST. FROM I TO O) x .02	*
P	0 + (DIST. FROM B TO J) x .0833 + (DIST. FROM J TO P) x .02	*
Q	0 + (DIST. FROM C TO K) x .0833 + (DIST. FROM K TO Q) x .02	*
R	0 + (DIST. FROM F TO L) x .0833 + (DIST. FROM L TO R) x .02	*
S	0 + (DIST. FROM G TO M) x .0833 + (DIST. FROM M TO S) x .02	*
T	.5 + (MEDIAN WIDTH) + (DIST. FROM N TO T) x .02	*
U	J + (DIST. FROM J TO U) x .0833	*
V	M + (DIST. FROM M TO V) x .0833	*

* DESIGNER MAY CALCULATE ELEVATIONS AT LOCATIONS SHOWN.



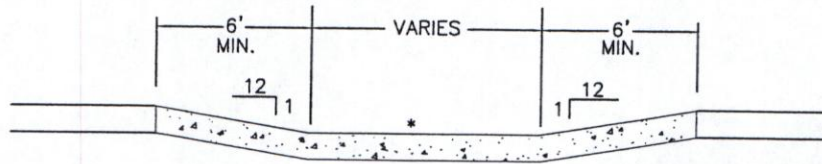
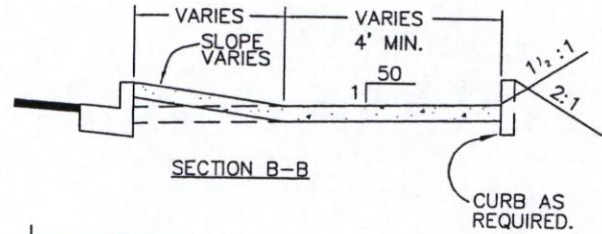
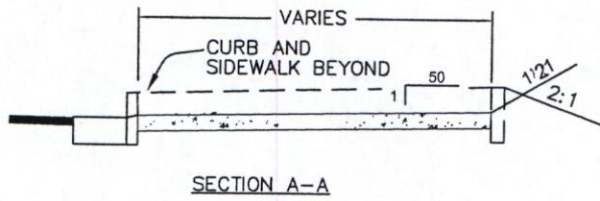
City of Adair Village
6030 NE William R Carr St.
Adair Village, Oregon 97330
(541) 745-5507 Fax: (541) 745-5530

SIDEWALK AND RAMP DETAIL
WITH PLANTER STRIP

DETAIL NO.

T-211

04/29/2009

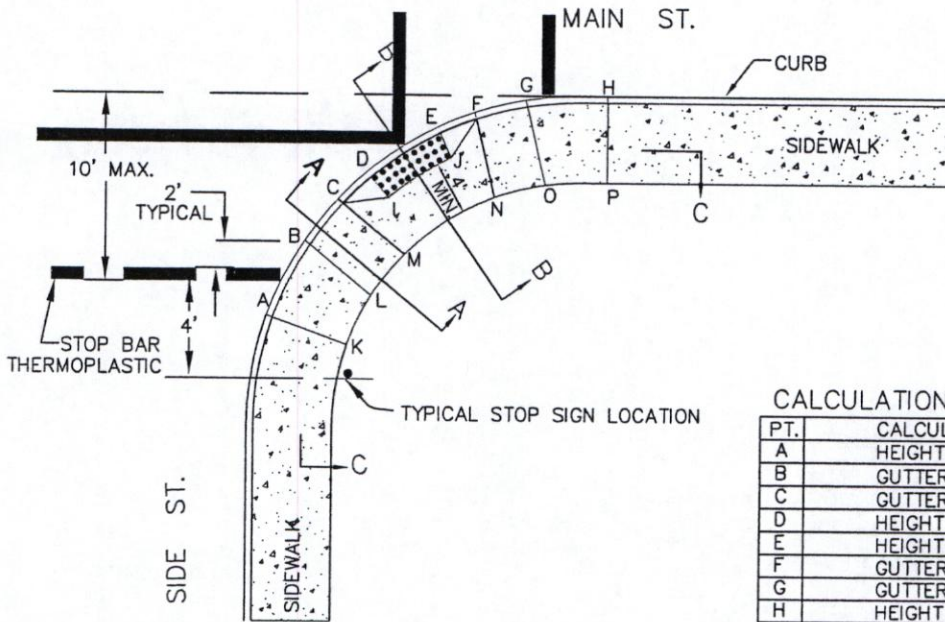


SECTION C-C

* SLOPE SIDEWALK TO PROVIDE POSITIVE DRAINAGE.

NOTE:

1. WHEELCHAIR RAMP GRADES SHALL MEET ADA STANDARDS. THE TABLE BELOW IS PROVIDED TO ASSIST THE DESIGNER AND CONTRACTOR WHO ELECT TO CALCULATE ELEVATIONS TO MEET THOSE STANDARDS.
2. ADDITIONAL INFORMATION REGARDING SLOPE AND RAMP TEXTURING IS PROVIDED ON CITY STANDARD DRAWING NO. T-214.
3. CURB INLET OR CATCH BASIN SHALL NOT BE ALLOWED BETWEEN PTS. B & C OR PTS. F & G.
4. PROVIDE STOP LINE ONLY ON SIDE STREET APPROACHES TO MAIN STREETS WITH CENTERLINE STRIPING. CROSSWALK LINES WHERE REQUIRED MUST BE AS PER STRIPING PLAN APPROVED BY THE CITY ENGINEER.
5. CONCRETE SHALL ATTAIN A MINIMUM COMPRESSIVE STRENGTH OF 3300 PSI IN 28 DAYS



PLAN

OPTIONAL CALCULATION TABLE FOR POINT ELEVATIONS

PT.	CALCULATION METHOD	* + FROM GUTTER
A	HEIGHT OF CURB	.5
B	GUTTER	0
C	GUTTER	0
D	HEIGHT OF CURB	.5
E	HEIGHT OF CURB	.5
F	GUTTER	0
G	GUTTER	0
H	HEIGHT OF CURB	.5
I	$0 + (\text{DIST. FROM D TO I}) \times .02$	*
J	$0 + (\text{DIST. FROM E TO J}) \times .02$	*
K	$.5 + (\text{DIST. FROM A TO K}) \times .02$	*
L	$0 + (\text{DIST. FROM B TO L}) \times .02$	*
M	$0 + (\text{DIST. FROM C TO M}) \times .02$	*
N	$0 + (\text{DIST. FROM F TO N}) \times .02$	*
O	$0 + (\text{DIST. FROM G TO O}) \times .02$	*
P	$.5 + (\text{DIST. FROM H TO P}) \times .02$	*

* DESIGNER MAY CALCULATE ELEVATIONS AT LOCATIONS SHOWN.



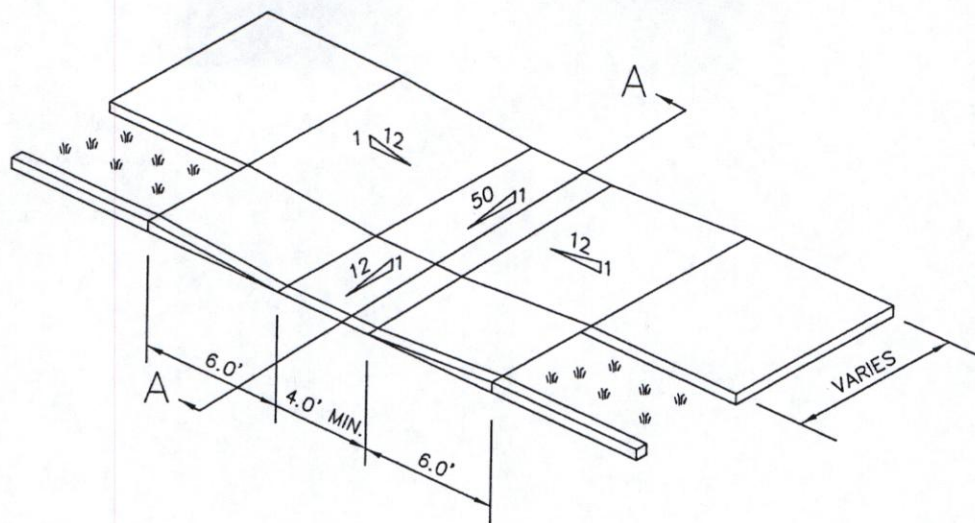
City of Adair Village
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Adair Village, Oregon 97330
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SIDEWALK AND RAMP DETAIL
WITHOUT PLANTER STRIP

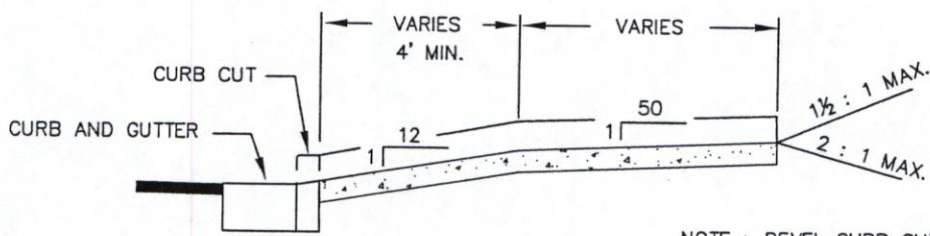
DETAIL NO.

T-212

04/29/2009

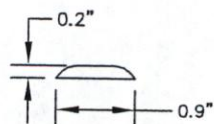


SIDEWALK RAMP DETAIL

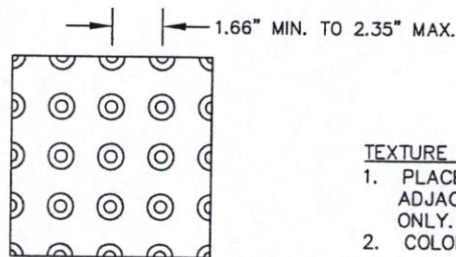


NOTE : BEVEL CURB CUT FROM GUTTER TO THE BACK OF CURB AT 8.33%

SECTION A-A



TRUNCATED DOME DETAIL



RAMP TEXTURE DETAIL

TEXTURE NOTES:

1. PLACE DOME TEXTURE IN THE LOWER 2' ADJACENT TO TRAFFIC THROAT OF RAMP ONLY.
2. COLOR OF DOMES TO BE SAFETY YELLOW.

RAMP TEXTURE DETAIL



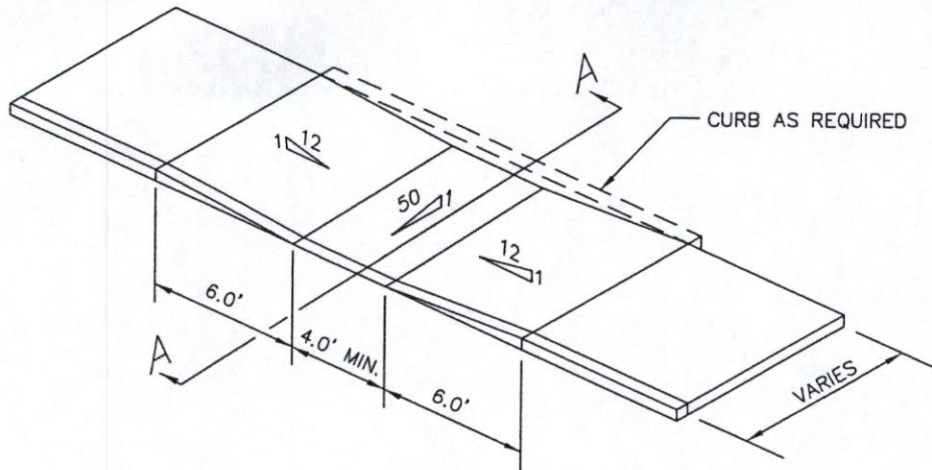
City of Adair Village
6030 NE William R Carr St.
Adair Village, Oregon 97330
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**RAMP AND TEXTURE DETAIL
WITH PLANTER STRIP**

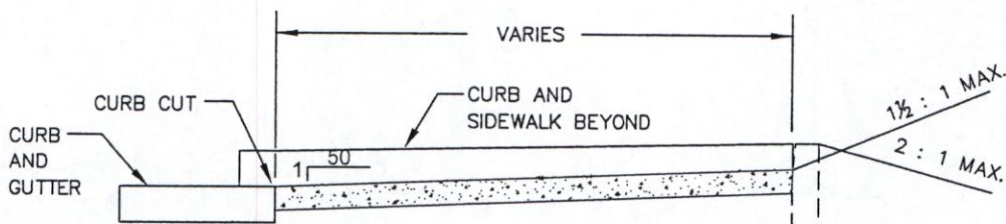
DETAIL NO.

T-213

04/29/2009



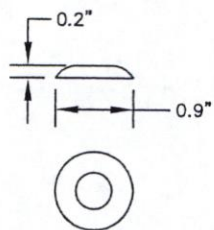
SIDEWALK RAMP DETAIL



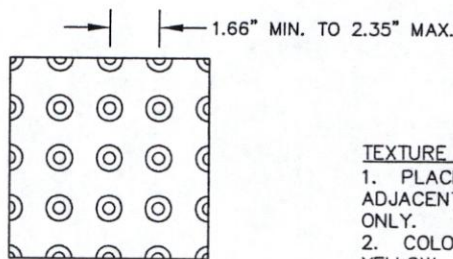
NOTE:
BEVEL CURB CUT FROM GUTTER
TO THE BACK OF CURB AT 2%

CONSTRUCT TYPE "C" CURB AT
NEW RAMPS WHERE ADJACENT
GROUND SLOPES AWAY
FROM SIDEWALK AS SHOWN.

SECTION A-A



TRUNCATED DOME DETAIL



RAMP TEXTURE DETAIL

TEXTURE NOTES:

1. PLACE DOME TEXTURE IN THE LOWER 2' ADJACENT TO TRAFFIC THROAT OF RAMP ONLY.
2. COLOR OF DOMES TO BE SAFETY YELLOW.

RAMP TEXTURE DETAIL



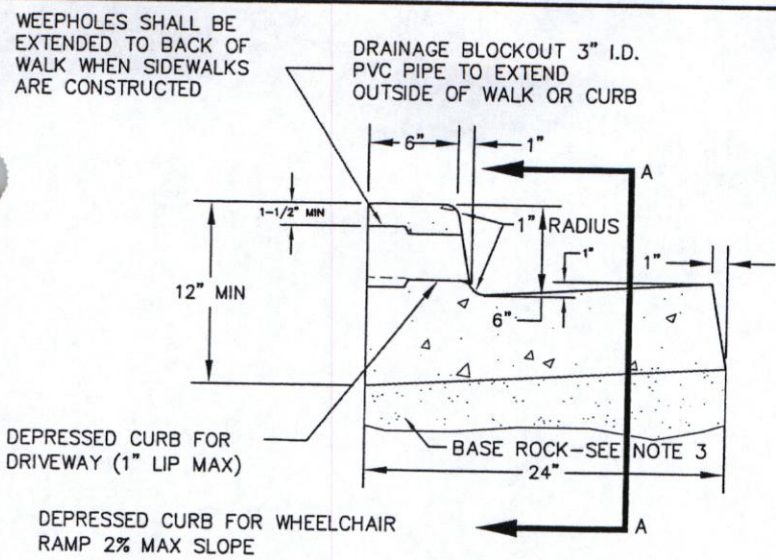
City of Adair Village
6030 NE William R Carr St.
Adair Village, Oregon 97330
(541) 745-5507 Fax: (541) 745-5530

**RAMP AND TEXTURE DETAIL
WITHOUT PLANTER STRIP**

DETAIL NO.

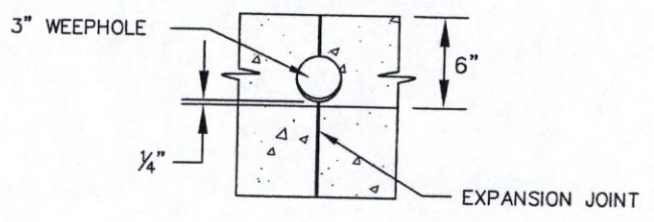
T-214

04/29/2009

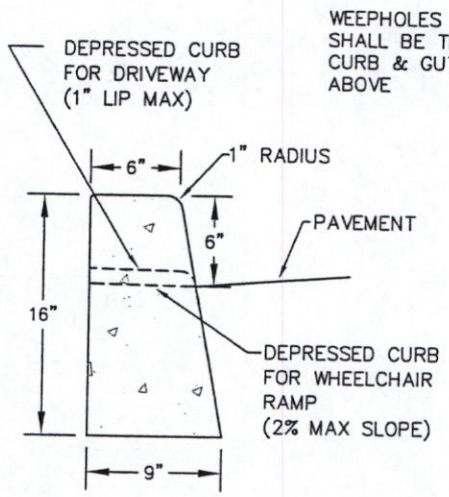


TYPICAL INTEGRAL CURB & GUTTER
NOT TO SCALE

WEEPHOLES ARE TO BE CONSTRUCTED USING 3" ID DRAIN PIPE & COUPLING. PLACE WEEPHOLES AT EXPANSION JOINTS WHENEVER POSSIBLE



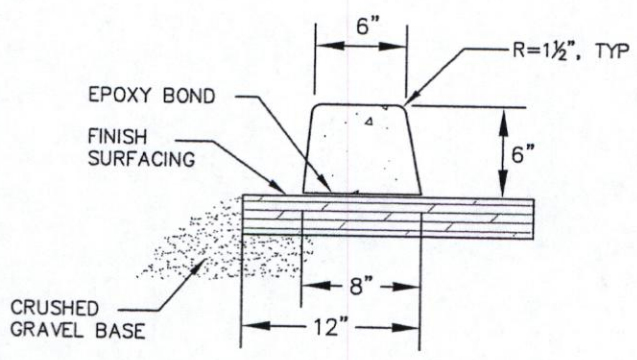
SECTION AA: WEEPHOLES
NOT TO SCALE



TYPICAL STRAIGHT CURB (TYPE C)
NOT TO SCALE

WEEPHOLES CONSTRUCTION SHALL BE THE SAME AS CURB & GUTTER DETAIL ABOVE

- NOTES:
- CONCRETE SHALL HAVE A BREAKING STRENGTH OF 3500 PSI AFTER 28 DAYS
 - CONTRACTION JOINTS
 - TO BE PROVIDED
 - AT EACH POINT OF TANGENCY
 - AT EACH COLD JOINT
 - AT EACH SIDE OF INLET STRUCTURES
 - AT BOTH SIDES OF AN APPROACH
 - SPACING TO BE NOT MORE THAN 15 FEET
 - THE DEPTH OF THE JOINT SHALL BE AT LEAST 1/3 OF THE THICKNESS OF CONCRETE
 - EXPANSION JOINTS IN CURB & GUTTER SHALL BE PLACED AT MAX 45' INTERVALS IN 15' MULTIPLES
 - BASE ROCK - 1-1/2"-0", 95% COMPACTION ROCK SHALL BE TO SUBGRADE OF THE STREET SECTION OR 4" IN DEPTH, WHICHEVER IS GREATER
 - DRAINAGE BLOCK - 3" DIA. PLASTIC PIPE
 - DRAINAGE ACCESS THROUGH EXISTING CURBS SHALL BE DONE BY:
 - CORE DRILLING, OR
 - VERTICAL SAWCUT OF CURB 18" EACH SIDE OF DRAIN AND RE-POURED TO FULL DEPTH OF CURB
 - STAMP TOP OF CURB WITH "W" AT WATER SERVICE CROSSING AND "S" AT SANITARY LATERAL CROSSING AS SPECIFIED
 - EXTRUDED BONDED CURBS SHALL NOT BE USED IN PUBLIC RIGHT OF WAYS OR PRIVATE STREET
 - SEE STANDARD CURB CUT DETAIL FOR DRIVEWAY
 - TYPICAL STRAIGHT CURB (TYPE C) ALLOWED FOR REPLACEMENT OF EXISTING TYPE C CURBS AND NOT RECOMENDED FOR NEW CONSTRUCTION



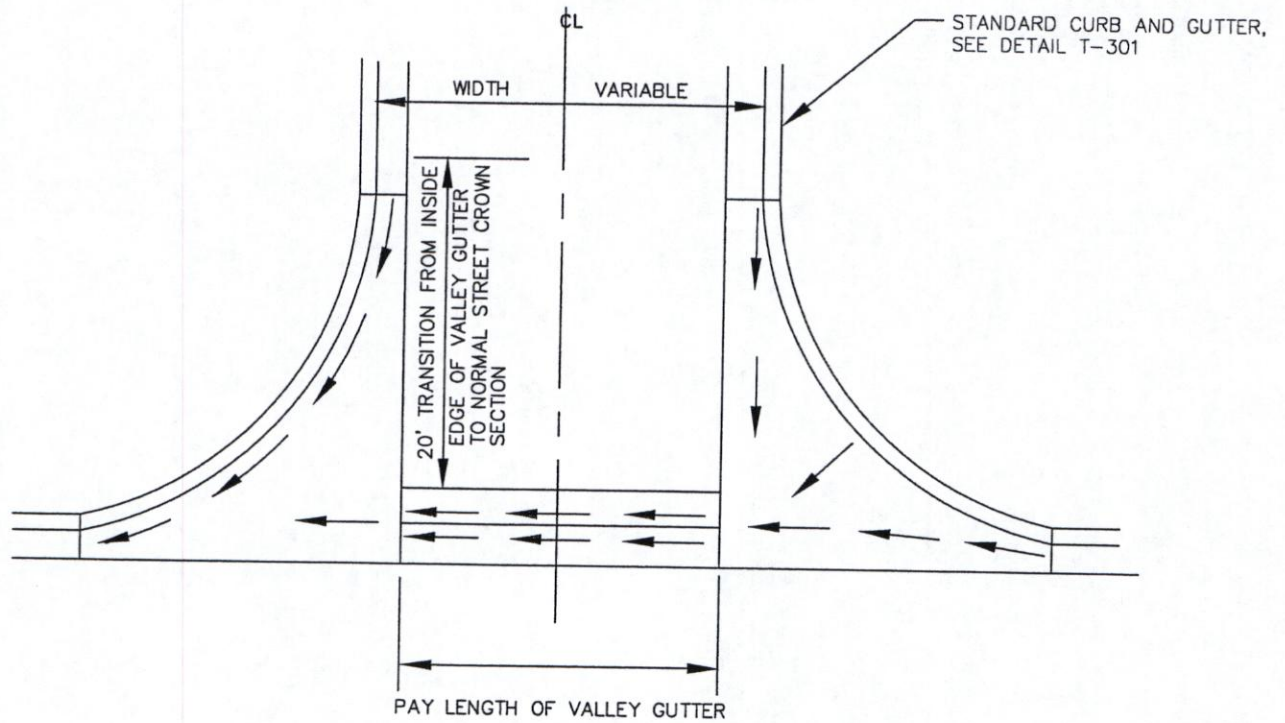
EXTRUDED BONDED CURB (CONC.)
NOT TO SCALE



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CURB AND GUTTER DETAILS

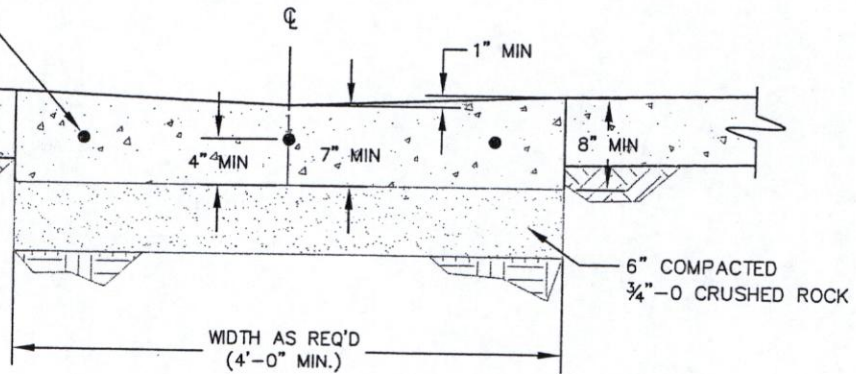
DETAIL NO.
T-301
04/29/2009



3 - #4 REBAR CONTINUOUS, REBAR SHOULD BE CENTERED IN VALLEY GUTTER

EXIST'G CONCRETE OR AC ROADWAY, TYP APPROXIMATE DEPTH = 6"

UNDISTURBED SOIL, TYP



NOTE:

- 1) VALLEY GUTTERS ARE NOT TO BE USED EXCEPT FOR IN ALLEYS OR OTHER SPECIAL CONDITIONS AS APPROVED BY CITY ENGINEER.
- 2) CONCRETE VALLEY GUTTER SHALL BE ODOT CLASS 3500 CONCRETE



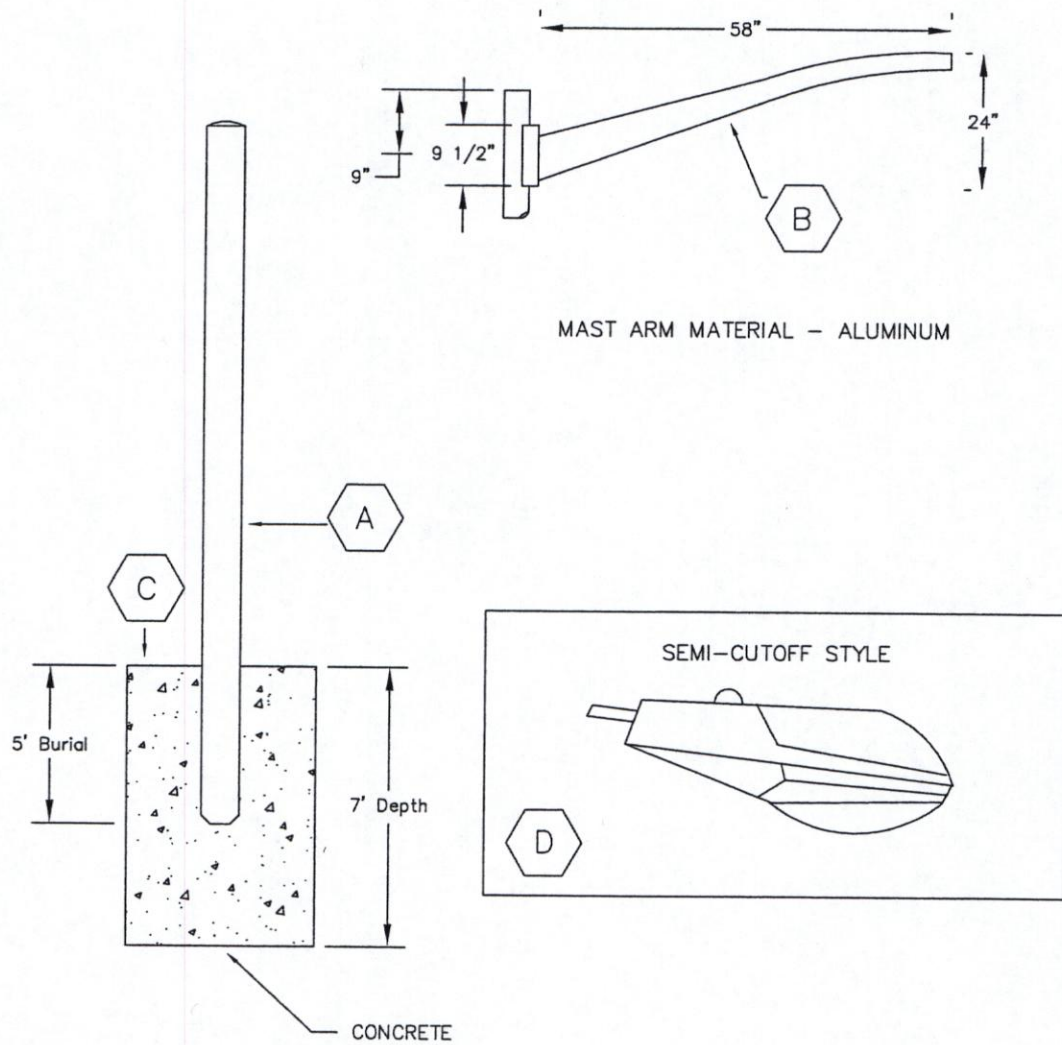
City of Adair Village
 6030 NE William R Carr St.
 Adair Village, Oregon 97330
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VALLEY GUTTER DETAIL

DETAIL NO.

T-302

04/29/2009



ITEM	DESCRIPTION
A	25' GRAY METAL POLE
B	5' ALUMINUM MAST ARM
C	CONCRETE
D	100 W HPS ROADWAY LAMP (WILL VARY DEPENDING ON LIGHTING REQUIREMENT)

NOTE:
MOUNTING OF POLE AND LIGHT TO COMPLY WITH LOCAL ELECTRICAL UTILITY REQUIREMENTS AND THE NEC.



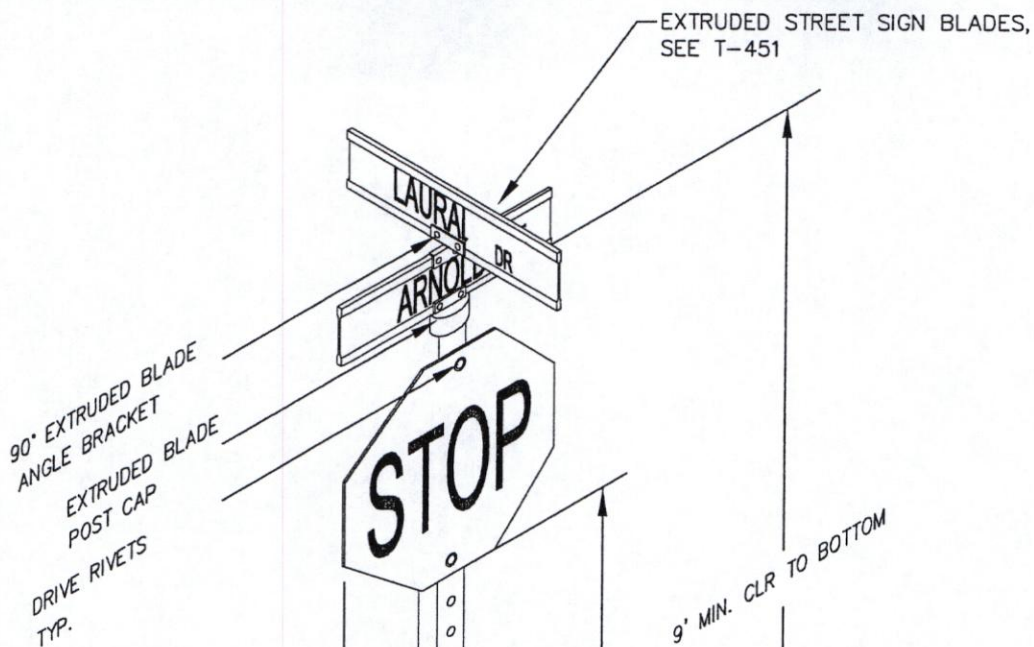
City of Adair Village
6030 NE William R Carr St.
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STANDARD STREET LIGHT DETAIL

DETAIL NO.

T-401

04/29/2009



12 GA. 2"x2" STEEL TUBING WITH 7/16" HOLES PUNCH AT 1" O.C. ON 4 SIDES ALLIED TUBE OF EQUAL. FLOW COAT - ZINC COATING

9' MIN. CLR TO BOTTOM

7' MIN.

GROUND LEVEL

12"

18"

12 GA. 2"x2" STEEL TUBING

2 HOLES TO BE EXPOSED ABOVE FINISHED GRADE

GROUND SURFACE

INSTALL ANCHOR AND STIFFENER SLEEVE FLUSH

2 1/2" x 2 1/2" x 18" STIFFENER SLEEVE (.105 WALL THICKNESS)

2 1/4" x 2 1/4" x 30" ANCHOR SLEEVE (.105 WALL THICKNESS)

WRAP IN FELT OF KRAFT PAPER FOR POST INSERTION DEPTH (6"-12")

YIELDING BREAKAWAY ANCHOR BASE ASSEMBLY



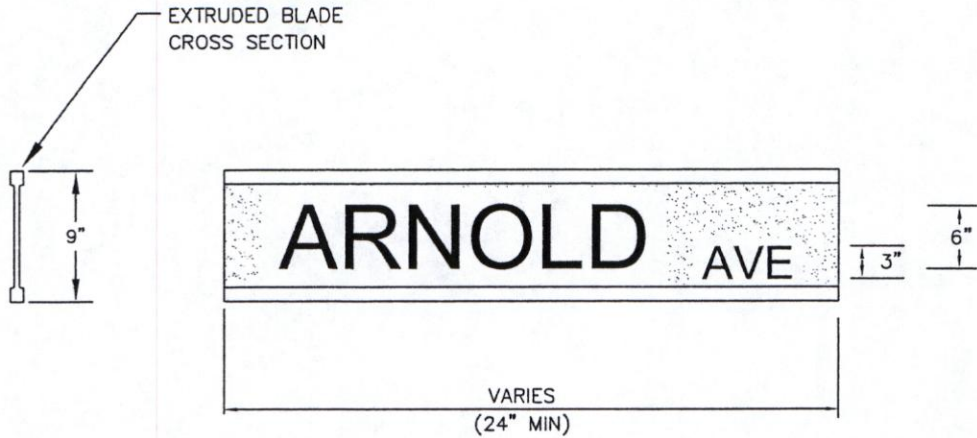
City of Adair Village
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(541) 745-5507 Fax: (541) 745-5530

STANDARD SIGN DETAIL

DETAIL NO.

T-450

04/29/2009



NOTES:

1. MATERIALS

STREET NAME SIGN SHALL BE 9" HEIGHT, EXTRUDED ALUMINUM. THE MINIMUM LENGTH SHALL BE 24" AND MAXIMUM LENGTH SHALL BE 36" BOTH SIDES OF STREET NAME SIGNS SHALL BE GREEN 3M SCOTCHLITE BRAND HIGH INTENSITY REFLECTIVE SHEETING WITH WHITE BORDER.

2. LETTERING

ALL LETTERS, NUMBERS, AND BORDERS USED TO FABRICATE A STREET NAME SIGN SHALL BE HIGH INTENSITY SILVER USING 3M SCOTCHLITE BRAND. THERE ARE TWO SIZES OF LETTERS THAT MAKE UP A STREET NAME SIGN. FOR PREFIXES, SUFFIXES, AND BLOCK NUMBERS. A 3" SERIES 'C' IS USED. THE ACTUAL NAME OF THE STREET IS A 6" SERIES 'B'. ALL STREET NAME SIGNS SHALL HAVE BLOCK NUMBERS, AS ASSIGNED BY THE CITY, WHEN INSTALLED BY CONTRACTOR.

3. MISCELLANEOUS

STREET NAMES SHALL BE APPROVED BY THE PUBLIC WORKS DIRECTOR PRIOR TO THE SIGNS BEING FABRICATED AND INSTALLED.



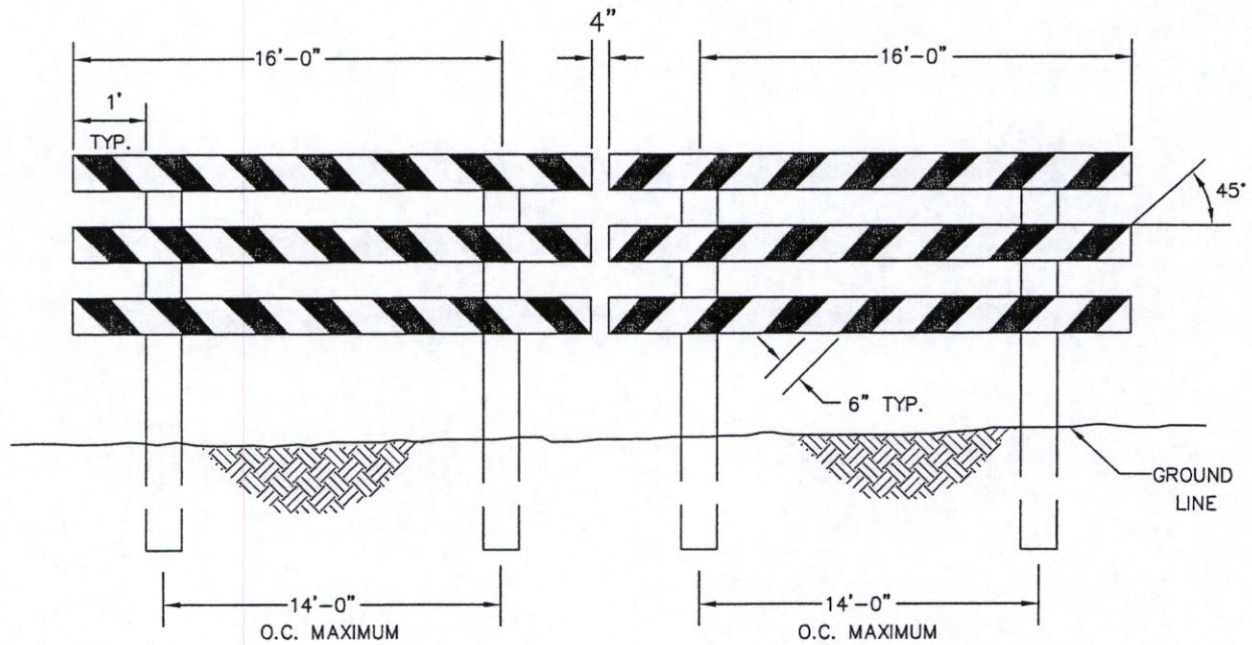
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**STREET SIGN AND LETTERING
 DETAILS**

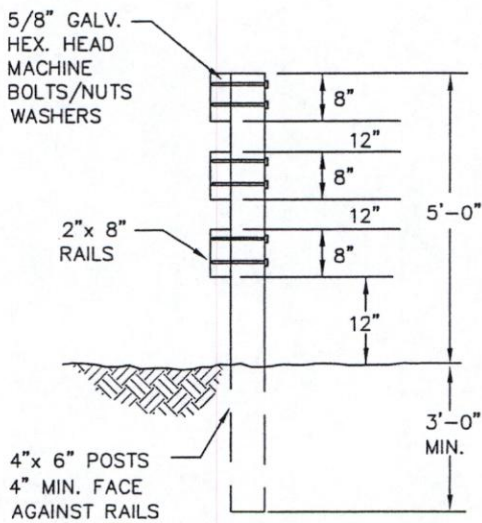
DETAIL NO.

T-451

04/29/2009



ELEVATION



END VIEW
N.T.S.

NOTES:

1. RAILS TO BE RETROREFLECTIVE WHITE AND ORANGE STRIPES. POSTS TO BE PRESSURE TREATED.
2. SEE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS AND THE OREGON SUPPLEMENT.
3F-1 BARRICADES
6C-8 BARRICADE DESIGN
6C-9 BARRICADE APPLICATION
3. ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT STATE OF OREGON STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION.
4. FOR WIDER APPLICATIONS, MULTIPLE SECTIONS AS SHOWN SHALL BE USED.



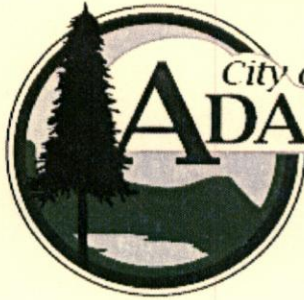
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STANDARD PERMANENT
BARRICADE DETAIL

DETAIL NO.

T-501

04/29/2009



City of
ADAIR VILLAGE

*Grounded in history,
growing for the future.*

BENTON COUNTY, OREGON

DIVISION 4:
DRAINAGE SYSTEM DESIGN STANDARDS
MANUAL
Guidelines for Development

Effective: July1, 2009

Section 1 – General Design Requirements

- 1.1 The purpose of this manual is to set standards for the design and construction of storm sewer and drainage system improvements to serve new and future development. This manual may be updated periodically and the design engineer shall ensure that they have the latest version.
- 1.2 Storm water, including street, roof, or footing drainage shall not discharge into the sanitary sewer system.

Section 2 – Design Plan Format

- 2.1 Engineering plans and specifications shall be prepared for all public works improvements. Plans shall be clear and legible and show all improvements in sufficient detail to allow for determination of compliance with City standards, and proper field construction. City Engineer or representative may require additional detail if deemed necessary.
- 2.2 Plan shall show the location, stationing, and size of all sewer mains and services including appurtenances such as manholes, clean-outs, tees, and wyes. Stationing shall be called out for specific items to be installed. Matchlines shall be used when continuing to other sheets.
- 2.3 Profile view with stationing and elevation shall be provided for sewer mains. Profile shall show existing ground, finish grade, invert and manhole rim elevations, backfill class materials, pipe size and slope, and all existing and proposed utilities crossing the profile. Profile shall be generated along the sewer pipe centerline. Vertical separation shall be shown for crossing utilities.
- 2.4 Detail drawings shall be provided for typical trench sections, manholes, clean-outs, sewer service laterals, and others as required.
- 2.5 Refer to the City's "Engineering Policy – Guidelines for Development" document for additional requirements and submittal procedures.

Section 3 – Storm Sewer and Drainage System Design Requirements

- 3.1 Storm sewers and related appurtenances shall be provided for new subdivisions, land partitions, and industrial and commercial developments as determined necessary by the City Engineer or representative.
- 3.2 The applicant shall provide stormwater and detention facilities for their development. This includes the stormwater mains, inlets, manholes, laterals for roof and foundation drains, detention systems (if required), control structures (if required), inflow and outflow devices (if required), and energy dissipaters (if required).
- 3.3 All storm sewer and drainage improvements will be designed in accordance with the City of Adair Village Design Standards Manual and current Storm Water Master Plan and shall meet all City standards.

- 3.4 The storm sewer and drainage improvements shall be designed to detain any increased runoff created through the development of the site, as well as convey any existing off-site surface water entering the site from other properties. Facilities shall be sized adequately to convey all necessary flows off site to an approved point of discharge.
- 3.5 The applicant shall submit hydrology/detention calculations to the City Engineer for review and approval. The applicant shall provide documentation to verify the accuracy of the hydrology and detention calculations.
- 3.6 The applicant shall show the 100-year overflow (storm) path and shall not design the flow to cross any developed properties.
- 3.7 Applicant shall account for all surface and stormwater drainage from the point of origin to the ultimate point of discharge to an appropriate receiving stream or storm drainage system. The impact to facilities downstream of the development must be identified to determine if improvements are required outside of the development. If required, applicant will increase the capacity of downstream facilities or, through detention and attenuation, hold drainage on site and release it in a controlled manner so as not to affect the capacity of the downstream facilities.
- 3.8 The applicant shall design and develop a system that provides for the future extension of the drainage facilities to the entire drainage basin.
- 3.9 The applicant's engineer shall perform studies and prepare designs based on an engineering analysis which takes into consideration water quality issues, runoff rates, pipe flow capacity, hydraulic grade line, soil characteristics, pipe strength, and potential construction problems.
- 3.10 Other agencies (i.e. DEQ, ODOT, Benton County) may require some form of drainage review and impose additional drainage requirements that are separate from and in addition to those of the City. The applicant shall coordinate with these other agencies and resolve any conflicts or concerns in drainage requirements and water quality requirements. The City must receive copies of approval letters, review letters, and other relevant documentation as required.
- 3.11 Drainage Study
- 3.11.1 All developments that will increase or modify impervious surface area shall, if further study is not required by the criteria outlined below, submit a drainage study and plan for the development site that provides for system capacity design for a 25 year storm event. The time of concentration for the study shall be determined by using a 10-minute start time and calculated travel times in gutters, pipes and swales for each drainage basin on the development area. The drainage design shall be checked for overflow impacts that may occur in the 25-year storm event and shall include contingency measures to protect both on-site buildings and abutting properties.
- 3.11.2 A complete drainage study, as outlined below, shall be submitted for all developments that generate public and/or private storm drainage from more than one acre of land or generate peak flows in excess of 0.5 cfs. Developments or redevelopments that create 5,000 square feet of new impervious surface or

modify an existing drainage system with capacity of 0.5 cfs or greater shall also submit a complete drainage study, as outlined below. All developments containing or adjacent to a floodplain, stream, wetland or natural resource area shall review and report their impact to those systems as part of the drainage study required for the development.

3.11.3 If required by the criteria stated above, a complete drainage study shall be provided for a development that is proposed within the City's planning jurisdiction. The study shall include the following:

A. A hydrological study map, which shall include, at a minimum, the following:

1. The entire drainage basin, well defined, and an appropriate amount of area beyond the drainage basin limits; 100-foot minimum distance.
2. Streets important to the Study and the development and street names.
3. Flow arrows in streets and ditches.
4. Contours or spot elevations for verification of direction of overland flow and pipe cover. Contour intervals shall be as follows:

<u>Slope (%)</u>	<u>Contour Interval (ft)</u>
0-10	2
11-25	5
>25	10

5. Drainage areas of all sub-basins (list acres).
 6. Collection points (nodes) at downstream limits of all sub-basins complete with node numbers.
 7. A profile of the storm drain system showing invert elevations, manhole top and bottom elevations, existing utilities, and existing and finished ground line elevations.
 8. Existing and proposed storm drain pipes and channels with sizes and or cross sections included.
 9. Future pipes in the system, complete with proposed sizes, slopes, pipe cover, flow line elevations at manholes, etc.
 10. City drainage master plan information (if available) such as node numbers, basin names (numbers), drainage boundaries, etc.
 11. North arrow, scale, design firm (engineer) name and logo, designer, date, etc.
 12. Environmentally sensitive areas (i.e. gullies, ravines, swales, wetlands, steep slopes, springs, creeks, etc.). For natural drainage features, show direction of flow.
 13. 100-year flood plain with flood elevations and 100-year flood way, as applicable.
- B. Hydrologic calculations to establish runoff volumes (see analysis method requirements and design event in following sections regarding drainage study types)
- C. Hydraulic calculations to establish runoff volumes.

- 3.11.4 Unless specifically required by the City for a particular development, development applications will not be required to provide engineering level details for on-site (out of the right-of-way) pipe profiles or other specific details of the “private” side drainage system. Only information on new components in the right-of-way and connections into existing components must be provided.
- 3.11.5 Drainage Study Types/Categories - The level of detail and scope of work required for a particular drainage study will be governed by the following criteria:
- A. Small Site Study – A small site study shall be required when all of the following criteria are met:
1. Study area less than 5 acres in size.
 2. Study area drains into an established public system with available capacity for the peak flow based on the storm event frequency required as described in the Hydraulic Calculations Section later in these Standards.
 3. The development proposed is a residential development.
 4. Study area does not contain and is not adjacent to a flood plain, stream, wetland or natural resource area.
- B. Mid-Level Development Study – A mid-level drainage study shall be required when the criteria for a Small Site Study cannot be met and when all of the following criteria are met:
1. Study area less than 25 acres in size.
 2. Study area drains to an established public system within the City Limits.
 3. Study area does not contain and is not adjacent to a floodplain, stream, wetland or natural resource area.
- C. Full Drainage Development Study – A full drainage study shall be required when the criteria for a Small Site Study and a Mid-Level Development Study cannot be met. Some examples of when a full study shall be required include, but are not limited to cases where any of the following conditions are met:
1. Study area greater than 25 acres in size.
 2. Developments which require creation of a new outfall and/or exceed existing system capacity.
 3. Study sites which contain or are adjacent to a floodplain, stream, wetland, natural resource area.
 4. Any development which does not qualify for a Small Site or Mid-Level Development Study and which either generates peak flow in excess of 0.5 cfs or greater, or is a redevelopment or development which creates 5,000 square feet or more of new impervious area.
- D. The City Engineer or representative will make the final determination on the level of study required for any specific development.

3.11.6 Hydrologic Calculations – Hydrologic calculations for the various types/categories of drainage studies shall conform to the following minimum guidelines:

A. Small Site

1. Rational peak flow method. When the 'C' factor is 0.5 or greater, the time of concentration and the peak flow from the impervious areas shall be computed separately and compared to the combined area. The higher of the two peak flow rates shall then be used to size the conveyance.
2. Two-year storm event frequency for volumes up to 5 cfs.
3. Five-year storm event frequency for volumes from 5 cfs to 20 cfs.

B. Mid-Level Development

1. Unit Hydrograph Method
2. Storm event as Small Site and using the ten-year event for volumes of 20 cfs to 40 cfs.
3. 25-year storm event for detention facilities where necessary to meet downstream capacity issues.
4. 50-year storm event for volumes above 40 cfs.

D. Full Drainage Development

1. Unit Hydrograph Method.
2. Floodplain analysis if development impacts a floodplain.
3. Storm event as volumes outlined in Small and Mid-Level above and 100-year flood for areas in floodplain.

3.11.7 Hydraulic Calculations

A. In each instance, the method of hydraulic calculations shall be subject to City approval.

B. Site development improvement projects shall address on-site and off-site drainage concerns, both upstream and downstream of a project, including but not limited to:

1. Modifications to the existing on-site storm drainage facilities shall not restrict flows creating backwater onto off-site property to levels greater than the existing situation unless approved by the affected off-site property owners and the City. The affected property owner(s) shall agree to and sign an easement identifying the location of the backwater storage.
2. Storm drainage facilities shall be designed and constructed to accommodate all flows generated from upstream property and the most recent approved land use plan at full development.
3. The design of storm drainage facilities shall analyze the impact of restrictions downstream of the project site. Downstream restrictions that create on-site backwater shall be removed by the developer or the on-site backwater shall be addressed in the design of the development's storm system. The removal of downstream obstructions (i.e. control structures, undersized piping, etc) shall not be allowed if this removal creates downstream capacity problems.

D. Review of Downstream System

1. The design engineer for each development constructing new impervious surface of more than 5,000 square feet shall submit documentation, for review by the City, of the downstream capacity of any existing storm facilities impacted by the proposed development. The design engineer must perform an analysis of the drainage system downstream of the development to a point in the drainage system where the proposed development site constitutes ten percent or less of the total tributary drainage volume, but in no event less than $\frac{1}{4}$ mile.
2. If the capacity of any downstream public storm conveyance system or culvert is surpassed during the Event/CFS (Critical Flow Simulation) level requirements, due directly to the development, the developer shall correct (mitigate) the capacity problem or construct an on-site detention facility unless otherwise approved by the City.
3. If the projected increase in surface water runoff which will leave a proposed development will cause or contribute to damage from flooding to existing buildings or dwellings, the downstream stormwater system shall be enlarged to relieve the identified flooding condition prior to development, or the developer must construct an on-site detention facility.
4. Any increase in downstream flow shall be reviewed for erosion potential, defined as downstream channels, ravines, or slopes with evidence of erosion/incision sufficient to pose a sedimentation hazard to downstream conveyance systems or pose a landslide hazard by undercutting adjacent steep slopes.

3.12 Design of Stormwater Facilities

3.12.1 General

- A. The conveyance system shall be designed to convey and contain at least peak runoff for the Event/CFS design requirements. Structures for proposed pipe systems shall provide a minimum of one foot of freeboard between the hydraulic grade line and the top of the structure or finish grade above pipe for a 25-year peak rate of runoff. Surcharge in pipe systems shall not be allowed if it will cause flooding in portions of a habitable structure, including below-floor crawl spaces.
- B. The design shall be supplemented with an overland conveyance component demonstrating how a 100-year event will be accommodated. This overland component shall not be allowed to flow through or inundate an existing building or dwelling.

3.12.2 Manhole Design

- A. Manholes shall be provided at least every 500 feet, at every grade change, and at every change in alignment and junction of two or more lines. Manhole lids shall have a minimum of six inches clearance from the edge of a curb or gutter and shall not be in a wheel path of the traveled way. Final top

elevation of manhole shall be set flush or not greater than ½" above the finish grade of surrounding area.

- B. All manholes shall be a minimum of 48 inches in diameter.
- C. Pipe crowns of branch or trunk lines entering and exiting junctions shall be at the same elevation. If a lateral is placed so its flow is directed against the main flow through the manhole or catch basin, the lateral invert shall be raised to match the crown of the mainline pipe.
- D. Inside drop and water quality manholes shall be at least 60 inches in diameter with 42 inches of clear space.
- E. All manholes shall have a minimum 12-inch ledge on one side of the channel in the base at an elevation of 0.8 of pipe height, except for water quality manholes.
- F. Details shall be submitted with the plans where pipes into or out of a manhole are larger than 24 inches or where more than four mainline connections are made.
- G. Connections to an existing manhole, elevation of the existing ledge, and elevations of existing inlets and outlets shall be submitted with the plans.
- H. Connections are allowed directly into a manhole providing that they are properly channelized. No more than three side laterals shall be connected to a manhole unless otherwise approved by the City. There shall be a minimum of eight inches separating connections as measured from the outside diameter of the pipe.
- I. A manhole may have a free inside drop of up to two feet. Drops over 24 inches must incorporate an appropriate drop assembly as shown in the included standard detail drawings.
- J. Line manholes may be 'T' top design for pipe diameters 42 inches and larger where no side line connections are present or planned.

3.12.3 Water Quality Components

- A. Water quality structures shall be an approved, manufactured unit. All capacity, efficiency, and operation and maintenance data shall be submitted at the time of plan review.
- B. Each water quality component shall be designed for the runoff from the upstream watershed at build-out, based on the applicable comprehensive land use plan. No flow shall be introduced into the manhole in addition to the design amount.
- C. Water quality manholes shall be a minimum of 60 inches in diameter. Other sized structures may be required depending on the type and extent of treatment desired.

- D. Water quality manholes shall not be used in a submerged or surcharged system. The manufacturer's required head losses shall be accommodated for in the system design.
- E. Water quality components will only be required if determined necessary by the City Engineer or representative or as required by another agency (ODOT, DEQ, etc.)
- F. Water quality components shall be required at last fixture before discharging into stream, lakes or tidal waters.

3.12.4 Piping and Conduit Design

- A. Branch piping in the drainage system shall not be smaller than 10-inches in diameter.
- B. Mainline piping shall be a minimum of 12-inches diameter.
- C. Service laterals for single-family residences (catch basins, etc) shall be a minimum of 6-inches in diameter. All other laterals or branches shall be a minimum of 10-inches diameter. Exception can be made for roof drains which may be 3 or 4 inches in diameter. Drainage sleeves through curbs shall not exceed 3 inches in diameter.
- D. All pipes shall be designed to achieve a minimum velocity of three feet per second (fps) at 0.5 part full based on the following table of 'n' values.

Table 3.12.4A
Manning's 'n' Values for Pipes

Material Type	Uniform Flow (Preliminary Design)	Backwater Flow (Capacity Verification)
Concrete pipe and Lined Corrugated PE pipe	.014	.012
Annular Corrugated Metal pipe:		-
2-2/3" x 1/2" plain or fully coated	.028	.024
Paved invert	.021	.018
3" x 1" corrugation	.031	.027
6" x 2" corrugation (field bolted)	.035	.030
Helical 2-2/3" x 1/2" corrugation & corrugated PE pipe	.013	.011
Spiral rib metal pipe and PVC pipe	.013	.011
Ductile Iron pipe (cement lined)	.014	.012
Solid Wall PE pipe (butt fused only)	.009	.009
HDPE Smooth Walled Interior	.012	.010

#Note: Corrugated metal pipe must be pre-approved by City.

- G. All pipes exceeding critical flow velocities shall have analysis data submitted showing the effects of hydraulic jump at manholes and downstream water levels for peak flow situations.

H. Pipe Location

1. All storm drain piping shall be located within the public right of way. Exceptions for systems with physical constraints precluding location within the public right-of-way may be granted at the discretion of the City Engineer or representative.
 - a. Storm pipe located not in a public right-of-way must have a maintained access road acceptance by the City.
2. Storm pipes shall not be located closer than ten feet from the edge of a public street right-of-way, unless otherwise approved by the City Engineer or representative.
3. Easements for storm drainage pipes shall be a minimum of 15 feet in width with wider easements as required for pipes placed at depths greater than 8 feet in depth such that a 1:1 theoretical slope from the pipe centerline would daylight within easement. All storm drainage pipes shall be located at the centerline of easements unless otherwise approved by the City Engineer or representative.
4. Storm pipes shall be located so that manholes are not in the wheel path unless otherwise approved by the City Engineer or representative.
5. Drainage laterals shall be provided on the down slope side of all lots in developments where drainage to the street cannot be provided.

I. Distance between drainage structures

1. The maximum length of pipe between manholes, catch basins, or other drainage structures shall not exceed 500 feet for piping systems utilizing 24-inch diameter pipe and smaller.
2. Large diameter trunk systems shall not exceed 600 feet between structures.

J. Pipe shall be laid on a straight alignment at a uniform grade rate from structure to structure.

K. Pipe Cover

1. Pipe cover shall be measured from the finished ground elevation to the top of the outside surface of the pipe in areas located outside paved areas.
2. In paved areas, the pipe cover shall be measured from the lowest point of the gutter section to the top outside surface of the pipe.
3. Minimum pipe cover shall be 18-inches for reinforced pipe and 36-inches for plain concrete and plastic pipe materials.
4. Engineered solutions and manufacturer supported submittals may be accepted for pipe or specific installations not able to meet these conditions.

L. Perforated or "French drain" systems shall be engineered and submitted to the City Engineer or representative for approval.

3.12.5 Catch Basin/Inlet Design

- A. Trash racks, debris barriers, and/or removable oil and grease traps and 18-inch sumps shall be installed on all inlets to the public storm system.

- B. All inlet and catch basin openings shall be designed to accept flow from a ten-year storm event. Grates shall, as far as practical, be designed to avoid failure due to accumulation of debris.
- C. All catch basins and area drains shall be designed with an 18-inch deep sump as specified by the Uniform Plumbing Code.
- D. A mainline storm pipe shall not pass through a sumped catch basin, unless approved as a manhole /inlet combination.
- E. Flows in streets during the two-year event shall not run deeper than four inches against a curb or extend more than two feet into the travel lane. Streets classed as collector and above and streets in commercial areas shall meet the above requirements for the ten-year event. Inlets in sag location shall be designed with no more than one-foot of depth during the 25-year event.
- F. A catch basin shall be provided just prior to curb returns on streets with a centerline gradient of three percent or more and a street gutter drainage run of 100 feet or more.
- G. Catch basins may connect to main storm lines with a tee connection when the main storm line is at least one size larger than the catch basin line. When the catch basin line is the same size as the main storm line, the connections shall be made at a manhole or other approved structure. The maximum length of pipeline between the catch basin and the mainline shall be 60-feet for 12-inch pipe. Oversize basins (one 30-inch inside dimension) shall be installed when a tee connection is used.
- H. A main storm line shall not pass through a field inlet or ditch inlet.
- I. Ditch inlets shall be located at the upper terminus of a main storm line or shall connect to a main storm line only at a manhole.

3.12.6 Channels and Ditches

- A. Vegetation lined channels are to be used whenever possible.
- B. Rock-lined channels shall be used where a vegetative lining cannot provide adequate protection from erosive velocities.
- C. Constructed open channels shall be sized to pass the required flows and have side slopes no steeper than 3:1. Any proposed constructed channel improvement that does not meet these requirements may be required to be piped, as determined by the City Engineer or representative.
- D. Channels designed to handle the runoff from a development shall be constructed from the development to an existing public drainage conveyance system with an established outfall to a receiving water body.

- E. Channels shall not contain protruding pipes, culverts, or other structures that reduce or hinder the flow characteristics of the channel, except for structures which are required and designed to dissipate velocities. Channels shall be designed to prevent scouring and erosion.
- F. Channel protection shall be as in the following table:

Table 3.12.6A
Channel Protection for Channel Construction

Velocity Greater than (FPS)	Velocity Less than or equal to (FPS)	Required Protection	Thickness (ft)	Min. Height Above Design Water Surface (ft)
0	5	Vegetative Lining	N/A	0.5
5	8	Rip Rap Class 50	1	1
8	12	Rip Rap Class 100	2	2
12	20	Gabion or Velocity Dissipaters	Varies	2

- G. Access roads or other suitable access ways for maintenance purposes shall be provided when channels do not abut public right-of-way. Access shall be provided along one side of channel, as necessary for vehicular maintenance access.
- H. Access roads shall have a maximum grade of 15 percent and a maximum cross slope of 3 percent.
- I. A 40-foot minimum outside turning radius shall be provided on the access road.
- L. Access roads shall be a minimum of 15 feet wide on curved sections and 12 feet wide on straight sections.
- M. Access roads less than 400 feet in length shall have a turn-around unless approved by the City Engineer or representative.
- N. Access roads shall be designed and constructed to support a 20-ton vehicle under all weather conditions.
- O. The roads shall be constructed of gravel, crushed rock, or asphalt.
- P. Roadside ditches shall be constructed with a maximum depth of two feet as measured from the shoulder of the road.
- Q. Side slopes shall be 3:1 or less.
- R. Ditch velocities, when flowing full, shall not exceed the erosive velocity limits of the soil or the lining in the ditch.

3.12.7 Storm Drain Outfalls

- A. All outfalls shall conform to the requirements of all federal, state, and local regulations.
- B. Outfalls shall be above the mean low water level except as approved by the City Engineer. Installation of tide gates may be required when the outfall is in a tailwater condition.
- C. Erosion must be prevented at the outfall. All outfalls shall be provided with a rock splash or other approved erosion control protection measure. Mechanisms which reduce velocity prior to discharge from an outfall are encouraged and may be required. Examples are drop manholes, energy dissipaters, and rapid expansion into pipes of much larger size.
- D. Other forms of energy dissipation may include stilling basins, drop pools, hydraulic jump basins, baffled aprons, or bucket aprons, shall be provided for outfalls with velocities at design flow greater than 10 FPS.
- E. If required, tidegates, flapgates, or other outlet gates will be installed on specified outfalls. Gates will meet the requirements of the Oregon Department of Fish and Wildlife (ODFW), National Oceanic and Atmospheric Administration (NOAA), and other agencies as applicable.

3.12.8 On-site Detention Design - General

- A. Mitigation of the impacts of new development on the downstream drainage system can be accomplished through on-site detention systems or by improving the capacity of the downstream conveyance system.
- B. On-site detention facilities shall be constructed when any of the following conditions exist:
 - 1. An identified downstream deficiency along with upstream detention, rather than downstream conveyance system enlargement, is determined to be the more effective solution.
 - 2. There is an identified regional detention site within the boundary of the development.
 - 3. The need for pre-treatment of stormwater discharge dictates that flows be detained for water quality processes.
 - 4. There is a need to mitigate flow impacts on receiving streams.
 - 5. There is a need for additional detention due to an increase in impermeable surface area.
- C. When required, on-site stormwater detention facilities shall be designed to capture run-off so the run-off rates from the site after development do not exceed the predevelopment conditions, based upon a 25-year, 24-hour return storm. Volume and duration of predevelopment conditions will be considered.
- D. When required, due to an identified downstream deficiency, on-site stormwater detention facilities shall be designed so that peak run-off rates

will not exceed predevelopment rates for the specific range of storms that cause the downstream deficiency.

- E. Construction of on-site detention shall not be allowed as an option if such a detention facility would have an adverse effect upon receiving waters in the basin or sub-basin in the event of flooding, or would increase the likelihood or severity of flooding problems downstream of the site.
- F. Impervious Area Calculations
 - 1. For single family and duplex residential subdivisions, stormwater quantity detention facilities shall be used for all impervious areas created by the subdivisions, including all streets, residences on individual lots at a rate of 2,640 square feet of impervious surface area per dwelling unit, and other impervious areas. Such facilities shall be constructed with the subdivisions public improvements.
 - 2. For all development other than single family and duplex, the sizing of stormwater detention facilities shall be based on the impervious area to be created by the development, including structures and all streets and impervious areas. Impervious surfaces shall be determined based upon building permits, construction plans, aerial mapping, or other appropriate methods as deemed reliable by the City Engineer or representative.

3.12.9 Detention Pond Design

- A. Detention ponds and other open impoundment facilities such as landscape areas, open playing fields, and parklands, shall comply with the requirements of ORS 537, in general, and more specifically, ORS 537.4.
- B. Facility Geometrics
 - 1. Interior side slopes up to the maximum water surface shall be no steeper than 3H:1V. If interior slopes need to be mowed, the slope shall be 4H:1V
 - 2. Exterior side slopes shall not be steeper than 2H:1V unless analyzed for stability by a geotechnical engineer.
 - 3. Ponds walls and/or dikes may be retaining walls, provided that the design is prepared and stamped by a registered professional engineer and that a fence is provided along the top of the wall and that at least 25 percent of the pond perimeter will be a vegetated soil slope of not greater than 3H:1V.
 - 4. Pond bottoms shall be level, and shall be located a minimum of 0.5 feet below the inlet and outlet to provide sediment storage.
 - 5. Outlet control systems shall utilize gates, valves, weirs, or other control structures and systems to control the outflow from the pond so that the downstream systems are not overwhelmed. If desired, water must be capable of being held in the pond indefinitely.
- C. Overflow/Emergency Spillway
 - 1. A pond overflow system shall provide controlled discharge of the design storm event for developed contributing area without

- overtopping any part of the pond embankment for exceeding the capacity of the emergency spillway.
2. The design shall provide controlled discharge directly into the downstream conveyance system.
 3. An emergency overflow spillway (secondary overflow) shall be provided to safely pass the 100-year, 24-hour design storm event over the pond embankment in the event of control structure failure and for storm/runoff events exceeding design.
 4. The spillway shall be located to direct overflows safely towards the downstream conveyance system.
 5. The emergency overflow shall be stabilized with riprap or other approved means and shall extend to the toe of each face of the berm embankment.

D. Access/Maintenance

1. Pond access easements and roads shall be provided when the ponds do not abut public right-of-way. Access roads shall provide access to the control structure and along one or both sides of pond as necessary for vehicular maintenance and as determined by the City Engineer or representative.
2. Access roads shall have a maximum grade of 15 percent and a maximum cross slope of 3 percent.
3. 40 foot minimum outside turning radius shall be provided on the access road.
4. Access roads shall be a minimum of 15 feet wide on curved sections and 12 feet wide on straight sections.
5. Access roads less than 400 feet in length shall have a turn around unless approved by the City Engineer or representative.
6. Access roads shall be designed and constructed to support a 20-ton vehicle under all weather conditions.
7. The roads shall be constructed of gravel, crushed rock, or asphalt.

E. Slope Stabilization (Detention ponds)

1. Pond berm embankment higher than six-feet shall be designed by a geotechnical engineer.
2. The berm embankment shall have a minimum 15-foot top width, where necessary, for maintenance access; otherwise, top width may vary as recommended by the design engineer, but in no case shall top width be less than four feet.
3. The toe of the exterior slope of the pond berm shall be no closer than five feet from the tract or easement property line.
4. The pond berm embankment shall be constructed on native consolidated (or adequately compacted and stable fill soils analyzed by a geotechnical engineer) free of loose surface soil materials, roots and other organic debris.
5. The pond berm embankments shall be constructed by excavating a 'key' equal to 50 percent of the berm embankment cross-sectional height and width or as designed by a geotechnical engineer.
6. The berm embankment shall be constructed on compacted soil (95 percent minimum dry density per AASHTO T99, placed in 6-inch lifts, with the following characteristics:

- a. A minimum of 30% clay
 - b. A maximum of 60% sand
 - c. A maximum of 60% silt
 - d. With nominal gravel content
 - e. Or as designed by a geotechnical engineer.
7. Anti-seepage collars shall be placed on pipes in berm embankments that impound water greater than four feet in depth at the design water surface.
 8. Exposed earth on the pond bottom and side slopes shall be seeded with seed mixture approved by the City Engineer.

3.12.10 Miscellaneous

- A. Other facilities may be utilized for emergency or alternative detention structures when approved by the City Engineer. Examples include:
 1. Parking lots
 2. Roof structures
 3. Underground piping, vaults, or tanks
 4. Infiltration facilities
 5. Injection wells
 6. Parks, fields, or other recreational areas
 7. etc.
- B. Storm water pump stations shall only be provided when gravity service cannot be practically provided. Prior approval from the City is required.
- C. Any alternative detention facility must meet all the local, state, and federal design requirements and be approved by the City Engineer.

Section 4 – Construction Provisions

- 4.1 All work within the public right-of-way shall be conducted by a licensed and bonded contractor. This requirement shall be stated on the construction drawings.
- 4.2 City shall be notified at least 3 working days in advance prior to commencing construction work.
- 4.3 Traffic control shall be signed, flagged and conducted in a manner conforming to ODOT standards (Manual of Uniform Traffic Control Devices, MUTCD) and approved by the City, where appropriate. If road closures or detours are anticipated, prior approval from the City and ODOT officials must be obtained, as appropriate.
- 4.4 Safety Requirements. The contractor is responsible for observing the safety of the work and all persons and property coming into contact with the work. The contractor shall conduct his work in a manner complying with the requirements prescribed by Occupational Safety and Health Administration (OSHA).
- 4.5 Progress. Construction shall proceed in a systematic manner to minimize public inconvenience and disruption of services. All excavations, embankments, stockpiles, waste areas, etc. shall be kept protected. All roads, ditches, etc. shall be kept free from

debris and shall be continually cleaned during the work. Dust control measures shall be employed as required and directed by the City.

- 4.6 Protection of Existing Improvements. Contractor shall contact the Utility Notification Center (811) at least 48 hours in advance of digging operations to get approximate locations for buried utilities. Exact locations of buried facilities may not be known or shown and contractor is responsible to pot-hole carefully in advance of the work to avoid such facilities. Contractor shall coordinate with all utilities and notify them immediately in the event of any damage. Contractor shall protect, repair, and replace any damaged utilities as directed by the persons responsible for such utility. All landscape, grass, shrubs, signs, pavements, mail boxes, driveways, culverts, gravel surfacing, fencing, etc. shall be protected from damage and returned to conditions as good, or better than existed prior to construction. All costs for protection, repair, and replacement of all existing items shall be borne entirely by the contractor. Contractor shall obtain a release from any property owners for any claims of injury or property damage prior to final acceptance of the work by the City.
- 4.7 All existing survey monuments and control shall be protected, including individual property corner monuments. Any such monuments destroyed or altered during construction shall be restored by the contractor or developer in accordance with Oregon Revised Statutes as applicable.
- 4.8 Any temporary disruption to water or sewer service must be coordinated with, and approved by the City and kept to the minimum length of time necessary. City shall be notified at least 2 working days in advance of when an approved shut-down is desired. Contractor shall not operate any valves or hydrants without the City's approval.
- 4.9 Trench foundation grades shall be constructed to within 0.1 feet of the grade shown in the plans. Surface tolerances shall be within 0.02 feet of plan elevation at any one point.
- 4.10 For pipelines, vertical deviation from true grade shall not exceed 0.02 feet (0.24 inch). Horizontal tolerance for deviation from line shall be 0.03125 feet (3/8 inch). Depressions or bellies which create the potential for solids deposition are not allowed.
- 4.11 Compaction testing equipment (nuclear gauge) shall be furnished and operated by the contractor or an independent testing firm shall be retained by the contractor or developer to perform compaction testing. Testing shall conform to the ODOT Manual of Field Testing Procedures (MFTP). Compaction testing shall be conducted in the presence of the City's inspector, representative or developers engineer. Sufficient tests will be taken to ensure that the materials and compaction efforts being used are adequate to obtain the required density. Several tests shall be taken on each lift placed during the first day of backfill operations. Additional tests will be taken periodically during the work. At minimum, 2 compaction tests shall be taken for each trenchline (manhole to manhole). Alternate materials or methods will be required if adequate compaction is not being obtained. In no case shall pipe laying continue if inadequate compaction results until a resolution is provided.
- 4.12 Construction staking will be provided by the Developer's Engineer for establishing the location of the system. Offset stakes shall be placed at no more than 100 foot intervals along the mainline and at each manhole. Each lateral location shall be staked.

- 4.13 Open trench length at any time shall not exceed 100 feet unless otherwise approved. Related resurfacing shall be completed within 800 feet of the open trench limit.

Section 5 – Storm Sewer and Drainage System Materials

- 5.1 All materials shall be newly manufactured. No rebuilt, reconditioned or used material will be allowed.
- 5.2 Oregon Standard Specifications (OSS) – Means the 2002 Oregon Standard Specifications for Construction produced by ODOT and APWA, including latest revisions.
- 5.3 Concrete shall conform to OSS Section 00440, Commercial Grade Concrete. Compressive field strength shall not be less than 3,000 psi at 28 days. Maximum aggregate size shall be 1½-inches. Slump shall be between 2 and 4 inches.
- 5.4 Non-Shrink Grout. Grout shall be Sika 212, Euco N-S, Five Star, or approved equal nonmetallic cementitious commercial grout exhibiting zero shrinkage per ASTM C827. Grout shall not be amended with cement or sand and shall not be reconditioned with water after initial mixing. Nonshrink grout shall be placed and packed only with the use of an approved commercial bonding agent. Unused grout shall be discarded after 20 minutes.
- 5.5 Manholes
- 5.5.1 Manholes shall conform to ASTM C478-03 with yard permeability tests passing ASTM C497-03 prior to delivery. Manhole steps shall be plastic with ½” grade 60 steel reinforcing bar encapsulated with injection molded copolymer polypropylene with serrated surfaces. Preformed gaskets shall be Ram-Nek, Kent-Seal No. 2, or approved equal.
- 5.5.2 Manhole Frames and Covers. Casting shall be tough, close-grained gray iron, smooth and clean, free from blisters, blowholes and all defects and conforming to ASTM A48, Class 30. All bearing surfaces shall be planed, ground or machined to ensure flat, true surfaces. Watertight frames and covers shall be installed at all locations subject to flooding or ponding. Tamperproof frames and covers required in off-street areas and easements. Cap screws for bolt-down covers shall be stainless steel with 60,000 psi minimum tensile strength conforming to ASTM A453.
- 5.6 Trench Backfill Materials
- 5.6.1 Foundation Stabilization: 3”-0 to 6”-0 aggregate base rock meeting OSS Sections 00641 and 02630. Required when native trench foundation material contains groundwater, or is unsuitable to provide a firm foundation in the opinion of the City Engineer or representative.
- 5.6.2 Pipe Bedding and Zone: ¾”-0 dense-graded aggregate, uniformly graded from coarse to fine and meeting OSS Section 02630.10. Clean sand may be substituted for pipe zone.

- 5.6.3 Class A Backfill: Native or common excavated material, free from organic or other deleterious material, free from rock larger than 3-inches, and which meets the characteristics required for the specific surface loading or other criteria of the backfill zone in the opinion of the City Engineer or representative. If stockpiled material becomes saturated or unsuitable, Class B, C or D Backfill shall be substituted.
- 5.6.4 Class B Backfill: $\frac{3}{4}$ "-0 dense graded aggregate, uniformly graded from coarse to fine and meeting OSS Section 02630.10.
- 5.6.5 Class C Backfill: Clean sand with no particles larger than $\frac{1}{4}$ -inch.
- 5.6.6 Class D Backfill: Pit run or bar run material, well graded from coarse to fine, with maximum aggregate size of 3 inches.
- 5.6.7 Class E Backfill (CLSM): Controlled Low-Strength Material (cement slurry) conforming to OSS Section 00442.
- 5.6.8 Compaction: Material (except Class E Backfill) shall be compacted in multiple lifts (6-inch maximum lift) to obtain 95% of the maximum dry density as determined by AASHTO T-99.
- 5.6.9 All Backfill within public right-of-ways or within 5 feet of a traveled surface shall be Class B Backfill, except where Class E Backfill is required under pavements as required by the City or State.
- 5.7 Storm Drain Pipe Materials – Design engineer to determine the most appropriate material for the project. Approval of the City Engineer or representative is required for pipe material choices.
- 5.7.1 PVC gravity pipe, 4- through 15-inch nominal diameter shall be rubber gasketed, SDR35 minimum, conforming to all requirements of ASTM D3034 in accordance with ASTM D1784. Pipe shall integral wall-thickened bells with bonded-in elastomeric gaskets meeting ASTM F477.
- 5.7.2 PVC gravity pipe, 18- through 27-inch nominal diameter shall be rubber gasketed, SDR35 minimum, conforming to all requirements of ASTM F679 in accordance with ASTM D1784. Pipe shall integral wall-thickened bells with bonded-in elastomeric gaskets meeting ASTM F477.
- 5.7.3 HDPE gravity pipe shall meet the requirements of AASHTO M-294. Pipe end connections shall be water-tight with rubber or neoprene bell and spigot ends. HDPE shall be corrugated outer walls with smooth and flat inner walls.
- 5.7.4 Aluminum CMP culverts shall be aluminum spiral ribbed, with 2-2/3" x $\frac{1}{2}$ " corrugations and conforming to AASHTO M-196. Gauge of pipe shall be per manufacturer recommendations and approved by City Engineer.
- 5.7.5 Reinforced Concrete Pipe shall conform to ASTM C-76 Class IV. Joints shall be bell and spigot with rubber gaskets.

5.8 Fittings

- 5.8.1 PVC fittings for gravity pipe shall be rubber gasketed sewer fittings meeting ASTM D3034, SDR 35, ASTM F477, and ASTM D3212.
- 5.8.2 Other fittings shall include tees, bends, and plugs and shall be of the same material as the mainline pipe.
- 5.8.3 Manhole Connections
 - 5.8.3.1 Connections to precast manhole sections shall be accurately core-drilled and shall utilize a properly sized flexible rubber boot providing a watertight seal. Adapter shall be factory tested for watertightness up to 10.8 psi. Kor-N-Seal as manufactured by NPC, Inc. or approved equal.
 - 5.8.3.2 Connections to cast-in-place concrete shall be made with a rubber water-stop grout ring. Ring shall clamp to pipe with stainless steel clamp and have water-stop ribs. Water-stop Grouting Ring by Press-Seal Gasket Corp., or approved equal.
- 5.8.4 Connections for aluminum CMP piping shall be made with 12-inch wide dimple bands of the same material and gauge as the run of pipe. Use minimum of 20' long CMP sections, except for end run.

5.9 Catch Basins

- 5.9.1 Precast basins and inlets shall be of Portland cement concrete conforming to AASHTO M199M/M (ASTM C478).
- 5.9.2 Cast-in-place concrete basins and inlets will be allowed. CIP basins will meet the requirements of commercial grade concrete as specified in Section 00440 of the 2002 Oregon Standard Specifications including latest versions of. CIP units shall be equivalent or superior to the specified precast units.
- 5.9.3 Frames, grates, and covers shall meet the requirements of AASHTO M227, Class 65. Casting shall be tough, close-grained gray iron, smooth and clean, free from blisters, blowholes and all defects. All bearing surfaces shall be planed, ground or machined to ensure flat, true surfaces.

Section 6 – Storm Sewer and Drainage System Installation (Workmanship)

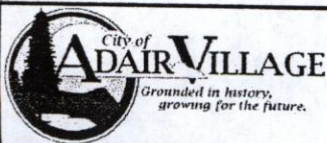
- 6.1 Prepare trench in accordance with the standard detail in a safe manner. Place and compact foundation stabilization materials as required. Notify City to allow for inspection of the trench bottom.
- 6.2 Place and compact pipe bedding material before placing pipe in the trench. Dig depression for pipe bells to provide uniform bearing along the entire pipe length. Thoroughly compact bedding material to prevent future bellies.

-
- 6.3 Prior to lowering pipe into the trench, the Engineer or City representative will check for damage to the pipe. The Contractor shall repair or replace, as directed, all damaged or flawed pipe prior to installation.
 - 6.4 Place materials in the pipe zone in layers not greater than 6 inches thick and in a manner that equalizes the pressure on the pipe and minimizes stress. As required under the haunches of pipe and areas not accessible to mechanical tampers or to testing, compact with hand methods to ensure thorough contact between the material and the pipe. Before placing the pipe zone material, condition, aerate, or wet the material so that the moisture content of each layer is within minus 4% to plus 2% of optimum moisture content.
 - 6.5 Provide proper Backfill Class material as required. Backfill the trench above the pipe zone in successive lifts. Do not allow the backfill to free-fall into the trench until at least 3 feet of cover is provided over the top of the pipe. Modify the compaction as necessary to protect the pipe. Compact each lift to not less than 95% of the maximum density.
 - 6.6 If the specified compaction is not obtained, contractor shall remove material, modify compaction procedures, and/or reduce the thickness of lifts as required. Do not proceed with additional excavation or pipe laying until the backfill can be compacted to the satisfaction of the City.
 - 6.7 When CLSM Backfill is required, backfill above pipe zone with CLSM material. If the CLSM is to be used as a temporary surfacing, backfill to top of the trench and strike off to provide a smooth surface. If CLSM is not to be used as a temporary surface, backfill to bottom of the proposed resurfacing. Use steel plates to protect the CLSM from traffic a minimum of 24 hours.

STORM DRAINAGE

STANDARD DETAIL DRAWINGS INDEX

- D-050: STANDARD UTILITY LOCATIONS
- D-100: TYPICAL STORM DRAIN TRENCH DETAIL
- D-105: STREET CUT STANDARD DETAIL
- D-150: PIPE ANCHOR / TRENCH CUT-OFF WALL DETAIL
- D-200: STANDARD MANHOLE
- D-201: POLLUTION CONTROL MANHOLE
- D-205: FLAT-TOP MANHOLE
- D-210: MANHOLE BASE STANDARD DETAILS
- D-220: STANDARD INSIDE DROP MANHOLE W/ DEFLECTION PLATE
- D-250: MANHOLE COVER AND FRAME DETAILS
- D-260: MANHOLE FRAME GRADE ADJUSTMENT
- D-300: STANDARD INLETS, FRAMES & GRATES
- D-301: TRAPPED/POLLUTION CONTROL CATCH BASIN
- D-302: TYPICAL DITCH INLET
- D-303: TYPICAL AREA DRAIN INLET
- D-304: HEADWALL WITH TIDEGATE



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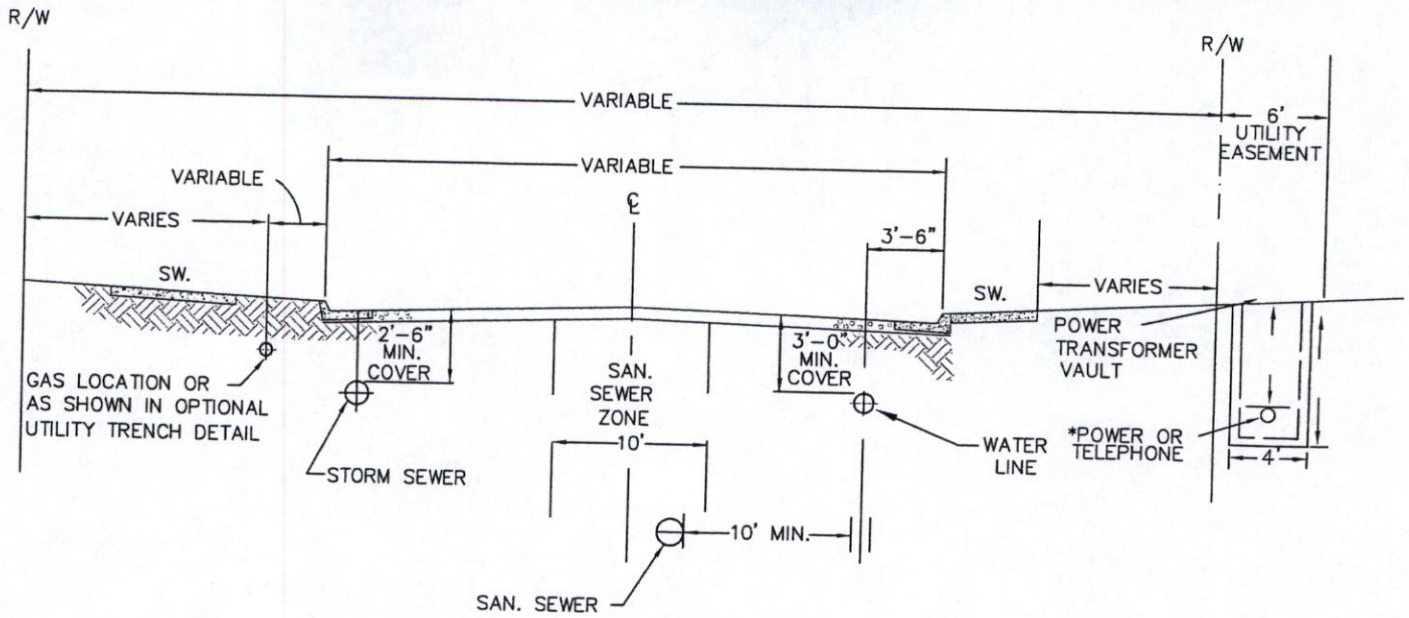
STANDARD DETAIL DRAWING INDEX

DETAIL NO.

D-010

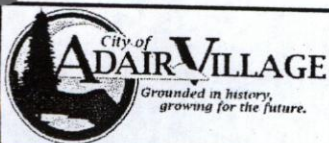
04/29/2009

SEE DWG. T-050 FOR STANDARD STREET WIDTHS AND SECTIONS



NOTES:

1. WATER LOCATED 3'-6" INSIDE FROM FACE OF CURB OR AS OTHERWISE DIRECTED.
2. 10' HORIZONTAL SEPARATION BETWEEN WATER AND SEWER WHERE POSSIBLE. COMPLY WITH SEPARATION REQUIREMENTS OF OAR 333-061-050.
3. WATER DISTRIBUTION MAINS SHALL HAVE 36" MINIMUM COVER OR AS OTHERWISE DIRECTED.
4. SEWER MAINS SHALL HAVE 5.25' (63") MINIMUM COVER UNLESS OTHERWISE APPROVED TO AVOID CONFLICTS WITH WATER AND OTHER UTILITIES.
5. WATER MAINS SHALL BE LOCATED ON NORTH OR EAST SIDE OF STREET WHEN PRACTICAL.
6. WATER, SEWER, STREET AND DRAINAGE SYSTEMS ARE SUBJECT TO CITY STANDARDS.
7. MANHOLE LIDS SHALL NOT BE LOCATED DIRECTLY IN NORMAL WHEEL PATH.
8. ALL LAYOUTS AND LOCATIONS ARE SUBJECT TO CITY APPROVAL.



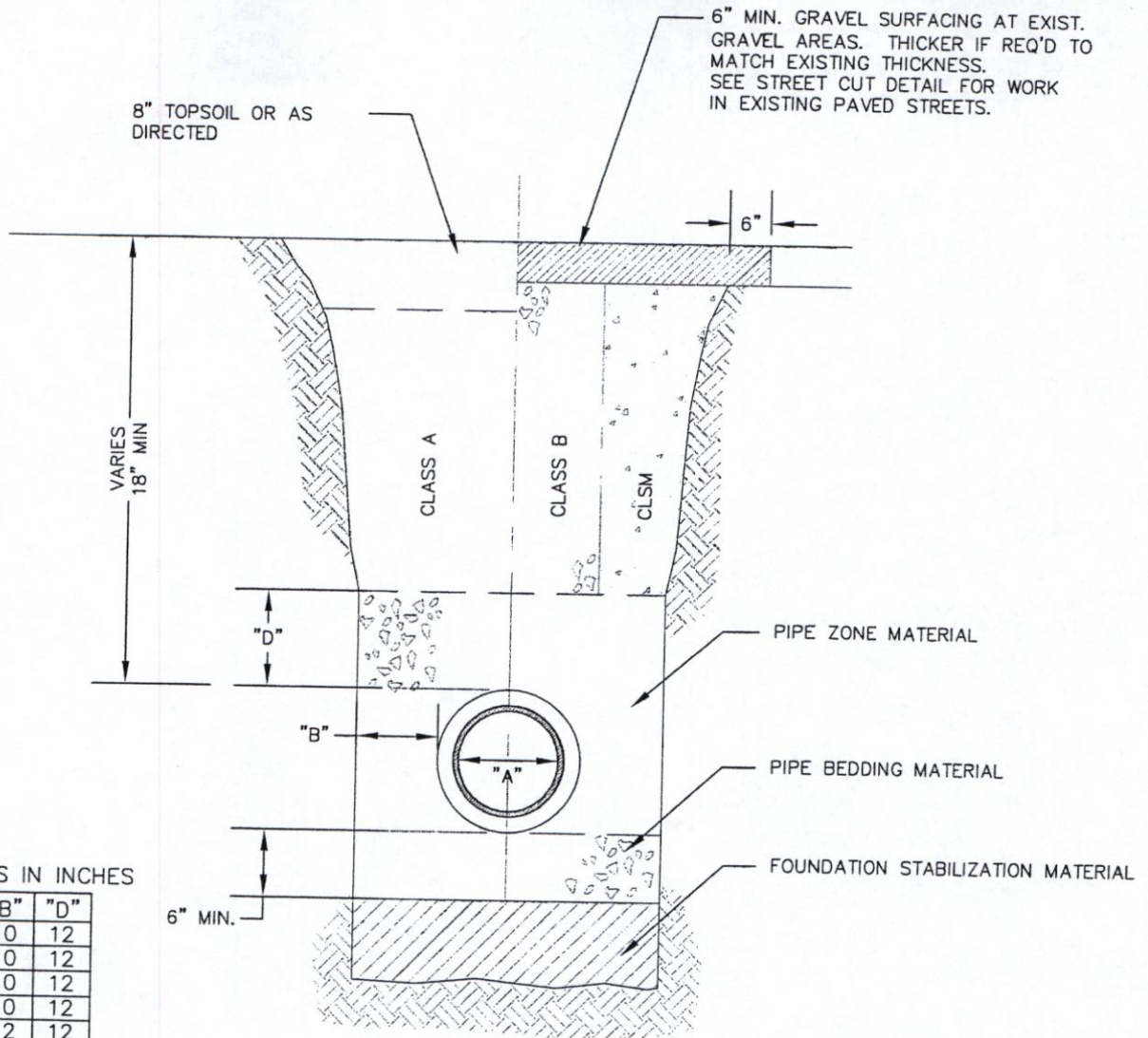
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STANDARD UTILITY LOCATIONS

DETAIL NO.

D-050

04/29/2009

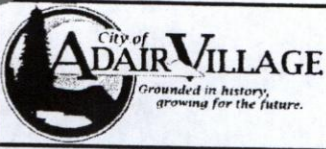


DIMENSIONS IN INCHES

"A"	"B"	"D"
4	10	12
6	10	12
8	10	12
10	10	12
12	12	12
15	12	12
18	16	12
21	16	12
24	18	12
30	18	12
36	24	14

NOTES:

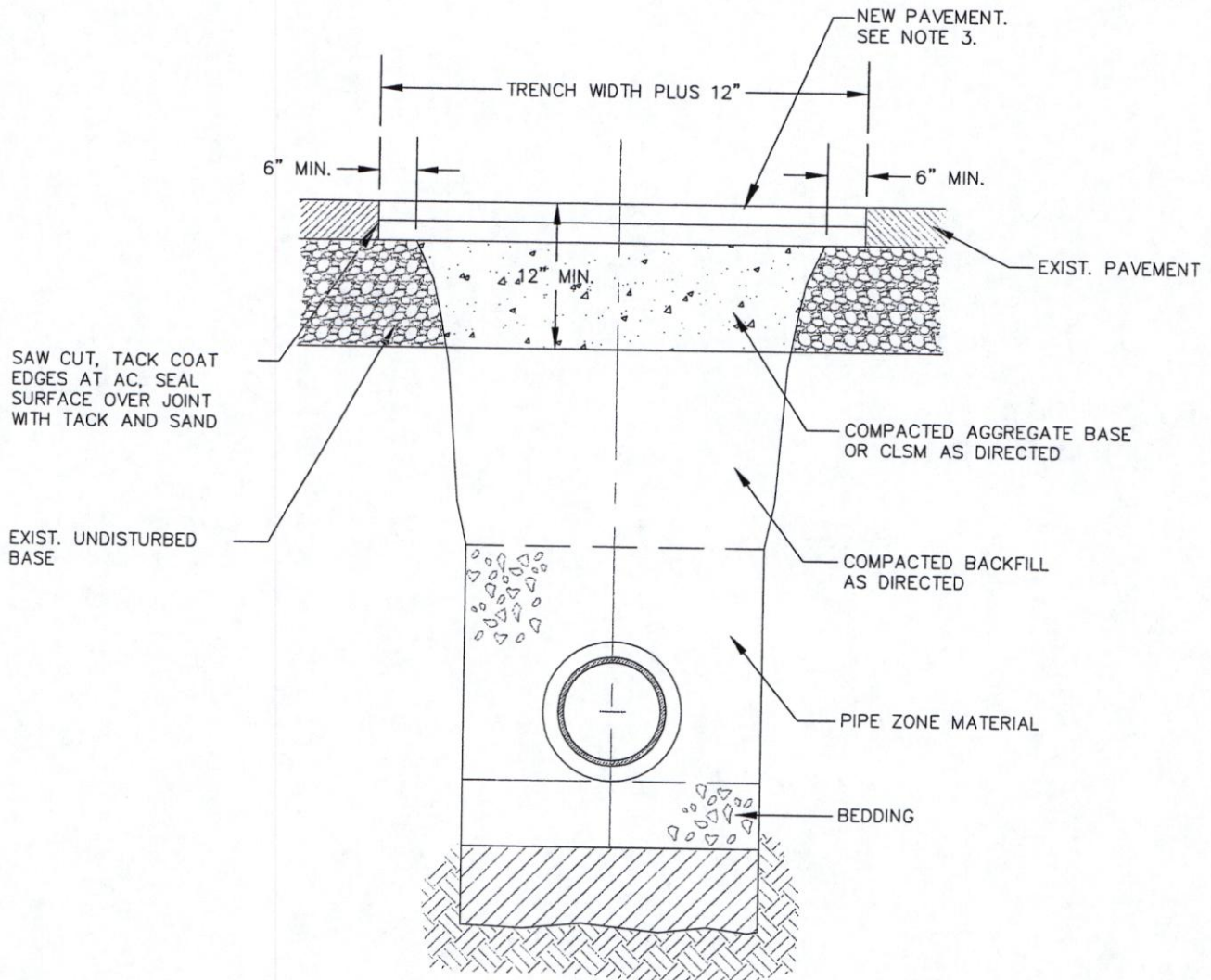
1. TRENCH EXCAVATION SHALL BE CONDUCTED IN A SAFE MANNER WITH ALL NECESSARY BRACING AND SHORING PROVIDED FOR COMPLIANCE WITH OSHA.
2. FOUNDATION STABILIZATION SHALL BE PROVIDED WHEN MATERIAL AT BOTTOM OF TRENCH IS UNSUITABLE IN THE OPINION OF THE CITY TO PROVIDE A STABLE TRENCH BASE.
3. CONSTRUCTION IN PUBLIC RIGHT-OF-WAY SHALL COMPLY WITH CITY STANDARDS.
4. CLASS B BACKFILL REQUIRED IN ALL ROADWAYS AND TRAFFIC PATHS EXCEPT WHERE CLSM BACKFILL IS REQUIRED BY COUNTY, ODOT, OR CITY.
5. MATERIALS SHALL BE IN ACCORDANCE WITH THE CITY STORM DRAINAGE DESIGN STANDARDS MANUAL.
6. COMPACT ALL FILL AS SPECIFIED.



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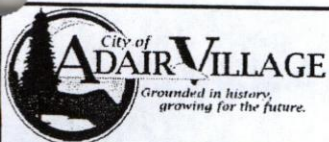
TYPICAL TRENCH DETAIL
 STORM DRAINAGE SYSTEM

DETAIL NO.
D-100
04/29/2009



NOTES:

1. ALL EXISTING AC OR PCC PAVEMENT SHALL BE SAWCUT IMMEDIATELY PRIOR TO REPAVING.
2. CONCRETE PAVEMENT SHALL BE REPLACED WITH CONCRETE TO A MINIMUM THICKNESS OF 6 INCHES OR TO THE THICKNESS OF REMOVED PAVEMENT, WHICHEVER IS GREATER.
3. PLACE AC MIX TO A MINIMUM THICKNESS OF 4 INCHES OR THE THICKNESS OF REMOVED PAVEMENT, WHICHEVER IS GREATER. COMPACT AS DIRECTED. AC PAVEMENT SHALL BE PLACED IN AT LEAST TWO 2" LIFTS.
4. COMPLY WITH THE REQUIREMENTS OF THE AGENCY HAVING JURISDICTION OVER THE ROAD IN WHICH THE STREET CUT OCCURS.



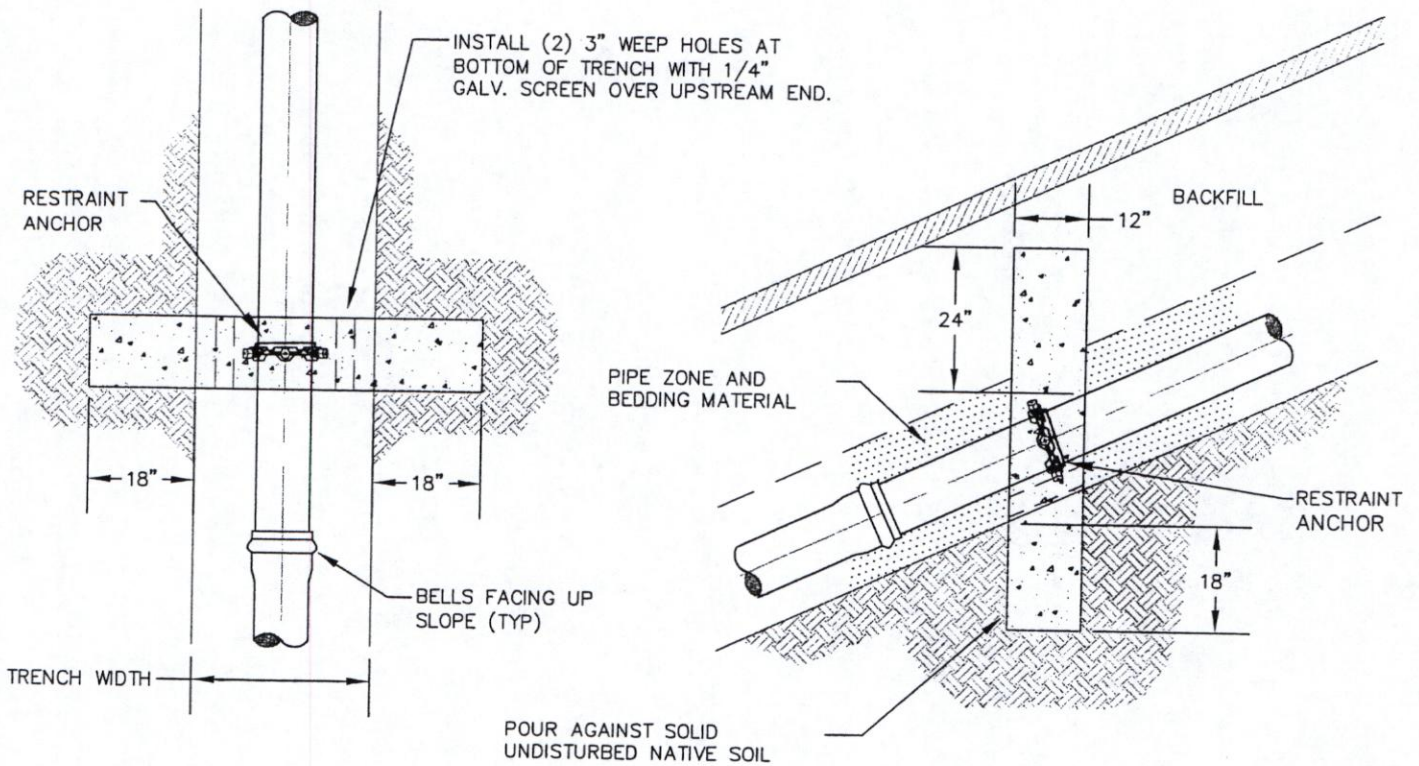
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**STREET CUT
 STANDARD DETAIL**

DETAIL NO.

D-105

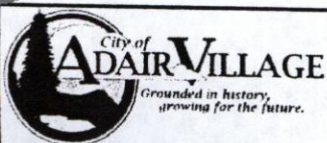
04/29/2009



NOTES:

1. CUT-OFF WALLS REQ'D AT ALL PIPELINES WHERE SLOPE EXCEEDS 20%.
2. RESTRAINED JOINT PIPE REQUIRED AT SLOPES BETWEEN 15% AND 20%.
3. WALLS SHALL BE FORMED WITHIN TRENCH. REMOVE FORMS PRIOR TO BACKFILLING.
4. CONCRETE SHALL HAVE 3000 PSI COMPRESSIVE STRENGTH MIN. (CLASS 3000).
5. SPACING OF WALLS SHALL BE:

SLOPE	SPACING
20-34%	35 FEET
35-50%	25 FEET
51-+ %	15 FEET



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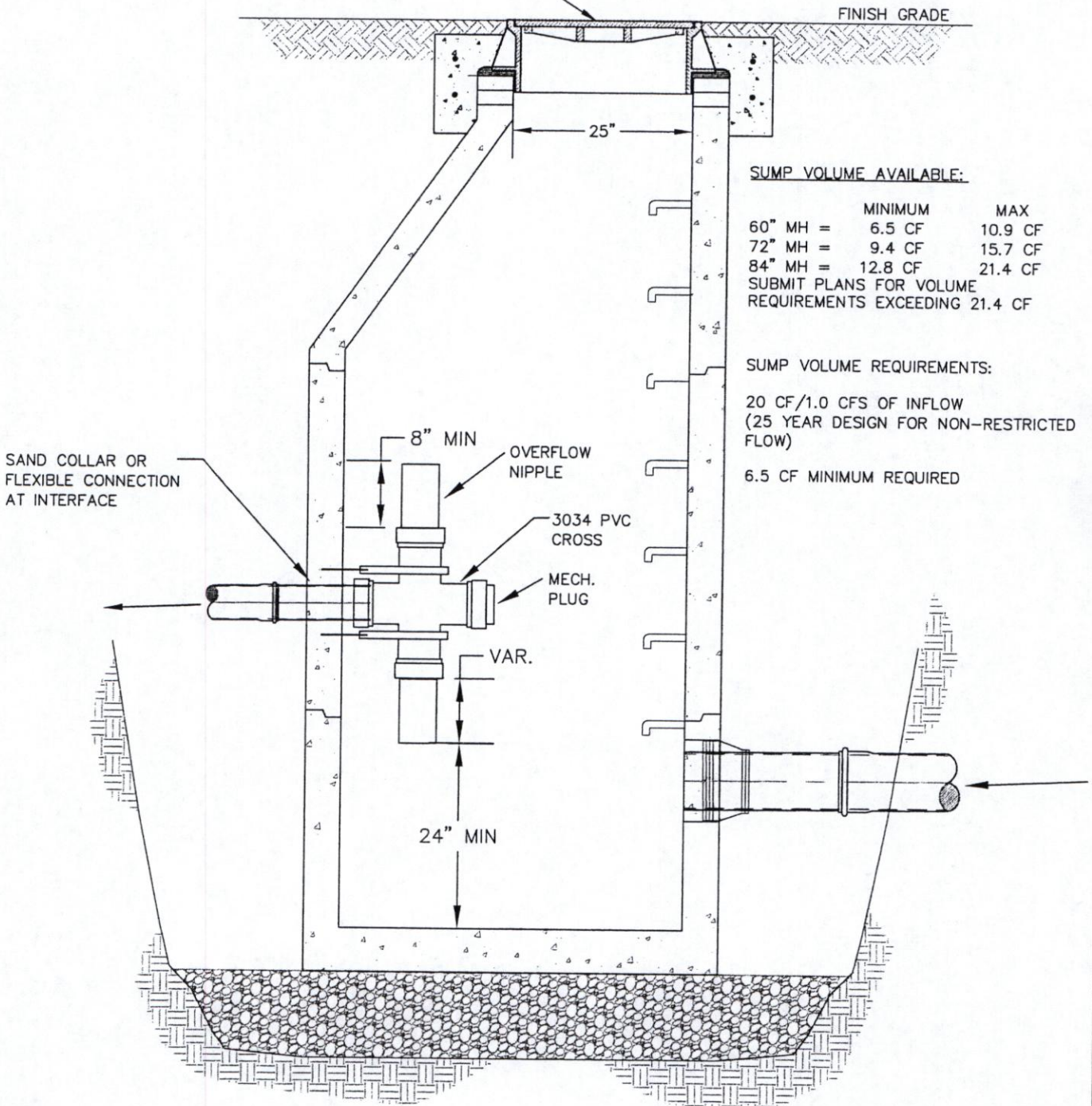
PIPE ANCHOR / TRENCH
 CUT-OFF WALL DETAIL

DETAIL NO.

D-150

04/29/2009

CAST IRON (H-20 RATED)
MANHOLE COVER AND FRAME, SEE
STANDARD DETAIL D-250



SUMP VOLUME AVAILABLE:

	MINIMUM	MAX
60" MH =	6.5 CF	10.9 CF
72" MH =	9.4 CF	15.7 CF
84" MH =	12.8 CF	21.4 CF

SUBMIT PLANS FOR VOLUME
REQUIREMENTS EXCEEDING 21.4 CF

SUMP VOLUME REQUIREMENTS:

20 CF/1.0 CFS OF INFLOW
(25 YEAR DESIGN FOR NON-RESTRICTED
FLOW)
6.5 CF MINIMUM REQUIRED

SAND COLLAR OR
FLEXIBLE CONNECTION
AT INTERFACE

8" MIN
OVERFLOW
NIPPLE

3034 PVC
CROSS

MECH.
PLUG

VAR.

24" MIN

FOR STANDARD MANHOLE DETAILS,
SEE D-200

FOR FLAT TOP MANHOLE DETAILS,
SEE D-205

INSIDE DROP AND WATER QUALITY MANHOLES SHALL BE AT
LEAST 60" Ø WITH 42" OF CLEAR SPACE



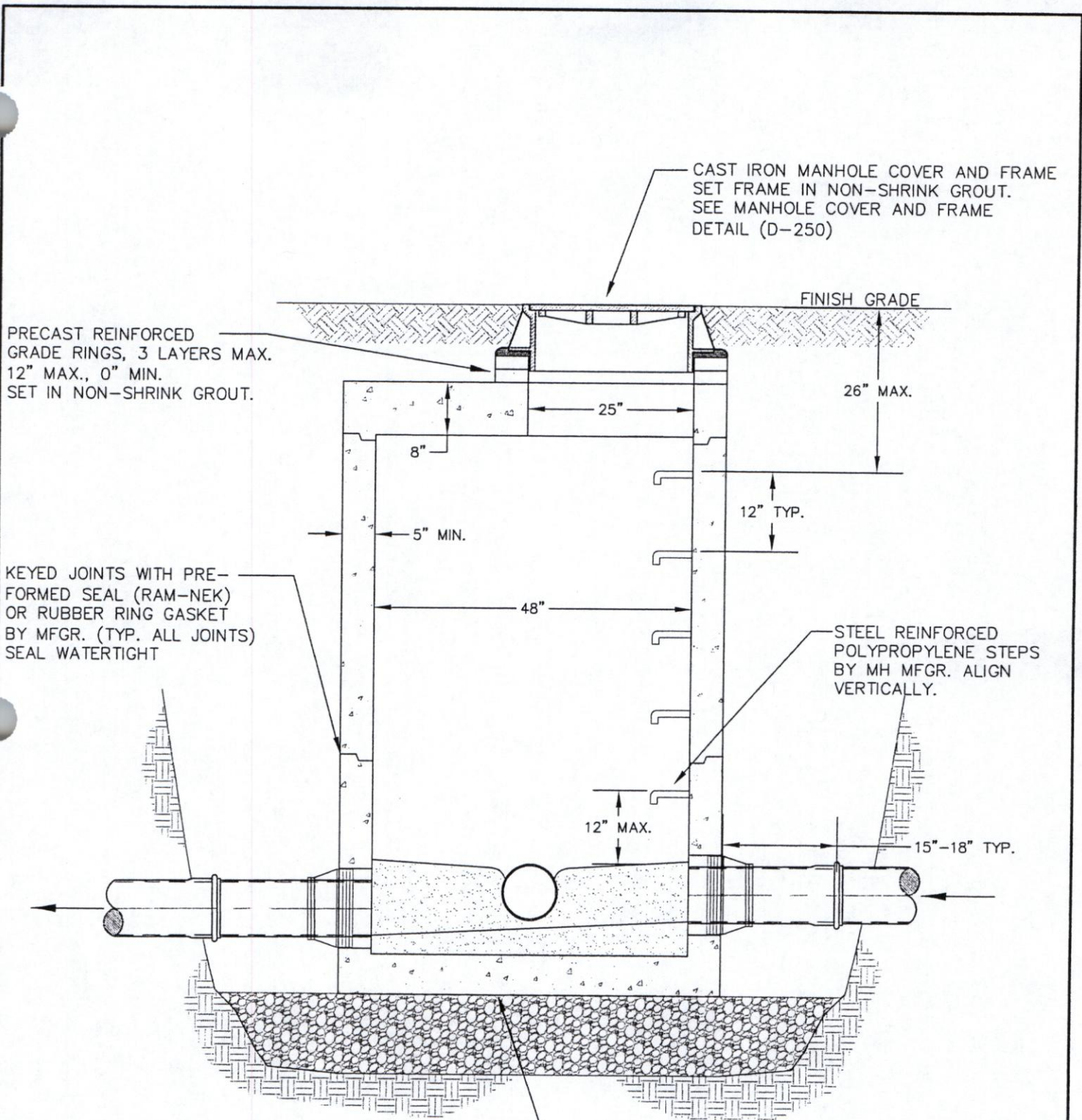
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**STORM DRAIN POLLUTION
CONTROL MANHOLE**

DETAIL NO.

D-201

04/29/2009



CAST IRON MANHOLE COVER AND FRAME
 SET FRAME IN NON-SHRINK GROUT.
 SEE MANHOLE COVER AND FRAME
 DETAIL (D-250)

FINISH GRADE

PRECAST REINFORCED
 GRADE RINGS, 3 LAYERS MAX.
 12" MAX., 0" MIN.
 SET IN NON-SHRINK GROUT.

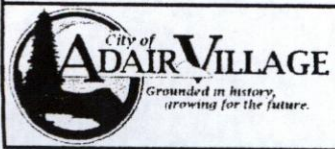
KEYED JOINTS WITH PRE-
 FORMED SEAL (RAM-NEK)
 OR RUBBER RING GASKET
 BY MFR. (TYP. ALL JOINTS)
 SEAL WATERTIGHT

STEEL REINFORCED
 POLYPROPYLENE STEPS
 BY MH MFR. ALIGN
 VERTICALLY.

SEE MANHOLE BASE
 STANDARD DETAIL D-210

NOTE:

- 1) ALL PRECAST MANHOLE SECTIONS SHALL MEET ASTM C-478.
- 2) STANDARD MANHOLE REQUIRED WHEN DEPTH FROM FINISH GRADE TO INVERT IS 6 FEET OR MORE.



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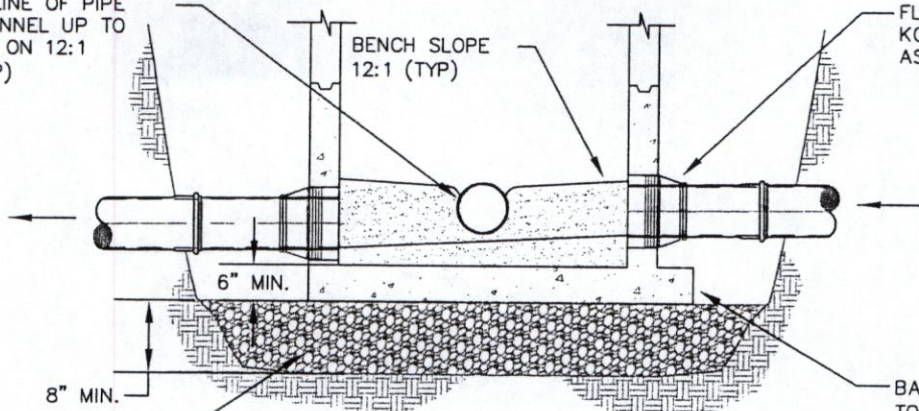
**FLAT-TOP MANHOLE
 PIPES LESS THAN 24" DIAM.**

DETAIL NO.
D-205
04/292009

AT SPRING LINE OF PIPE
EXTEND CHANNEL UP TO
CROWN LINE ON 12:1
BATTER (TYP)

BENCH SLOPE
12:1 (TYP)

FLEXIBLE RUBBER BOOT
KOR-N-SEAL OR EQUAL
AS APPROVED.



3/4"-Ø CRUSHED
ROCK BASE (TYP)

PRECAST BASE

PRECAST BASE HEIGHT
SUFFICIENT TO AVOID
JOINT AT PIPE PENETRATIONS

BASE EXTENSION AS REQ'D
TO PREVENT UPLIFT (TYP)

UNDISTURBED EARTH OR
COMPACT SELECT MATERIAL
AS REQ'D (95%) (TYP)

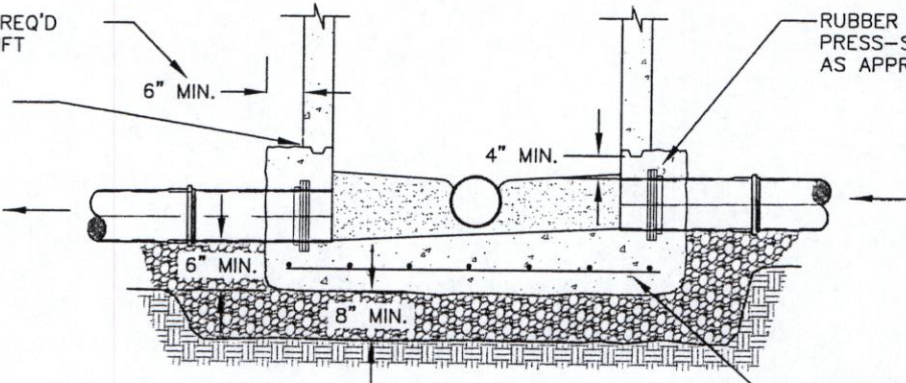
OR GREATER AS REQ'D
TO PREVENT UPLIFT

RAM-NEK SEAL

6" MIN.

RUBBER WATERSTOP GROUT RING
PRESS-SEAL GASKET OR EQUAL
AS APPROVED.

4" MIN.



#4 HOOP AND #4 @ 12" E.W.
#5 BARS WHEN DEPTH
EXCEEDS 15'

CAST-IN-PLACE BASE

CONTOUR TO PROVIDE
SMOOTH CHANNELS
SHAPE TO AVOID SOLIDS
DEPOSITION AND DIRECT
HEAD-ON FLOWS

M.H. STEPS

15" TO 18"

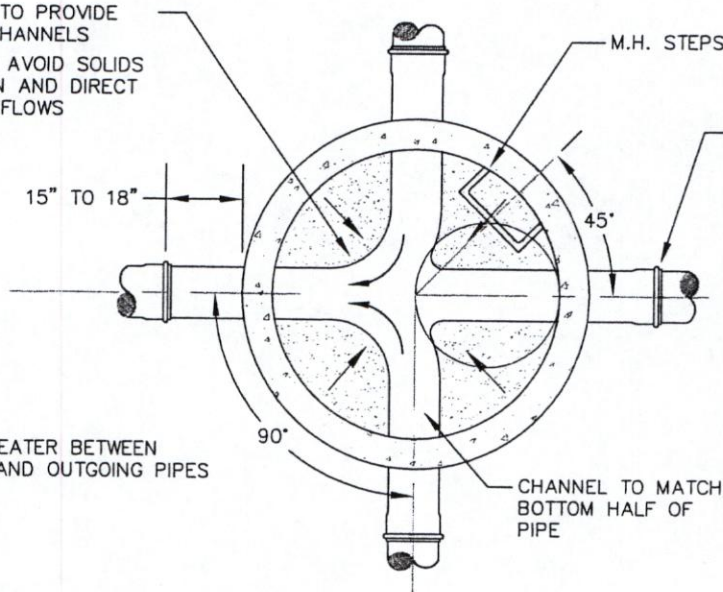
PIPE JOINT
FLEXIBLE COUPLING
WHERE CONNECTING
TO EXIST. PIPE

PRECAST OR CAST-IN-PLACE
BASE AT CONTRACTOR'S
OPTION OR AS DIRECTED.

ALL FIELD PLACED CONCRETE
SHALL BE TYPE II PCC WITH
3000 PSI MIN. STRENGTH

MIN. 0.2 FT. INVERT DROP
ACROSS INLET AND OUTLET
PIPES.

90° OR GREATER BETWEEN
INCOMING AND OUTGOING PIPES

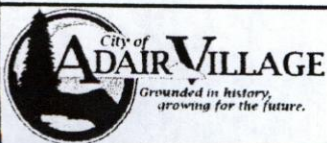


MANHOLE BASE STANDARD DETAILS

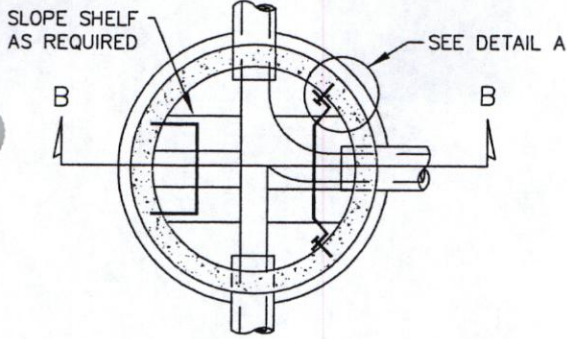
DETAIL NO.

D-210

04/29/2009

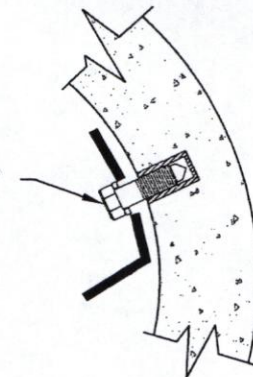


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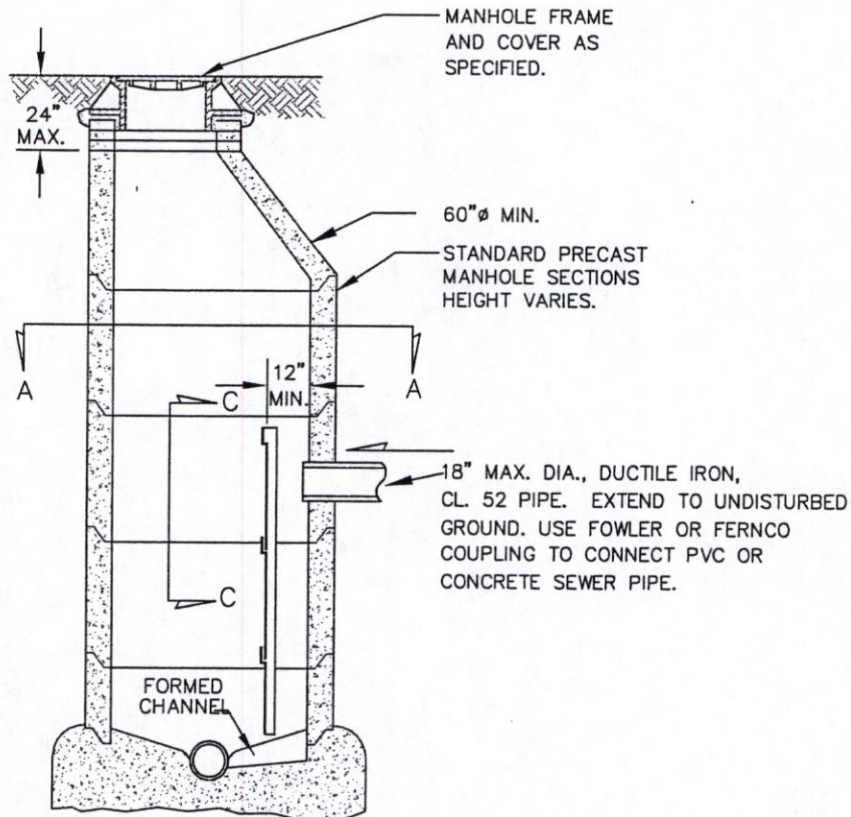


SECTION A-A

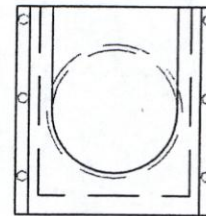
1/2" ϕ SELF TAPPING
 CONCRETE ANCHORS,
 PHILLIPS S-12 OR
 APPROVED EQUAL, w/
 1/2" ϕ x 1-1/2" Lg.
 STAINLESS STEEL
 BOLT & STAINLESS
 STEEL LOCK WASHER.



DETAIL A
 (PARTITION ATTACHMENT)



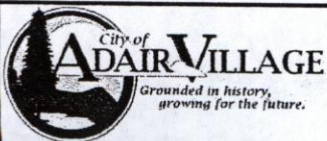
SECTION B-B



SECTION C-C

NOTES:

1. INSIDE DROP MANHOLES WITH DEFLECTION PLATE SHALL ONLY BE USED WITH PRIOR APPROVAL FROM CITY.
2. ONLY ONE DROP ASSEMBLY ALLOWED PER MANHOLE.
3. INSIDE DROP AND WATER QUALITY MANHOLES SHALL BE AT LEAST 60" ϕ WITH 42" OF CLEAR SPACE



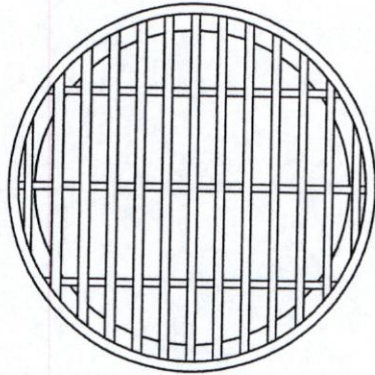
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**STANDARD INSIDE DROP M.H.
 W/ DEFLECTION PLATE**

DETAIL NO.

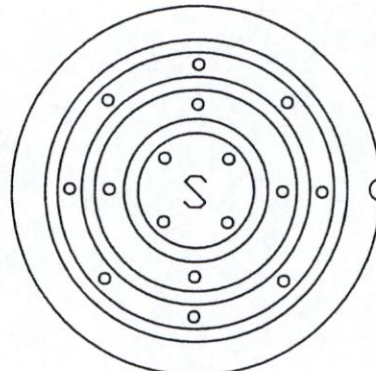
D-220

04/29/2009



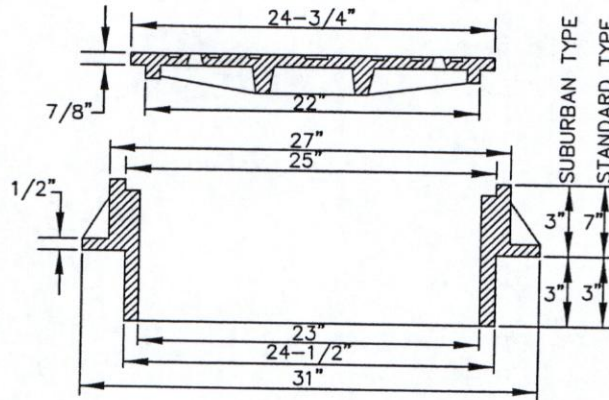
GRATE

(OLYMPIC FOUNDRY #MH26G,
OR APPROVED EQUAL)



STORM

(OLYMPIC FOUNDRY #MH26P
OR APPROVED EQUAL)

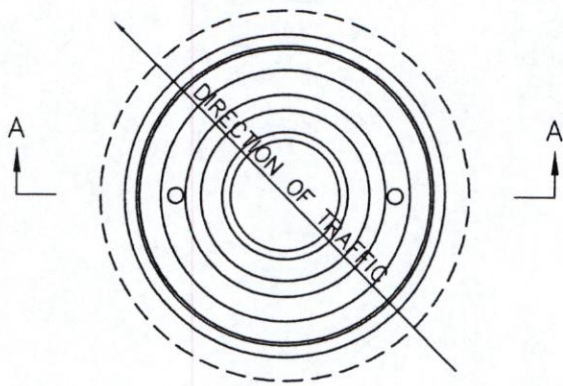


FRAME

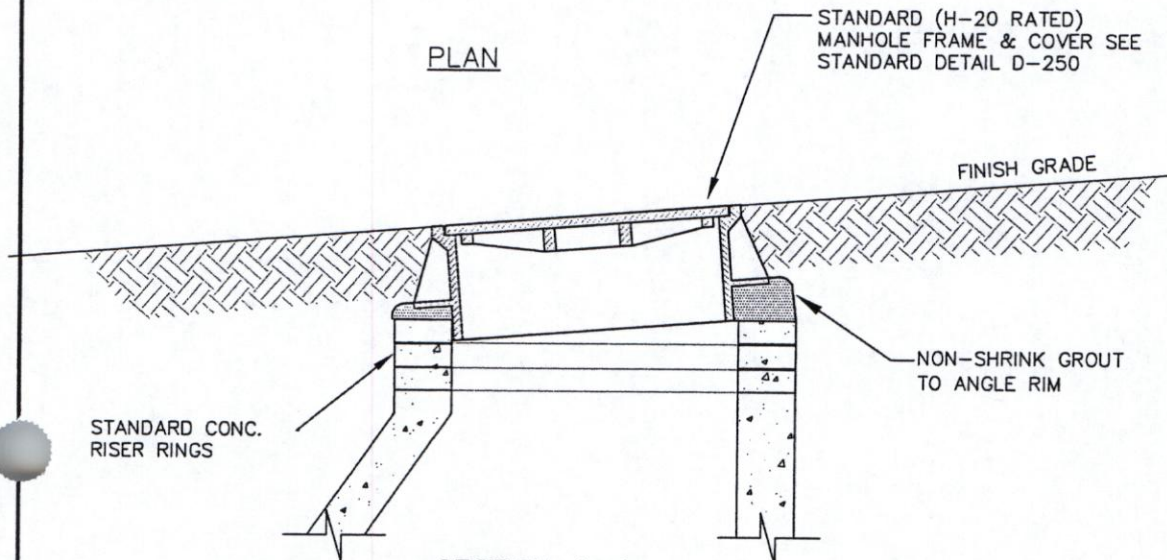
(OLYMPIC FOUNDRY #MH26A,
OR APPROVED EQUAL)

NOTES:

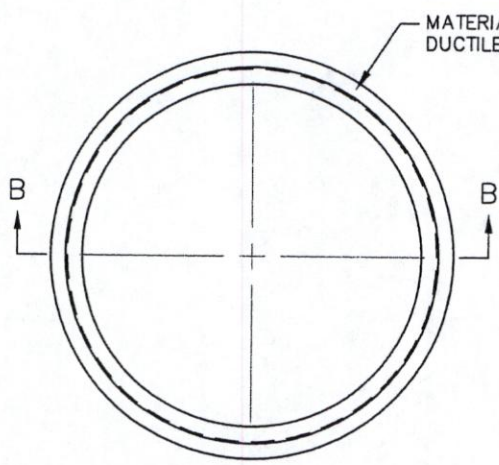
1. USE SUBURBAN TYPE ONLY IN NON-TRAFFIC AREAS, AND ONLY WITH APPROVAL BY THE CITY.
2. COVER AND FRAME SHALL BE GRAY CAST IRON ASTM A-48 CLASS 30.
3. COVER AND FRAME TO BE MACHINED TO A TRUE BEARING ALL AROUND.
4. NOTCH LID FOR LIFTING HOOK.
5. OPEN GRATES REQUIRE APPROVAL BY CITY, AND MUST BE BICYCLE SAFE IF USED IN TRAFFIC AREAS.



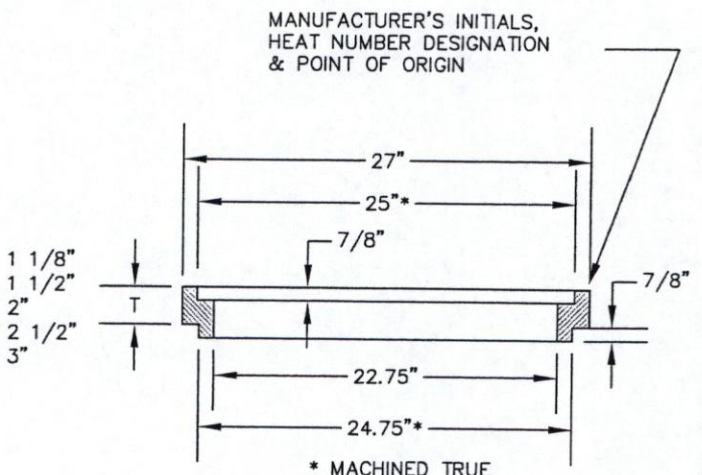
PLAN



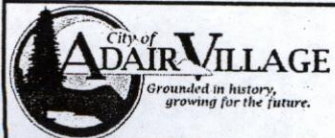
SECTION A-A
TYPICAL MANHOLE GRADE ADJUSTMENT IN STREET



MANHOLE ADJUSTMENT RINGS
FOR RESURFACING



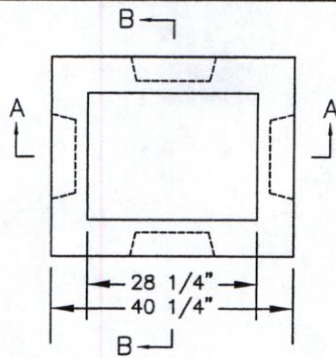
SECTION B-B



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MANHOLE FRAME
GRADE ADJUSTMENT

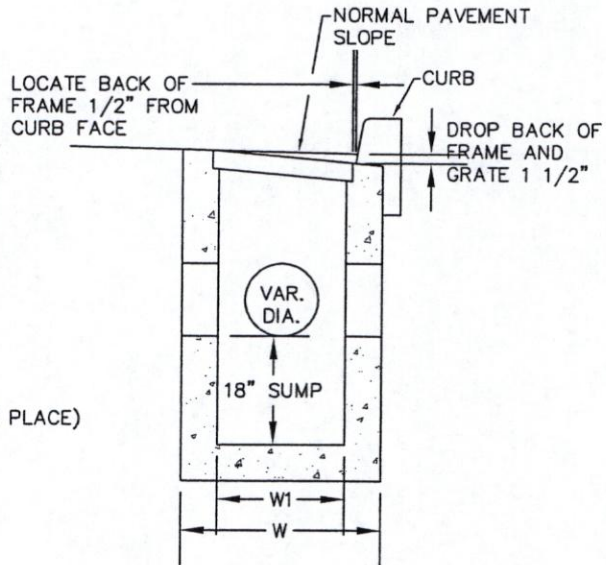
DETAIL NO.
D-260
04/29/2009



TOP VIEW

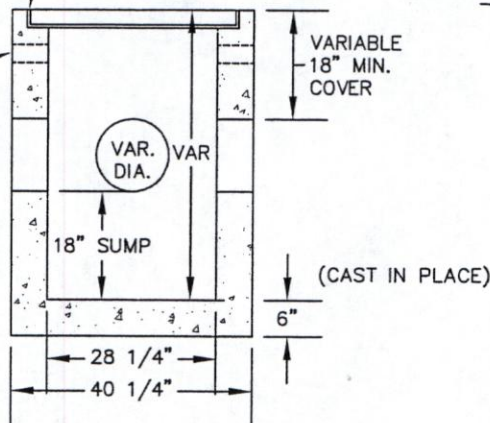
INLET TYPE	W	W1
G-1	2' 8-7/8"	1' 8-7/8"
G-2, G-2M	3' 3-3/8"	2' 3-3/8"

STEEL FRAME CAST IN TOP SLAB OR BASIN (IF TOP SLAB IS CAST-IN-PLACE)



SECTION B-B

OPTIONAL: INSTALL 3" WEEP HOLES WITH FIELD INSTALLED MESH SCREEN FOR SUBGRADE DRAINAGE



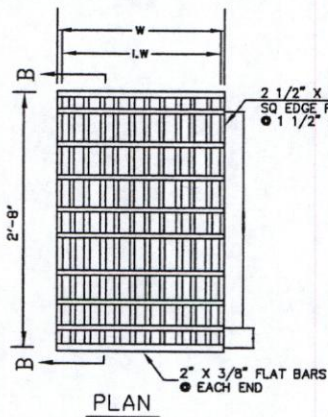
SECTION A-A

NOTES:

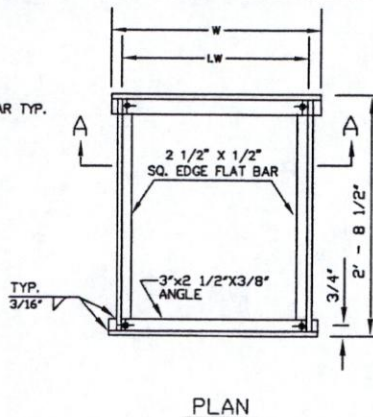
1. CONCRETE STRENGTH SHALL BE 3300 PSI.
2. PRECAST BASE WALLS SHALL BE A MINIMUM 4" THICK. CAST-IN-PLACE BASE WALLS SHALL BE 6" THICK.

TYPE	W	I.W
STANDARD	1'-9"	1'-8 1/4"

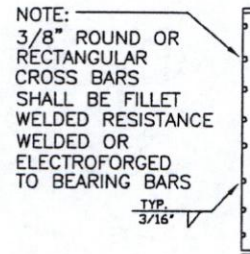
TYPE	DIA. PIPE	W	I.W
STANDARD	10"-12"	1'-10 3/4"	1'-9 3/8"



PLAN

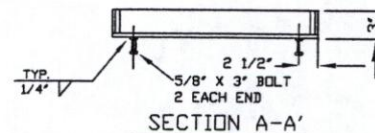


PLAN

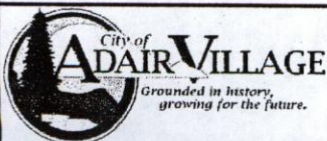


SECTION B-B

NOTE: USE VERTICAL BEADS IN CORNERS, FILLET WELD JOINT ON BOTTOM OF FRAME. GRATE MUST REST FLAT ON



SECTION A-A'



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6030 NE William R Carr St.
Adair Village, Oregon 97330
(541) 745-5507 Fax: (541) 745-5530

STANDARD INLETS,
FRAMES & GRATES

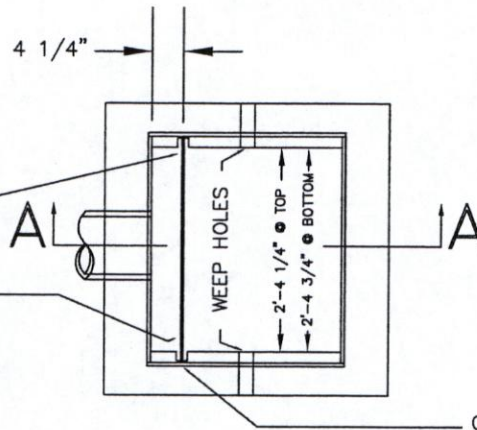
DETAIL NO.

D-300

04/29/2009

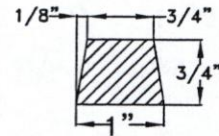
NOTCH INLET FRAME
FOR BAFFLE ON
EACH SIDE.

REMOVABLE HIGH
DENSITY POLYETHYLENE
BAFFLE 2'-5 1/2" X TOP
X 2'-4" BOTTOM X 2'-6"
HIGH X 1/2" THICK.

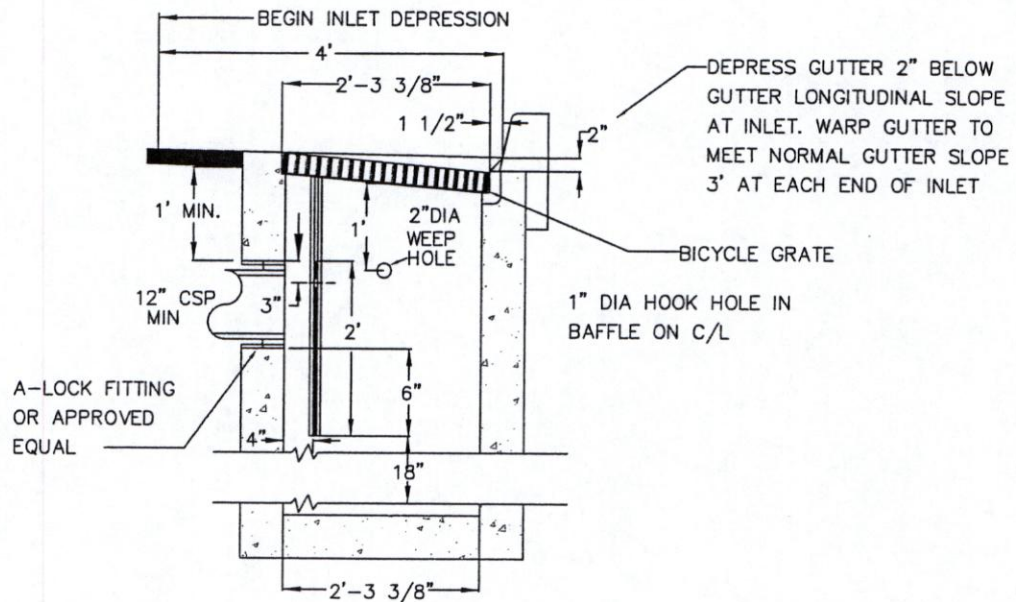


PLAN

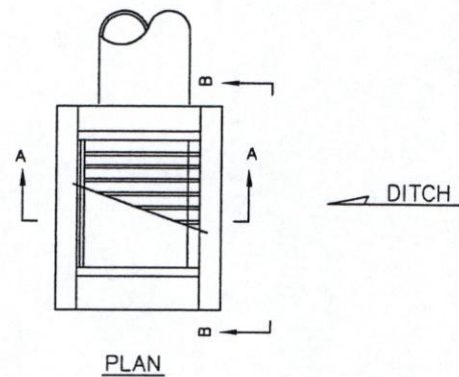
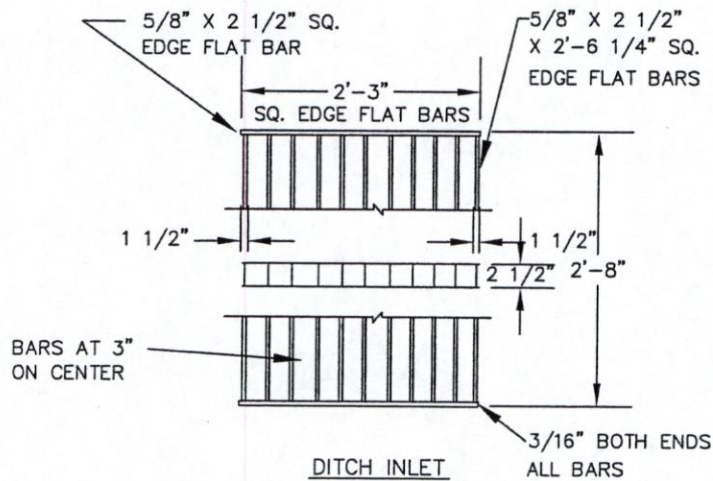
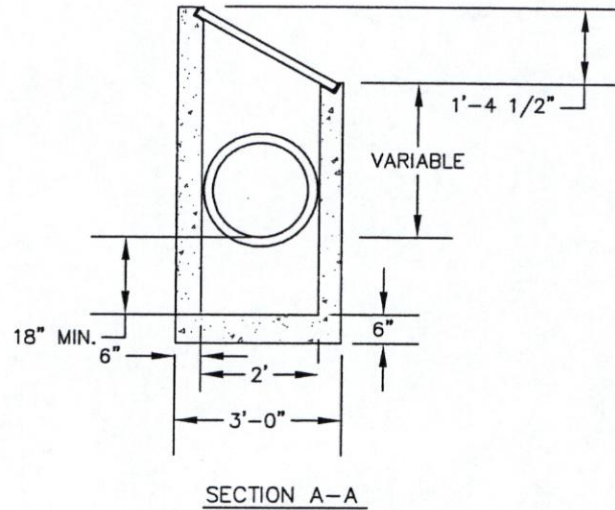
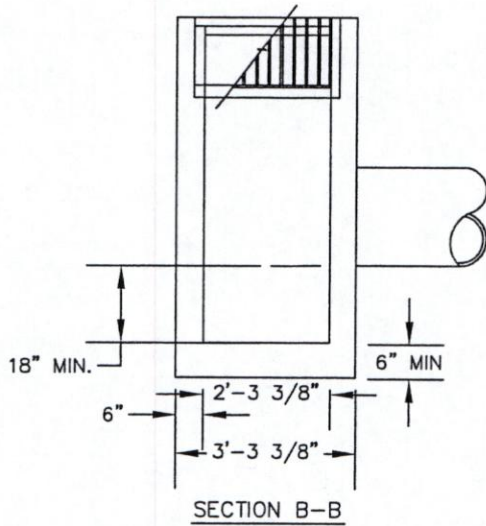
NOTES:
USE 3000 LB CONCRETE
2" TO 4" SLUMP



CHANNEL FORMED IN CATCH
BASIN WALL USING A WOOD
STRIP OF THE DIMENSIONS
SHOWN ABOVE.

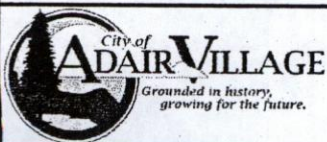


SECTION A-A



NOTES:

1. CONCRETE STRENGTH SHALL BE 3300 PSI.
2. CATCH BASIN, FRAME, AND GRATES SHALL MEET H₂O LOADING.
3. INSIDE FRAME DIMENSIONS: 2'-3 3/8", 2'-8 1/2".
4. 3/8" CROSS BARS SHALL BE FLUSH WITH THE GRATE SURFACE AND MAY BE FILLET WELDED, RESISTANCE WELDED OR ELECTROFORGED TO BEARING BARS.
5. DITCH INLET CATCH BASINS SHALL MEET THE REQUIREMENTS OF ODOT DITCH INLET TYPE "D"



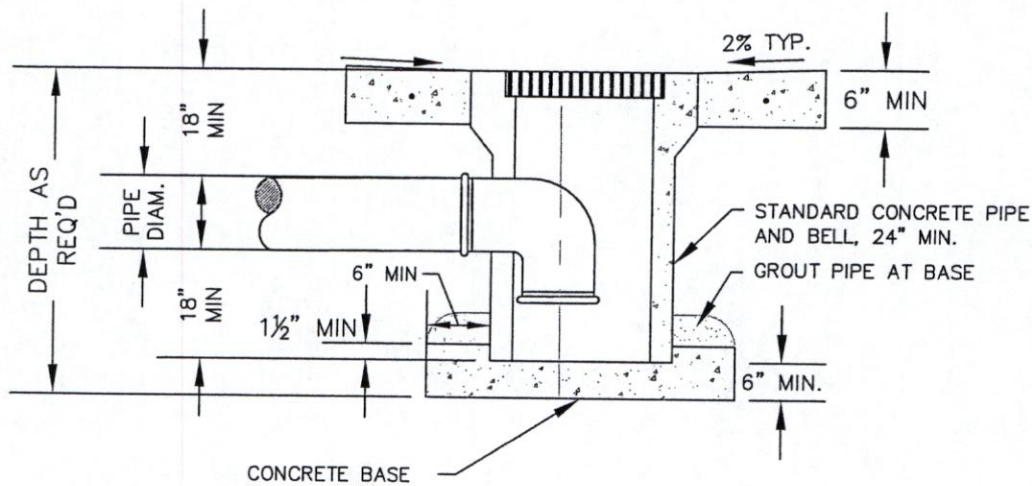
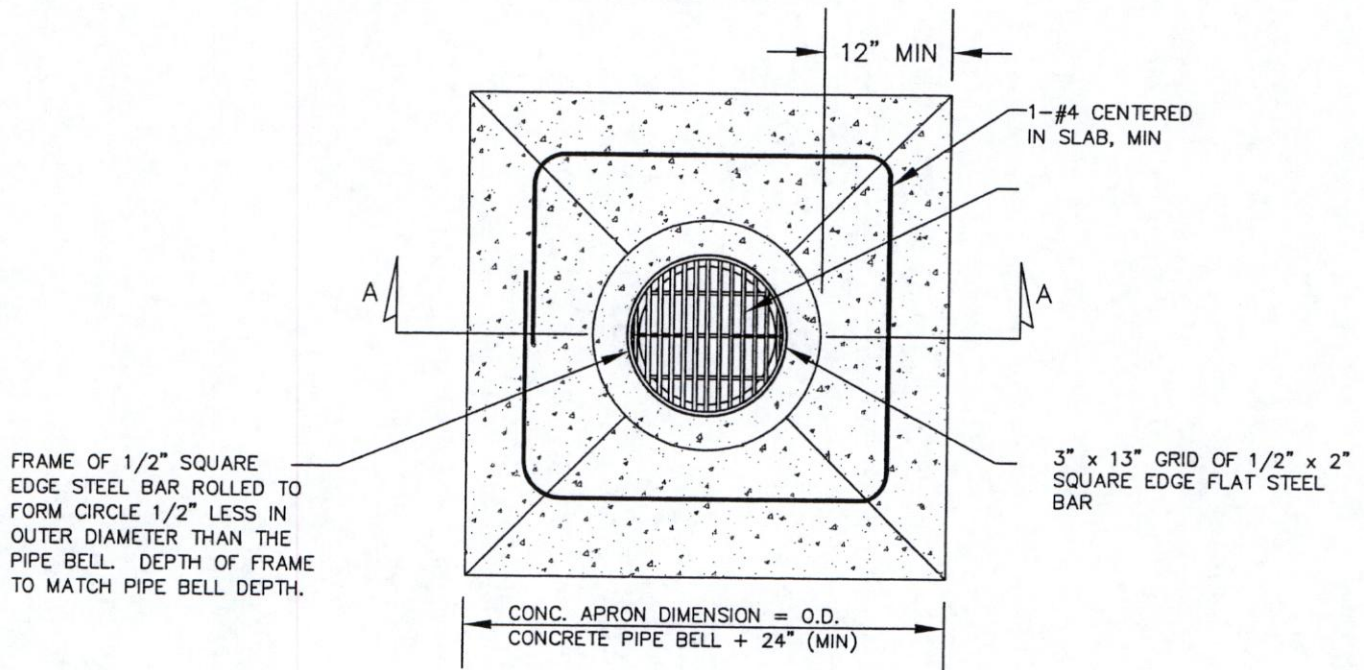
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Adair Village, Oregon 97330
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TYPICAL DITCH INLET
AND GRATE

DETAIL NO.

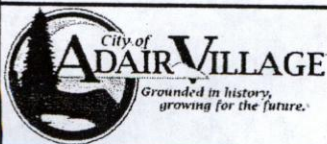
D-302

04/29/2009



NOTES:

1. GRATES SHALL BE CONSTRUCTED FOR BICYCLE SAFETY.
2. PRECAST CONCRETE CATCH BASINS MAY BE USED FOR AREA DRAINS WHEN APPROVED BY THE CITY.
3. NOT FOR USE IN VEHICULAR TRAFFIC AREAS.



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TYPICAL AREA DRAIN INLET

DETAIL NO.

D-303

04/29/2009

