CITY OF ARLINGTON

DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

July 2008

DEPARTMENT OF PUBLIC WORKS
238 N. OLYMPIC AVENUE • ARLINGTON, WA 98223

FOREWORD

The July 2008 updates of the Public Works Design and Construction Standards and Specifications have been prepared by the Public Works Department of the City of Arlington. I would like to thank Public Works staff for their joint efforts working on this document, and staff from Community Development Department and Fire Department for their review and comments.

This document is to be used in conjunction with the latest edition of the WSDOT/APWA Standards and Specifications for Road, Bridge and Municipal Construction, and the City of Arlington Municipal Code. These Standards apply whenever any public or private work is performed within the City of Arlington including work performed by private parties at their own expense under authority granted by the City of Arlington.

Revisions to these Standards may be made periodically to make corrections, clarify procedures and to conform to municipal practice and new technology or state or federal standards.

Despite all efforts to make this error-proof document, some errors may have slipped through the cracks. Should you find errors in this document, please bring them to our attention at the following address:

City of Arlington
Engineering Division
238 N. Olympic Avenue
Arlington, WA 98223
Phone: (360) 403-3500
Fax: (360) 403-3447
Web: www.ci.arlington.wa.us
E-Mail: engineering@ci.arlington.wa.us

Updated Standards are posted on the City's website. Copies of this document may be obtained for $30.00 per copy ($40.00 if mailed). The users shall ensure that they are using the latest edition of these Standards.

Sincerely,

Len Olive, P.E.
Public Works Director

ORDER FORM

Title: City of Arlington, Public Works
Design and Construction Standards and Specifications

Edition: July 2008

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City of Arlington
Engineering Division
238 N. Olympic Avenue
Arlington, WA 98223

CHAPTER 1

GENERAL CONDITIONS

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1-1 GENERAL REQUIREMENTS

1-1.01 GENERAL

The purpose of the City of Arlington Public Works Design and Construction Standards and Specifications (including City Standard Details) hereinafter referred to as the City Standards or these Standards is to provide minimum standards and guidelines for design and construction performed within the City of Arlington. This includes work in the public right-of-way or easements, and all other work performed pursuant to construction related permits issued by the City. No construction shall start without the City's approval of construction plans, prepared in accordance with these Standards, conditions of any land use permit issued by the City, developer agreement(s) for the property, and the Arlington Municipal Code (AMC). All construction shall conform to these Standards, the *WSDOT/APWA Standard Specifications,* and other applicable standards and regulations of the Federal, State, County, and the City. The City Engineer shall be the final authority in all matters related to design and construction.

These Standards are intended to represent the minimum design standards for public works construction in the City of Arlington. Compliance with these Standards does not relieve the Design Engineer of the responsibility to apply conservative and sound professional judgment to promote the health, safety, and welfare of the general public. The City of Arlington may, at its sole discretion due to special site conditions and/or environmental constraints, require more stringent requirements than would normally be required under these Standards.

Revisions to these Standards may be made periodically to make corrections, clarify procedures and to conform to municipal practice and new technology or State or Federal standards. The users shall ensure that they are using the latest edition of these Standards.

1-1.02 DEVIATION FROM STANDARDS

Permissible alternatives different from these Standards may be approved by the City Engineer upon review of evidence submitted by the Developer if such modifications are equal to or better than the requirements in these Standards, they are in the public interest, they are based upon sound engineering judgment, and the requirements for safety, function, appearance, and maintainability are fully met. Requests for proposed alternatives shall be submitted as soon as possible during the permit process to allow time for decision by the City. Requested alternatives must be reviewed and approved prior to construction. The City Engineer will make the decision as to whether a requested alternative will be considered as permissible.

1-1.03 GOVERNMENTAL AGENCY REQUIREMENTS

A project may involve dealing with the City of Arlington, City of Marysville, and/or Snohomish County. These jurisdictions may have different engineering standards.

If the project is located in the City of Arlington and served by Arlington water and sewer systems, the Design Engineer shall prepare complete site/civil plans including utilities in accordance with the standards of the City of Arlington and submit to the City of Arlington for review and approval.

If the project is located in the City of Arlington and served by Marysville water and sewer systems, the Design Engineer shall prepare site/civil plans in accordance with the *City of Arlington Standards*, and water and sewer plans in accordance with the City of Marysville Standards.

If the project is located in the City of Marysville or unincorporated Snohomish County and served by City of Arlington water and sewer systems, the Design Engineer shall prepare water and sewer plans in accordance with the Standards of the City of Arlington and submit to the City of Arlington for review and approval.

Copies of the site or utility plans from the other jurisdiction will need to be provided if applicable.

All construction within the City, County or State and their right-of-way shall be performed in accordance with the applicable standards and requirements and in accordance with the franchise agreements and/or permit requirements. The Contractor is responsible for determining these requirements prior to construction and meeting the requirements.

Where conflict exists between these Standards and the agency's requirements, the most stringent requirements shall take precedence.

1-2 DEFINITIONS

AMC – The City of Arlington Municipal Code.

Building Official – City of Arlington Building Official or their designee.

City – The City of Arlington, Washington.

City Attorney – City of Arlington City Attorney

City Engineer – City of Arlington City Engineer or their designee.

City Inspector – An authorized representative of the City Engineer performing inspection and testing.

City Standards or these Standards – City of Arlington Public Works Design and Construction Standards and Specifications, latest edition.

City Standard Details or Standard Details – City of Arlington Standard Detail drawings, latest edition.

Contractor – The individual, firm, partnership, corporation, or joint venture entering into a contract with a Developer or the City to perform the work in accordance with these Standards. The term shall also include the Contractor's agents, employees and subcontractors.

Developer – The property owner or their agents/contractors who have made or intend to make an application to the City for a permit or approval for development.

Developer's Engineer or Design Engineer – The Professional Engineer or engineering firm entering into a contract with the Developer and representing the Developer to prepare construction documents and provide other engineering services. The term shall also include its employees and sub-consultants.

Director of Community Development – City of Arlington Director of the Department of Community Development.

Director of Public Works – City of Arlington Director of the Department of Public Works.

DOE Stormwater Management Manual – Department of Ecology Stormwater Management Manual for Western Washington, adopted edition by the City of Arlington.

Fire Chief – City of Arlington Fire Chief or their designee.

Material or Materials - These words shall be construed to embrace machinery, manufactured or fabricated articles, and natural substance to be furnished in connection with the Project.

MUTCD – Manual on Uniform Traffic Control Devices for Streets and Highways, published by U.S. Department of Transportation Federal Highway Administration, latest edition.

Permit Center – The City of Arlington Permit Center.

Plans or Construction Plans – Project drawings subject to City review and approval prior to construction that show the location, character and dimensions of the proposed work such as layouts, profiles, cross-sections, details, methods and general notes.

Project – The structure or improvement to be constructed in whole or in part.

PUD – Snohomish County Public Utility District No. 1

Words and Phrases - Whenever the words, "as directed", "as required", "as permitted", or words of like effect are used, it shall be understood that the direction, requirement or permission of the City Engineer is intended. The words, "sufficient", "necessary", "proper", and the like shall mean sufficient, necessary or proper in the judgment of the City Engineer. The words, "approved", "acceptable", "satisfactory", or words of like import shall mean approved by, acceptable to, or to the satisfaction of the City Engineer.

WSDOT - Washington State Department of Transportation.

WSDOT/APWA Standard Specifications - Standard Specifications for Road, Bridge and Municipal Construction, latest English edition, Washington State Department of Transportation and the American Public Works Association, including all amendments.

1-3 PLAN REQUIREMENTS

1-3.01 GENERAL REQUIREMENTS

Following these Standards for design will help ensure a timely review of the plans and keep review costs to a minimum. Non-standard plans may take longer time to review and increase the costs to the Developer. The City's decision to approve, reject or modify non-standard plans shall be based on the plans conforming to the City's Comprehensive Plans, meeting or exceeding the requirements of these Standards and the applicable codes, and not adversely affecting environmental quality, safety, operation or maintenance of the City's infrastructure.

If the project involves work within the City public right-of-way, or infrastructure to be conveyed to the City after completion, the City reserves the right to accept the Developer's Engineer, or to request that the Developer choose a different Design Engineer.

All construction plans submitted to the City for review must be stamped and signed by a Washington State licensed Professional Engineer (P.E.). All land boundary survey and legal descriptions must be stamped and signed by a licensed Professional Land Surveyor (P.L.S.). As-built plans may be stamped and signed by a licensed P.E. or a P.L.S. Topographic survey data and mapping prepared specifically for a proposed project may be performed by the P.E. stamping the engineering plans as allowed by the Washington State Board of Registration for Professional Engineers and Professional Land Surveyors.

The Design Engineer is responsible for any errors and omissions in the plans. The Design Engineer shall provide adequate quality control before plans are submitted to the City for review.

The City's review is for conformance to the City's Standards. The City's review or approval of the plans does not relieve any of the Design Engineer's responsibility or liability imposed upon it by law or by contract.

At the City Engineer's sole discretion, the plans may be rejected if they are of poor quality, difficult to read, or contain a significant amount of errors and omissions.

The City's plan review, plan approval, and construction inspection do not relieve any of the Developer's responsibility to conform to the AMC and these Standards.

Site civil plans shall be valid for eighteen (18) months from the approval date. One six-month extension may be granted by the City Engineer if requested in writing by the applicant prior to original expiration date. If plans expire again, an additional fee shall be assessed to review the plans for compliance with the current Standards.

1-3.02 SURVEY REQUIREMENTS

Prior to design and construction, the Developer's Professional Engineer or Professional Land Surveyor shall arrange for underground utility locations to be marked on the ground, surveyed and included in the construction drawings. The Engineer/Surveyor shall also research available utility records for use during the design, permit and construction process. The Developer shall provide copies of recorded survey for the property, stamped and signed by a Professional Land Surveyor licensed in the State of Washington.

Use NAVD88 as vertical datum and NAD83 as horizontal datum

1-3.03 DRAFT STANDARDS

1) Drafting Software - Plans shall be prepared using AutoCAD™ Release 2000 or later. Hand drawn submittals (including corrections or alterations) and pasted pieces will not be accepted.

2) Symbols - Use the standard Washington State Chapter of the APWA symbols as supplemented by current City Standard Details.

3) Standard Plan Sizes - All site civil plans shall be on 22"×34" paper.

4) Type of Paper – Construction plan should be on standard drafting paper. As-built plans shall be printed directly on Mylar to the same standards as the original plans. No hand correction, whiteout, or pasted pieces are allowed.

5) Ink and Screening – Plans shall be black ink prints. Screen the base map which shows existing improvements.

6) All existing and proposed improvements shall be located and dimensioned with datum to City of Arlington survey monuments, monument lines or road centerlines. Dimensioning must be completed by stationing and offset from these control lines.

7) Monuments - At least two (2) monuments shall be shown for each street in the plan view. Show coordinates (northing and easting) and descriptions for each monument, bearings and distances between monuments for each road.

8) Bench Marks – Show locations and elevations of permanent and temporary bench marks to be used for vertical control during construction.

9) Stationing – Stationing on plan and profile shall proceed from left to right or from bottom to top if possible.

10) Plans shall be prepared with all utilities, existing and proposed, shown on all sets of plans. For example, on the water plans, the sanitary sewer and storm drain shall be shown half toned with the water portions being heavily highlighted.

11) Plan/Profile - All site civil plans for road improvements and utility systems shall be prepared in a plan/profile format. Drawings shall be laid out in a logical order for easy understanding. Plans will not be approved if the layout is considered confusing. It is advisable to discuss plan layout for a large project at the pre-design meeting. The plan view and profile for the same segment of work shall be shown on the same plan sheet. The profile shall be located and oriented directly below the plan view whenever possible. Plans and profiles may be shown on separate sheets with prior approval by the City Engineer.

12) Scale - Indicate scales in the drawing area and title block on each sheet, utilizing a consistent format. Bar scales shall be used in drawing areas for plan reproduction integrity. The horizontal scale for plan and profile sheets shall be 1” = 10’, 1” = 20’, or 1” = 30’. Drawings at horizontal scales of 1”=40’ or 1”=50’ may be used for simple utility plans if approved by the City. The vertical scale for profiles shall be 1” = 5’ (or 1”=10’ for steep slopes). Architectural scales will not be accepted.

13) Match-lines - Match lines with matched station and sheet number shall be provided where the plan is drawn on two or more sheets. Where the plan is shown on three or more sheets, include a total site plan index map at scale 1” = 100’ or 1” = 200’ to cross reference the portions of the project with their corresponding plan sheet location.

14) Plan View Information - The plan view shall indicate and identify all existing and proposed buildings, structures, utilities (water, sewer, storm drain, power, phone, gas, fiber optics and cable TV), road/street, right-of-way, easements, curbs, gutters, driveways, sidewalks, planters, streams, wetlands, mailboxes, traffic signs, street lighting poles, power poles, topographic data, and other known physical features within

the project area, which may affect the design and construction of the project. Pipes greater than 12 inches in diameter may be drawn in its actual width depending on the scale. Existing or proposed wells and septic systems within 100 feet from the property must be shown on the plans.

15) Profile Information - Profiles shall accurately show existing and finished grades. All existing and proposed utilities shall be shown. Each utility crossing shall be accurately depicted or a calculated clearance shall be shown. All physical characteristics of the utilities shall be shown true to scale. This shall include, but is not limited to, waterline deflection, fittings, valves, fire hydrants, blow-offs, air valves, pipe length/diameter/material, pipe slope, stormwater catch basin inverts, sewer manhole inverts, etc.

16) Division/Phase Lines - All division or phase lines shall be indicated showing proposed limits of construction.

17) Whenever possible, use notes specifying City Standard Detail numbers for common items such as catch basins, manholes, fire hydrant assemblies, water services, blow-offs, air/vacuum valves, etc.

18) Show the existing and proposed right-of-way and channelization of all roads that front the proposed development. Show contours, road improvements, including all curb cuts within two hundred (200) feet of the subject property, on both the adjacent properties and the properties across the road that front the proposed development.

19) Show complete data for the curb radii, utility locations (proposed and existing), curb elevations, road stationing, road widths, existing adjacent improvements, elevations of existing road improvements, utilities, etc.

20) Existing and proposed topography contours shall cover the entire site and minimum of thirty (30) feet beyond the site boundary, existing topography should be screened. Topography contours shall be shown at 2-foot intervals (5-foot intervals for slopes greater than 15% and 10-foot intervals for slopes greater than 30%). Elevations shall be labeled at a maximum of 10-foot intervals.

21) Right-of-Way, Easement, and Property Data - Show and clearly label property lines (with distances and bearings), lot numbers, plat names, right-of-way lines, road names, sensitive areas and set backs, and all existing easements with their recording numbers, and proposed easements.

22) Road Names – Official road names provided by the Building Official in the project shall be used if known. Otherwise, name road by letters (such as Street A, Road B, Tract C, etc.) in construction plans. Official road names shall be included in as-built plans. If the road is private, it shall be identified as such.

23) Engineer Stamp – Plans shall be prepared by a Professional Engineer with current registration in the State of Washington. All plan sheets submitted to the City for review shall be stamped, signed and dated by the Professional Engineer. If all the details shown in a construction detail sheet are the City Standard Details, the Engineer may include a note:

"BY STAMPING AND SIGNING THIS PLAN SHEET, I CERTIFY THAT ALL THE DETAILS SHOWN HEREIN ARE CITY OF ARLINGTON STANDARD DETAILS CURRENT AS OF THE DATE OF SIGNATURE AND THEY ARE NOT ALTERED OR EDITED BY ME OR ANYONE ELSE TO THE BEST OF MY KNOWLEDGE".

1-3.04 REQUIRED DRAWINGS

The number of plan sets specified on the applicable intake checklist and 2 copies of the Storm Drainage Report and Geotechnical Report (if applicable) are required at the time of site civil plan submittal. Generally the following items shall be included in the plan set. Additional elements may be required depending on project requirements:

1) Title Sheet.

2) Site Topographic and Horizontal Control Plan.

3) Temporary Erosion and Sedimentation Control Plan.

4) Grading Plan (separate cross-sections are required for all proposed road construction. Distance between cross section locations shall be typically 50 feet on stations or as determined by the City, based on site topography).

5) Road Improvement Plan.

6) Storm Drainage Plan (may be combined with Road Improvement Plan).

7) Water Distribution Plan.

8) Sanitary Sewer Plan (may be combined with water plan).

9) Composite Utility Plan.

10) Landscaping Plan.

11) Structural Plan.

12) Channelization and Signage Plan.

13) Illumination Plan.

14) Traffic Control Plan.

15) Details and Specifications for the above improvements, including duplicate copies of all standard drawings referenced on the plan and in the notes.

1-3.05 TITLE SHEET

The use of standard title sheets and title blocks developed by the City are strongly recommended. These files in AutoCAD™ format are available on the City's web site at HTTP://WWW.CI.ARLINGTON.WA.US/.

A summary of quantities for all work within the public right-of-way or in easements granted to the City shall be listed on the title sheet or on the first sheet of all plans. The following list can be used as a guideline for the items to be listed but is to be supplemented as necessary for a particular project.

Table 1-1 Summary of Quantities

ITEM	QUANTITY	UNIT
New Impervious Area (list both public & private)		**SQUARE FEET**
Ductile Iron Water Main (Size)		**LINEAR FEET**
Fire Hydrant Assemblies		**EACH**
Gate Valves (Size)		**EACH**
Water Main Blow-Offs		**EACH**
Water Main Air/Vacuum Valves		**EACH**
Residential Water Services		**EACH**
Non-Residential Water Services (≤ 2")		**EACH**
Non-Residential Water Services (≥ 3")		**EACH**
PVC, HDPE or DIP Sewer Main (Size)		**LINEAR FEET**
Sewer Manholes (Type)		**EACH**
Side Sewer (Size)		**EACH**
Storm Drain Pipe (Size)		**LINEAR FEET**
Catch Basins (Type)		**EACH**
Storm Drain Manholes (Size)		**EACH**

1-3.06 SITE TOPOGRAPHIC AND HORIZONTAL CONTROL PLAN

Show all existing underground, surface improvements and topography in proximity to the project. The information must be shown for the full width of the right-of-way or the easement and for a sufficient distance on either side of the right-of-way or easement to show possible impacts on adjacent properties and/or the relationship to related facilities (typically 200 feet). Show adjacent property owners, tax parcel numbers, lot numbers, and name of plat or development.

Information on existing surface and underground City of Arlington utilities may be obtained from the Public Works Department. Other utility information may be obtained from the respective utility owners (i.e. Snohomish County PUD, Verizon, Comcast, Olympic Pipe Line Company. Puget Sound Energy, City of Marysville, etc.).

Stationing shall be provided on all centerlines and reference lines. All intersecting road centerlines, utility crossings, right-of-way lines, property lines, railroad crossings, drainage structures, signal and light poles shall be referenced by station and offset. Curve data shall be provided for roadway centerline and right-of-way curves. All PC's, PT's, PRC's, PCC's and AP's shall be stationed and offset.

1-3.07 TEMPORARY EROSION AND SEDIMENTATION CONTROL PLAN

The temporary erosion and sediment control (TESC) plan shall show the following:

1) Existing and proposed topography.

2) Clearing limits and silt fence.

3) Location and details for construction entrance.

4) Specify the construction sequence.

5) Provisions for perimeter runoff control at property boundaries.

6) Show all cut and fill slopes.

7) Provide all necessary details to illustrate the intent of the TESC plan.

8) Show interim catch basin sedimentation protection.

9) Show all drainage pipes and ditches. Include pipe inverts, minimum slopes and cover, and ditch grades and dimensioning.

10) Specify areas to receive special treatment such as jute matting, rock lining, sod, mulching and seeding.

11) Provide all necessary dimensioning and details for sediment traps, berms, pond storage, pond outlet structure, filtering devices, inlet/outlet stabilization techniques, control/restrictor devices, rock check dams, silt fences, pond inlet baffles, and other design elements.

12) In addition, the plan shall comply with the regulations listed in the *DOE Stormwater Management Manual*.

1-3.08 GRADING PLAN

The site grading work shall show all existing and proposed contours, and may be incorporated or combined with the Road Improvement Plan.

Provide road cross-sections at maximum 50 foot intervals and major topographical features (closer spacing may be required based on conditions) to ensure that proposed improvements will correspond with existing conditions, and with AMC requirements for improvements. Provide spot elevations at centerline of roadway, edge of existing asphalt, and face of proposed curb. Show retaining walls and elevations at the top and base of retaining walls at fifty (50) feet intervals with a minimum of two (2) call-outs per wall. Provide quantities of the cut and fill.

Show the location of rockeries and include section details for rockeries in grading plans.

1-3.09 ROAD IMPROVEMENT PLAN

Roadway Improvements include but are not limited to paving, curbs, gutters, sidewalks, planter strips, driveways, curb ramps, storm drainage structures, street lighting, traffic signals, traffic signs, channelization and landscaping plans.

1) Establish a base line or centerline adequately dimensioned from at least 2 known reference points or monuments approved by the City.

2) Adequately dimension all improvements off of the established base line or centerline.

3) All plans shall be stationed, with true point of origin for stationing dimensioned from monument. If 0+00 stationing point does not coincide with the monument, tie in with station equation.

4) When possible, road improvements in the right-of-way should have profile drawing beneath plan view.

5) Provide adequate information on roadway geometry, including PC, PT, PRC, PCC, AP, radius, curve angle, tangent length, curve length and all other information required to adequately establish the geometry. Provide adequate information on roadway profile, including vertical curve approach grades, length of vertical curve and all other information required to adequately establish the profile.

6) Provide spot elevations and slope call-outs where improvements abut with existing pavement. Show top of curb elevation at suitable intervals along curb line, and all break in grades. If the plan is separate from the profile, show top of curb elevation at all curb returns at intersections and at the back of cul-de-sacs.

7) Provide profile drawings for all private roads and for driveways with slope exceeding 5%.

8) Show bearings for all proposed roadway alignments.

9) Clearly label existing and proposed right-of-way and dimensions.

10) Show all existing and proposed easements as required on plans.

11) Show the mailbox locations and details in the road plan, channelization, signage plan, or landscaping plan. These drawings shall be reviewed and approved by the U.S. Postmaster (Arlington Station) before installation.

A "Driveway Schedule" shall be provided for a proposal with 3 or more proposed access points. The schedule shall list all of the driveways, both residential and commercial being constructed and shall include the following information pertaining to each driveway, in tabular form:

1) Location of driveway.

2) Width.

3) Length.

4) Surface type.

5) Profile grade (drawing maybe required).

6) Separation distance on either side of a driveway to nearby driveways or intersections.

1-3.10 STORM DRAINAGE PLAN

Use plans and profiles to show storm drainage facilities.

1) Label sequential number, type, size, station, offset from baseline, rim elevation, and invert elevations of each catch basin and manhole.

2) Label pipe length, size, material and slope in both the plan and profile.

3) Include flow direction arrows at the end of pipes entering the catch basins and manholes in plan view.

4) Include benchmarks on the plan.

5) Show spot elevations of the pavement in parking lots and runoff flow direction arrows.

6) Show roof leaders and footing drains connecting into conveyance system.

7) Show all stub-out locations for future connections.

8) Show the following for all stormwater detention facilities:

   - Show and label at least two cross-sections through the detention pond. One cross section shall show the control structure.

   - Show the location and details of emergency overflows and spillways.

   - Provide invert elevations of all pipes, inlets, tanks, vaults and spot elevations of the pond bottom. Label the pond volume, dimensions and design surface elevation.

   - Provide plan and section views with details of all rock protection and energy dissipaters.

   - Section and plan view of flow control structure must be shown with adequate detail, including size and elevation of orifices.

   - Show length, width, as well as the bottom width for all bio-filtration and water quality swales along with stormwater conveyance swales. Include sectional view, showing side slopes and design depth of flow.

   - Include seeding material information.

- Show types or classifications of streams and/or wetlands adjacent to the project or receiving stormwater from the project.

1-3.11 WATER DISTRIBUTION PLAN

Use plans and profiles to show proposed water distribution facilities. Profiles may be waived if approved by the City Engineer (depending on the length of the water main, variation of the ground elevations, and utility conflicts).

1) Label all existing water main size and material (e.g., EX. 8 inch DI). Show all existing fire hydrants, meters, and other appurtenances.

2) Show "before" and "after" connection details for the water main connections.

3) For utility crossings which involve vertical offsets in the water line, provide details showing the crossing, including vertical bends, blocking, shackle rods, and pipe invert elevations.

4) Label all types of fitting connections (MJ = mechanical joints, FL = flanged, PE = plain end, RJ = restrained joint).

5) Fire hydrants shall be free and clear of all obstructions, including landscaping or other interferences, for a minimum of 3 feet of clearance around the hydrant.

6) Standard Water Notes are required.

1-3.12 SANITARY SEWER PLAN

Use plans and profiles for all proposed sanitary sewer.

1) Existing Sanitary Sewer - Label all existing sewer main size and material (e.g. EX. 12 inch PVC SS).

2) Proposed Sanitary Sewer - Label proposed sewer mains including pipe length (measured horizontally from center of manhole to center of manhole), size, material and slope in plan and profile (e.g. 150 L.F. 8" PVC @ 0.50%). Slope is calculated based on I.E. OUT of upstream manhole, I.E. IN of downstream manhole, and horizontal distance between centers of the manholes.

3) Use arrows at the end of pipes entering manholes to show sanitary sewer flow directions in the plan.

4) Manhole - Label all proposed manholes and cleanouts in sequential order. Label station, offset from baseline, rim elevations and invert elevations and manhole size and type in both the plan and profile.

5) Utilities Crossing - Where a sewer main crosses or potentially conflicts with other utilities, show the location and pipe elevation in the plan with clearance in the profile.

6) Sewer Stubs - Show all sewer stub locations for future connections and side sewer connection stubs.

7) Side Sewer - On the plan, indicate the station of side sewer tee from nearest downstream manhole. Indicate the length of the side sewer stub from main to plug at the end of the line. Label invert at the plugged end of the stub.

8) Standard Sanitary Sewer Notes are required.

9) Other Utilities - Other existing and proposed utilities shall be shown in the plans and profiles if the information is available.

10) Pavement Restoration - If working in existing roadways, indicate the type of pavement restoration required, or refer to the right-of-way permit.

11) At connection to the existing sewer system, add a note "Contractor shall physically plug all new sewer connections until all tests have been completed and the City approves the removal of the plugs".

1-3.13 COMPOSITE UTILITY PLAN

Include a composite utility plan sheet showing existing utilities (half tone) and all proposed utilities. The composite utility plan shall show underground utilities and associated surface improvements that include the locations of sewer and storm drain laterals, water meters, fire hydrants, street lighting standards, traffic signal poles, mail boxes, transformers, telephone risers, utility vaults, etc. to establish clearances. Underground utilities of concern include sanitary sewer, storm drain, water, power, cable TV, telephone, street lighting, traffic signal wiring, gas, and overhead electric/telephone/cable facilities. Show locations of relocated overhead utilities and poles where applicable.

1-3.14 LANDSCAPING PLAN

The development of landscaping is to conform to the basic concepts and principles set forth in the AMC and these Standards. A copy of the Zoning Code is available for review from the Permit Center.

In consideration of providing adequate sight lines for visibility, all plans with center boulevard medians shall have plantings so as to minimize sight obstructions. In addition, no one shall plant any vegetation, erect any structure, or perform any action which results in obstructing the view of a fire hydrant for a distance of 10 feet on either side of the fire hydrant along the roadway. The owner/occupant of any area in which a hydrant is located shall be responsible for removing weeds and tree growth from around the hydrant for a distance of no less than 10 feet.

Landscaping plans for critical areas or their buffers must be reviewed by the Natural Resources Manager.

1-3.15 STRUCTURAL PLAN

Structural plans shall be prepared by a Professional Engineer licensed in the State of Washington.

1-3.16 CHANNELIZATION AND SIGNAGE PLAN

Channelization and signage plans may be combined with the Road Improvement Plan.

1-3.17 ILLUMINATION PLAN

Street light pole locations must be shown in the site civil plans. Street light plans shall be prepared in accordance with PUD Standards and approved by PUD. The Developer shall provide the City with a copy of the approved street light plans before site civil plan approval.

1-3.18 TRAFFIC CONTROL PLAN

Traffic control plan may be prepared by the Developer's Engineer as part of the site civil plan submittal, or by the Contractor before construction starts. All traffic control plans shall comply with *MUTCD* and be reviewed and approved by the City prior to initiating any work.

1) General

   The Contractor shall conduct their operations so as to offer the least possible obstruction and inconvenience to the public and shall have under construction no greater length or amount of work than they can prosecute properly with regard to the rights of the public. The Contractor shall not open up sections of the work and leave them unfinished, but shall finish the work in progress as practicable.

   Unless otherwise approved in writing by the City Engineer, all public traffic shall be permitted to pass through the work with as little inconvenience and delay as possible. The Contractor shall keep existing roadways with streets adjacent to or within the limits of the project open to the public in addition to being maintained in a good and safe condition for traffic at all times. The Contractor shall remove any deposits or debris and

shall repair any damage resulting from their operations. Convenient access to driveways, houses and buildings along the line of work shall be maintained. Emergency access shall be maintained to all residences and businesses at all times unless special arrangements have been prepared by the Contractor and approved by the Fire Chief prior to starting work.

2) Detours, Lane and Road Closures

Approval must be received from the City Engineer in advance for all proposed detours, lane and roadway closures. A formal traffic control plan complying with the *MUTCD* shall be submitted for review at least ten (10) working days prior to a scheduled closure.

Longer review times may be necessary where notices to the public are required. The City will give 48 hours advanced notification to the Police, Fire, Postmaster, School District, solid waste provider and Community Transit to allow advance planning of travel routes. Roadway closures shall require the posting of an advanced roadway closure sign placed for each direction of affected travel seven (7) days in advance of the closure.

3) Haul Routes

The City shall have the authority to determine truck haul routes related to grading/construction activities. Where reasonable alternative routing of construction related vehicles can occur to the arterial system as determined by the City, the approved haul routes may be conditioned so as to minimize construction related impacts on residential roadways or other roadways not intended for heavy truck use.

4) Flaggers, Barricades and Signs

Licensed flagger(s), barricades and signs shall conform to the requirements established in the latest edition of the *MUTCD*. The Contractor shall prepare a traffic control plan showing the required construction signing, barricades and flagger(s) for the project. The plan shall be submitted to the City Engineer at least ten (10) working days in advance for review and approval for signage and barricades to be required. All equipment and materials required for traffic control shall be furnished, installed and maintained by the contractor to the satisfaction of the City Engineer.

During construction activity at signalized locations, an off-duty, uniformed police officer shall be required at all times the signal or beacon is turned off, or when the traffic signal indicator is countermanded or if the City Engineer determines it is necessary for traffic control. Officers are also required for new traffic signal work. A uniformed police officer shall be provided at the expense of the Developer. For information on police officer availability, call the City of Arlington Police Department at 360-403-3400.

1-3.19 EASEMENTS

Utility improvements that are to be part of the public system and represent part of the City's capital improvements shall be constructed in the public's right-of-way or easements. Easements to accommodate utilities shall also be provided for projects which require new roadway construction or widening of existing roadways. This shall include subdivisions, short plats, planned unit developments, binding site plans, and certain building projects. The Zoning Code may establish additional requirements for right-of-way dedications, setbacks, and site improvements.

A permanent non-exclusive easement shall be reserved for and granted to all utilities (and their respective successors and assigns) serving the Developer's project. The exterior easement shall be ten (10) feet wide, located parallel to and contiguous to the road right-of-way, across the frontage of all lots, tracts, and common areas. The utility companies may use the easement to install, lay, construct, renew, operate, maintain and remove underground conduits, cables, pipes, and wires, together with other necessary facilities and equipment. The easement shall provide right-of-entry upon the easement at all times for maintenance and repair of necessary facilities. Utility easements shall not be located lineally in critical areas or their buffers, but if necessary they may be allowed to cross through perpendicularly in a manner not impacting naturally occurring functions.

All other easements for public utilities shall be a minimum of fifteen (15) feet in width. The City may require greater easement width to accommodate larger pipe sizes, deeper cover depths, access needs, or other special requirements.

All easements shall have a five (5) foot minimum building setback line (BSBL) from each edge of the easement. BSBL from vegetated stormwater easements shall be fifteen (15) feet for natural vegetation. All easements shall be located to run within single lots adjacent and parallel to property lines rather than being split by a lot line, unless otherwise approved by the City due to special circumstances. No permanent structures are allowed to be constructed within the easement area.

Landscaping within easements shall be restricted to low growing, non-invasive type shrubs, grasses, beauty bark, etc. In addition, paved vehicular access will be provided to all manholes, except as specifically approved by the City Engineer.

All easements shall be dimensioned and accurately drawn on the construction plans and as-built plans. All easements not directly related to the recording of a final plat shall be recorded before final plat, or project is accepted, or before any Certificates of Occupancy are issued. The following information shall be provided to the City for the examination of all easements:

1) A legal description(s) of the easement certified by a licensed Professional Land Surveyor.

2) A current title report covering the properties to be encumbered by the easement.

3) A scaled drawing on a letter size sheet (8½ inch x 11 inch) shall accompany all legal descriptions, showing the easement in a clear and legible manner, with bearings and distances along all sides, the center line and distances to any visible physical appurtenances such as fences and structures.

The following information shall be provided to the City on the construction plans for the examination of all easements:

1) Easement width and location.

2) Location of the utility within the easement.

3) Distance from the utility line to the easement centerline.

4) Water mains, sanitary sewers, and storm drain lines shall normally be located at the center of the easement.

5) AF# of easements.

6) Label all easements granted to the City as "Public Utility Easement" (e.g., 15' Public Utility Easement to the City of Arlington).

Easements granted to the City of Arlington for the placement of public utilities shall be on the City's standard easement form. The easements shall be recorded with the County after acceptance of the dedication is acknowledged on the face of the document by the appropriate City official.

If the easements dedicated to the City are in a plat located in unincorporated Snohomish County, the easements may be recorded in the County plat or recorded separately. If the Developer chooses to record the easement in the County plat, the Developer shall,

- Show the City easements and include proper easement language on the face of the plat,
- Provide a signature line for the City Engineer's approval of the easement, and
- Submit four (4) copies of the plat for the City Engineer to review.

The City Engineer will sign off on the County's plat after obtaining the authorization from the City Council.

1-4 GUARANTEES, BONDS AND INSURANCE

Guarantees in the form of performance and maintenance bonds and insurance will be required for all public works improvements.

Acceptable methods of performance guarantees will be as follows:

1) Performance Bond.

2) Assignment of Funds.

Standard forms of the above referenced documents acceptable to the City will be available from the Permit Center. Changes or substitutions for the above noted forms will require advance review and approval by the City Attorney. The Developer will be responsible for all legal expenses incurred by the review. A written request for deviation to the standard form may be presented to the City.

The Developer shall provide a detailed cost of construction estimate to the City, prepared by a Professional Engineer licensed in the State of Washington, for the cost of improvements based on the approved plans. The estimate shall itemize descriptions, quantities and unit costs. The submitted data will be reviewed by the City for use in establishing the bond amounts. The bond amount will equal one hundred and fifty percent (150%) of the approved Engineer's cost of construction estimate. The estimate shall be provided during the initial site civil permit submittal.

1-4.01 PERFORMANCE BONDS

Performance bonds will be required for all improvements located in the public right-of-way, including all roadway, utilities and drainage construction as detailed on the approved plans. Performance bonds will also be required for all City utility improvements in easements. Following is a summary of typical bonds required;

- Road / Alley (Public)
- Drainage / Grading (Public)
- Utilities (Public)
- T.E.S.C. (Private and Public)

The initial guarantee and subsequent extensions will be limited to 2 year increments. If time extensions are approved, the bond amount shall be revised to reflect inflation and/or other cost impacts.

Before the City will release the performance bond or surety, the Developer shall:

1) Dedicate right-of-way to the City is required.

2) Record all easements with the County.

3) Request a final inspection, complete and obtain approval on corrections as identified by the City Inspector.

4) Provide Mylar and electronic copies of as-built plans.

5) Provide the Bill of Sale for water utility, sanitary sewer utility and/or storm drainage utility.

6) Post a maintenance bond or other surety accepted by the City as described in Section 1-4.02.

1-4.02 MAINTENANCE BONDS

Maintenance bonds will be required at the time of final acceptance of the constructed public works and/or improvements required by City ordinance. The maintenance bond amount will be equal to twenty percent (20%) of the documented final cost of the improvements. The maintenance bond must be in place prior to the City's release of the performance bond. Methods of posting a maintenance bond shall be the same as for performance bond and shall be for two (2) years.

1-4.03 INSURANCE

Certificates of insurance shall also be provided by the Permittee, the Developer, and/or the Contractors on forms approved by the City Attorney prior to issuance of permits for construction. The insurance shall be in the amount of $1,000,000.00 per occurrence. The Certificate of Insurance shall name the City of Arlington as additional insured and shall not be cancelable without thirty (30) days prior written notice to the City. The surety company shall be authorized to transact business in the State of Washington.

1-4.04 PERMITS

Various permits may be required for an individual project, based upon the scope of the project proposal and conditions established during the pre-application and/or pre-design meetings, or during the permit approval process. The applicant is responsible for submitting all necessary applications accompanied by the required number of plans, details, calculations, specifications, estimates, and bonds as established by the Public Works Department. The applicant shall contact the Permit Center and request a list of submittal requirements prior to applying for City permits.

Proof must be submitted that all contractors and subcontractors are licensed in the State of Washington.

No permit(s) shall be submitted unless the written application for the applicable permit(s) has been completed.

Questions regarding permit requirements should be directed to the Permit Center. Applicants may be required to schedule and attend a pre-application meeting with City staff, depending on the type of project, prior to completing documents for permit submittal.

The approved applicant's copy of all the permit(s), together with a set of plans approved by the City shall be available on the job site whenever work is in progress on any portion of the project.

It is unlawful for any person to exhibit a permit at or about any project not covered by such permit, or to misrepresent the number of the permit or the date of expiration of the permit.

Following is a list of the City permits that may be required for various site civil projects:

1) Right-of-Way Permit.

2) Grading Permit.

3) Utility Permit (Stormwater, Sanitary Sewer and Water).

4) Underground Fire Sprinkler Permit

Other agencies such as those listed below may require review and approval for a proposed project. The applicant shall be responsible to coordinate with those agencies and provide the City with copies of the approval and/or permits. It is the Developer's responsibility to obtain approval/permits not listed here.

Agency	**Permit/Approval**
Developer/Local Agency Agreement	WA State Department of Transportation
Construction Plan Approval	WA State Department of Transportation
Channelization Plan Approval	WA State Department of Transportation
Right-of-Way Permit	WA State Department of Transportation
Construction Stormwater Permit	WA State Department of Ecology
Short Term Water Quality Modification	WA State Department of Ecology
Industrial Stormwater Permit	WA State Department of Ecology
Underground Injection Control Permit	WA State Department of Ecology
401 Water Quality Permit	WA State Department of Ecology
Hydraulic Project Approval (HPA)	WA State Department of Fish & Wildlife
Grading in Cultural Areas	WA State Office of Historic Preservation

Grading in Cultural Areas	Stillaguamish Tribe
Section 10 Permit	U.S. Army Corps of Engineers
Section 404 Permit	U.S. Army Corps of Engineers
On-Site Sewage and Well Permits	Snohomish County Health District
Right-of-Way Permit	Snohomish County Public Works
Street Light Plan Approval	Snohomish County PUD
Water/Sewer Permits	City of Marysville Public Works
Mailbox Approval	U.S. Postmaster (Arlington Station)

1-5 LEGAL RELATIONS AND RESPONSIBILITIES

The permittee shall at all times comply with all Federal, State and Local laws and ordinances, and any regulations which in any manner affect the project.

The permittee and their contractor shall release, indemnify and promise to defend and hold harmless the City, its officers, employees and consultants from and against any and all liability, loss, damage, expense, actions and claims, including costs and reasonable attorney fees incurred by the City in defense thereof, asserting or arising directly or indirectly on account of any violation of laws, ordinances or regulations whether such violations are by the contractor, their subcontractors, their employees, or their agents.

1-6 CONSTRUCTION HOURS

Except in the case of emergency or unless otherwise approved by the City, per AMC 11.01.120, the normal hours for construction and development activity, or operation of any heavy equipment shall be between 7:00 am and 7:00 pm, Monday through Saturday. No construction is allowed on Sunday or the following City recognized holidays.

New Years Day
Presidents Day
Independence Day
Veterans Day
Martin Luther King birthday recognition
Memorial Day
Labor Day
Thanksgiving and the Friday after
Christmas Day

1-7 CONSTRUCTION INSPECTION

1-7.01 PRE-CONSTRUCTION CONFERENCE

A pre-construction conference shall be held at the City prior to any construction work being performed by the Developer. Prior to the pre-construction meeting, the Developer shall have in their possession, construction plans approved by the City, performance bond, and all required City permits, which may include but not be limited to right-of-way permits, grading permits and underground fire sprinkler permit necessary to perform the work. The Contractor shall also have any and all permits required by other outside agencies.

The person who will be responsible for completion of the work shall be present during the entire pre-construction conference. It is the Developer's responsibility to contact the Permit Center to schedule the pre-construction conference.

1-7.02 MATERIALS SAMPLING & TESTING

It shall be the responsibility of the Developer to provide test reports certified by a Professional Engineer licensed in the State of Washington to verify compliance of materials used in the project. Sampling and/or testing shall be at a frequency and magnitude determined by the City. Copies of all test reports shall be furnished to the City Engineer. All costs incurred for testing or sampling, as required, shall be the responsibility of the Developer.

1-7.03 INSPECTION OF WORK

Construction or improvement work performed within the City, whether on private property or within the public right-of-way, shall be completed in accordance with the approved plans and specifications to the satisfaction of the City.

No work shall be started until such plans are approved. Any revision to such plans shall be submitted by the Developer's Engineer to the City Engineer for approval prior to performance of the work.

The City Engineer and other City officials will have the authority to enforce these Standards as well as other referenced or pertinent specifications and will appoint project engineers, assistants and inspectors, as necessary, to inspect the work for compliance.

The Contractor shall give the City timely notice that the work, or any part thereof, which has been constructed and is ready for inspection. In no event shall the work or any portion thereof, be covered up or placed into operation until the City Inspector has directed otherwise. If any work has been covered up without prior inspection or authorization by the City Inspector, it may be dug up for inspection at the discretion of the City Inspector, at the Developer's expense.

For inspections required on private property due to issuance of permits by the City, the City retains the right to enter the subject property at reasonable times for purposes of inspection for compliance with permit conditions. The Contractor shall provide access for the City Inspector.

To ensure the Inspector's safety and access during these inspections, the Contractor shall provide any equipment needed, such as walkways, railings, ladders, and platforms. When the City Inspector requests the Contractor shall (without cost to the City) provide samples of materials used or to be used in the work. Inspection by the City does not relieve the Developer/Contractor of their obligation to furnish satisfactory material and workmanship.

If at any time during construction the City finds that the Contractor is not adhering to these Standards, the City Inspector has the right to stop work on the project until full compliance has been met.

1-7.04 FINAL INSPECTION OF WORK

All materials and completed work shall, before acceptance by the City, be subject to final inspection by the City Inspector.

Prior to final acceptance, all items as identified by the City Inspector, needing additional work shall be completed and re-inspected to the satisfaction of the City Inspector.

1-8 PROTECTION OF PROPERTY AND UTILITIES

1-8.01 PROPERTY

The Contractor shall protect and preserve from damage, interference and destruction all private and public property on or in the vicinity of the work. If such property is damaged or destroyed or its use interfered with by the Contractor or their agents, it shall be restored immediately to its former condition or better by the Contractor at their expense and such interference terminated.

1-8.02 UTILITIES

The Contractor shall protect from damage to private and public utilities, including telephone lines, cable television lines, power lines, sewer, water lines, storm drain, railroad tracks, street lighting, traffic signals, and similar facilities. Before beginning any excavation, the Contractor shall provide notice of commencement to all owners of underground facilities through the one-call locator service, phone number 1-800-424-5555; or notice shall be given to all individual utility owners. Such notice shall not be less than two (2) and no more than ten (10) business days before the scheduled date of excavation.

1-9 SITE MAINTENANCE

The Developer and Contractor shall schedule and control their work so as to prevent all hazards to public safety, health and welfare.

1) The Developer shall ensure that no project-related dust, dirt, or construction debris remains on any public roadway. Roadways shall be cleaned of dirt and debris, on no less than a daily basis, at the end of each day. In addition, the Developer shall supply a roadway sweeper to clean up public roadways, which have been burdened by the project's construction debris, within twenty-four hours of verbal or written notice by the City.

2) Pedestrian facilities shall be kept free of obstruction, and continuity shall be maintained at all times unless otherwise approved by the Department of Public Works.

3) On existing roadways, two-way traffic shall be maintained at all times unless lane closures or detour plans have been approved in advance by the City.

4) Pedestrian and vehicular access to occupied buildings shall be maintained at all times except where approval from the building owner has been obtained.

5) Access to mail boxes shall be provided during construction.

6) City owned infrastructure (i.e., manholes, fire hydrants, valve boxes, meters, etc.) shall be accessible at all times.

7) Contractor shall protect the City's storm drain system, streams, and wetlands from sediments. Any critical areas or their buffers impacted by construction shall be restored by the Developer/Contractor at their expense.

1-10 ASBESTOS CONTROL

The Contractor shall refer to *Puget Sound Air Pollution Control Authority (PSAPCA*) Guidelines for identification, inspection, reporting, handling and removal of materials containing asbestos. Asbestos containing material (ACM) may be encountered during a construction project in the form of asbestos cement pipe, pipe insulation, or as insulation in a structure that is being demolished. It can be found in pipe for water and sewer mains, electrical conduits, drainage pipe, and vent pipes, etc. Normal breakage and crushing of the material can cause an asbestos fiber release which presents a serious respiratory hazard. It is imperative that asbestos fiber release be controlled. Citations by regulatory agencies for an asbestos fiber release carry substantial fines.

When required by applicable laws and regulations, the Contractor shall have all asbestos legally removed from the site and properly disposed of by a State licensed Asbestos Contractor in accordance with the practices specified by the *State of Washington Department of Ecology*, Snohomish County Solid Waste Division and all other pertinent State and Federal Regulations. See WAC 296-62-077.

1-11 AS-BUILT DRAWINGS

Before any work is accepted by the City, the Developer or their Engineer shall supply the City with as-built plans (construction corrected record drawings) on Mylar bearing the stamp and signature of either a licensed Professional Engineer or a Professional Land Surveyor and approved by the City Engineer. Paper and electronic copies of the as-built plans shall be provided by the Developer as directed by the City Engineer.

As-built plans shall be prepared based on

1) Construction plans,

2) As-built survey,

3) Contractor's redlines, and

4) City Inspector's review comments.

Sheets containing Temporary Erosion and Sediment Control (T.E.S.C.) Plan, T.E.S.C. Details and Notes, City of Arlington Standard Details, Traffic Control Plan, and Landscaping Plan are not to be included in the as-built plans. In the Index to Sheets on the Title Sheet, the titles of these sheets shall be struck through and labeled as "NOT INCLUDED", for example,

~~SHT. 3 TEMPORARY EROSION AND SEDIMENT CONTROL PLAN~~ (NOT INCLUDED)

~~SHT. 8 SANITARY SEWER STANDARD DETAILS~~ (NOT INCLUDED)

As-built corrections shall be done by striking through the original design information and adding the correct as-built information using bold face letters/numbers.

The Developer's Engineer shall submit as-built plans printed on standard drafting paper to the City for review. The City will notify the Developer's Engineer to submit as-built plans on Mylar as well as the electronic copy, if the submittal is approved. After the City Engineer approves the Mylars, the City will direct the Developer or Developer's Engineer to submit paper copies of the signed as-built plans.

The electronic format of the as-built plans shall be in AutoCAD™ Release 2000 or later ".DWG" files. Zipped or compressed files will not be accepted. The AutoCAD™ files shall include all plans, profiles, notes, x-reference files, and details of the system extension. The plot style table (pen assignments) file shall also be included so that the drawings are reproducible at the City. The electronic copy shall match the Mylar and paper copies.

As-built plans shall be considered an item on the Contractor's punch list. The project will not be accepted or approved by the City until the as-built plans are submitted and approved.

1-12 PROJECT ACCEPTANCE

The following items shall be completed before the City will accept the project and release the project's performance bond.

1) All right-of-way must be dedicated to the City and recorded; all easements must be reviewed, approved and recorded, if required.

2) All proposed improvements shown on the plans, or required by the land use permit have been completed, tested, inspected, accepted and approved by the City Inspector.

3) The City Engineer shall have received, reviewed and approved the Mylar and electronic copies of the as-built plans.

4) The Bill of Sale has been provided, approved and notarized.

5) The City must receive a satisfactory maintenance bond.

6) The balance of any remaining fees has been paid.

CHAPTER 2

ROADWAY AND RELATED WORK

TABLE OF CONTENTS

2-1 GENERAL REQUIREMENTS

All construction and improvements of roadway and related work, whether public or private, shall be in accordance with the plans approved by the City Engineer and shall be completed to the satisfaction of the City Inspector in accordance with these Standards and the construction permits issued for the project. The AMC and these Standards establish policy for the installation of street improvements. Specific applications may be reviewed with the applicant at a scheduled pre-application conference or will be determined at the time of permit application and/or issuance. In general, except where modified or amended in these Standards, all work and materials shall conform to the latest editions of the WSDOT/APWA Standard Specifications.

2-2 ROADWAY CLASSIFICATIONS

2-2.01 ROAD CLASSIFICATIONS

Most streets are provided a classification by the Transportation Element of the Comprehensive Plan in accordance with the AMC 20.56.010. Where a street is not classified therein, the classification shall be based upon the projected volume of traffic to be carried by the street, stated in terms of the number of trips per day.

The number of dwelling units to be served by the street may be used as an indicator of the number of trips but is not conclusive.

Whenever a subdivision street continues an existing street that formerly terminated outside the subdivision or it is expected that a subdivision street will be continued beyond the subdivision at some future time, the classification of the street will be based upon the street in its entirety, both within and outside of the subdivision.

The City's Official Street Map contained in the Transportation Element of the Comprehensive Plan classifies the City's streets into Principal Arterial, Minor Arterial, Collector, and Local Access.

1) Principal arterials provide for movement across and between large subareas of the City and serve predominantly "through trips" with minimum direct service to abutting land uses.

2) Minor arterials provide for movement within large subareas of the City. They may serve secondary traffic generators and traffic from neighborhood to neighborhood within a large community.

3) Collectors promote the flow of vehicles, bicycles and pedestrians from arterial roads to lower-order roads. Secondary functions are to serve abutting land uses and accommodate public transit. Traffic volumes typically range between 1,000 to 3,000 ADT.

4) Local access roads are designed to convey vehicles, pedestrians and bicycles to and from higher-order roads. Local access roads do not carry through traffic. Traffic volumes of 250 ADT or less are typical.

Typical sections and roadway appurtenances are shown in Standard Details R-010 through R-050. Modifications to the typical road sections may be required to address site specific soil conditions, drainage considerations and vehicle loads. Where higher than normal truck traffic is projected, the developer's traffic and geotechnical engineers should evaluate the adequacy of the proposed section and recommend any additional specific measures necessary to provide a minimum 20-year design life for the new asphalt pavement section. A minimum of 40-year design life is to be used for concrete pavement sections.

2-2.02 RIGHT-OF-WAY AND EASEMENTS

Standard right-of-way widths for road classifications are specified in AMC 20.56.080 and shown in AMC Table 20.56-5. These right-of-way widths shall apply for road design, except where these Standards specify other right-of-way requirements. Additional right-of-way and traffic lanes may be required to accommodate turning movements at intersections and parking as determined through special traffic studies for proposed projects.

Deeded or dedicated right-of-way is required for all public street and roadway improvements in accordance with these Standards, the AMC and the Transportation Element of the Comprehensive Plan. All portions of the traveled lanes, parking lanes, curbs, gutters, sidewalks, medians, bike lanes, trails, drainage facilities and other required public utilities shall be located within the right-of-way.

Where existing right-of-way width is not sufficient for the required improvements, the Developer shall obtain additional right-of-way and arrange for dedication to the City at his/her expense per AMC 20.56.170.

Under certain circumstances, it may be desirable to reduce right-of-way width and locate facilities, such as sidewalks, walkways or trails, in separate tracts of land outside the right-of-way. Such tracts shall be owned and maintained by the homeowners association and guaranteed by covenants recorded with the plat. The recorded covenants shall be referenced on the approved final plat documents.

Easements for the purpose of construction, access, maintenance, sight distance preservation, roadway slopes, and utilities may be required in addition to required right-of-way, and in conjunction with roadway improvements. See Section 1-3 of these Standards for easement requirements. Street landscaping, as required by the City, may be included in the easements. It shall be the Developer's responsibility to obtain necessary easements. When off-site easements are required, they shall be approved and recorded prior to construction plan approval unless otherwise directed by the City Engineer.

Fire accesses into residential short plats shall be regulated by the AMC. If the access is for two dwelling units, the minimum width of access easement shall be 20 unobstructed feet and the minimum width of pavement shall be 12 feet. The access serving three or four dwelling units shall have a minimum of 25 feet of easement and a minimum of 20 feet of pavement. The accesses serving commercial/industrial or multi-family developments shall have a minimum of 25 feet of easement and a minimum of 20 feet of pavement.

2-2.03 BIKE LANES AND TRAILS

Requirements for bike lanes and trails are established in the City Transportation Element of the Comprehensive Plan. Exact locations and widths of bike lanes and trails with respect to sidewalks and road lanes will be determined on a project specific basis. The Director of Public Works will determine final locations, widths, and related requirements. If the required bike lane or trail will not fit within the existing right-of-way available, then the Developer shall obtain, at his/her cost, and/or dedicate to the City additional right-of-way and easements necessary. Design and construction of bike lanes and trails shall conform to AASHTO standards for bike lanes, trails and paths.

2-2.04 UTILITIES

Typical locations of public utilities in roadways are shown on Standard Detail R-060 for design purposes. Deviations from the typical locations in the Standards Details may be proposed by the Developer's Engineer and reviewed/approved by the City. Refer to Chapters 3, 4 and 5 of these Standards for storm drainage, water and sanitary sewer design and construction considerations. Prior to design and construction, the Developer's Engineer or Surveyor shall arrange for underground utility locations to be marked on the ground, surveyed and included on the construction drawings. The Engineer/Surveyor shall also research available utilities records for use during the design, permit and construction process.

2-2.05 PRIVATE STREETS

Unless specifically approved by the Director of Community Development, private streets shall not be allowed, unless they serve four (4) or fewer dwelling units now and in the future as described by the City Land Use Code. Private Streets may be approved only when they are:

1) Located in an established tract providing legal access to each affected lot, sufficient to accommodate the required improvements;

2) Not in conflict with the goals of the City Comprehensive Plan;

3) Not going to result in land locking of present or future parcels;

4) Not needed as public roads to meet the minimum road spacing requirements of the Comprehensive Plan and these or other legal entity made up of all benefited property owners as noted on the face of the plat;

5) Built to the pavement thickness outlined in these Standards;

6) Accessible at all times for emergency and public service vehicles; and

7) Clearly described on the face of the plat as a private street not maintained by the City. After construction the street must be clearly signed as a private street.

2-3 ROADWAY GEOMETRICS

Roadway geometrics within the City shall be in conformance with the guidelines of the American Association of State Highway and Transportation Officials (AASHTO) *Policy on Geometric Design of Highways and Streets* and the WSDOT *Design Manual*. The City reserves the right to determine the final project geometric requirements. All new frontage improvements or other street improvements, whether public or private, shall conform to the minimum design geometrics of AASHTO for safe stopping and entering sight distance requirements consistent with the procedure described in these Standards unless otherwise approved by the City.

2-3.01 BLOCKS

1) The maximum length of the residential blocks in an existing or extended grid system shall be 400 feet; those not in the grid system shall be 1200 feet, and the minimum length should be 400 feet, unless no other practicable alternative is available. Variations from these requirements shall be approved by the Director of Community Development in cases of extreme topography and in multiple family residential, commercial, and industrial developments.

2) The maximum and minimum width of blocks shall be sufficient to provide for two rows of lots with an alley or utility easement. The City Engineer may approve a single row of lots where the lots abut a major arterial, a collector street, a drainage course, a railroad right-of-way or a single row of lots in an abutting subdivision of record.

3) Where blocks are longer than 800 feet in length, and where access to a school, park, or shopping center is necessary, a pedestrian walkway between lots approximately mid-block, with a minimum right-of-way width of 10 feet, may be required by the City. The walkway may require surfacing, fencing, and barriers.

2-3.02 ROAD LAYOUT

Road layouts for new developments shall conform to the Transportation Element of the Comprehensive Plan, AMC Chapter 12, and Land Use Code Chapter 20.56. The arrangement of streets shall meet the following requirements:

1) Provide for the continuation or appropriate projection of existing streets in surrounding areas. This shall include but not be limited to new/completed street linkages compatible with an overall city circulation network to provide improved connectivity of the transportation street system.

2) Conform to a plan for the neighborhood approved or adopted by the Director of Community Development to meet a particular situation where topography or other conditions make continuance or conformance to existing streets impracticable.

3) When a subdivision abuts or contains an existing or proposed arterial street. The City may require marginal access streets, reverse frontage lots with screened vegetation contained in an easement along the rear property line, deep lots with rear service alleys, or other treatment that may be necessary for adequate protection of residential properties and to afford separation of through and local traffic.

4) The principals of traffic calming shall be used for residential access streets where it is determined by traffic study that cut-through traffic is probable and the development will contribute to or exacerbate neighborhood cut-through traffic or speeding.

5) Reserved strips controlling access to streets shall be prohibited except where they can be controlled by the City under conditions approved by the City Engineer. They must also provide access to adjoining undeveloped property as determined by the City.

6) Where a proposed development shall create or cause to exist 49 or more dwelling units (new or combination of new and existing), either single family, multi-family, retirement, or similar, a minimum of two vehicular access points to the street system are required. Such access points shall be located for circulation, alternate emergency vehicle access routes, through access and general area transportation design considerations. The emergency access (crash gate) shall be approved by the Fire Chief and shall not be considered a vehicular access point.

7) Property lines at street intersections shall be rounded with a radius of 10’ or greater if required by the City. The City may permit comparable cutoffs or chords in place of rounded corners.

2-3.03 INTERSECTIONS

1) Angle of Intersection; streets shall be laid out so that intersecting streets are at nearly right angles (80 to 90 degrees) unless otherwise approved by the City Engineer. Not more than 2 streets shall intersect at any one point unless the City Engineer certifies that such an intersection can be constructed with no extraordinary danger to public safety.

2) Grades at Intersections; road grade transitions at intersections shall be designed using vertical curves wherever the grade change exceeds 1%. This includes the transition from the slope of the intersecting road to the cross-slope of the road being intersected.

   For safety reasons, a landing or safe stopping area must be provided before the intersection. The landing may be part of the vertical curve transition between the slope of the intersecting road and the cross-slope of the road being intersected. The standard to be met for an acceptable landing is no more than one foot of elevation change for a distance of 30 feet from an arterial road or 20 feet from a non-arterial road, measured from the ultimate right-of-way line of the road being intersected.

   For low-volume roads (<1,000 ADT) approaching a stop sign controlled intersection, a 20 mph design speed with a minimum vertical curve length of 60 feet may be used for the final curve at the intersection.

3) Centerline Offsets; whenever possible, proposed intersections along one side of a street shall coincide with existing or proposed intersections on the opposite side of such street. In any event, where a centerline offset (jog) occurs at an intersection, the distance between centerlines of the intersecting streets shall not be less than 150 feet. On any street classified as arterial, the distance between centerlines of the intersecting streets shall not be less than 300 feet. Except when no other alternative is practicable or legally possible, no two streets may intersect with an arterial on the same side at a distance of less than 1,000 feet.

4) Every intersection shall be designed to accommodate the design vehicle appropriate for the highest classified street forming the intersection. All elements of the intersection, including turning lanes and channelizing islands, shall be designed so that a design vehicle will not encroach onto curbs, sidewalks, traffic control devices, channelizing islands, or center divisional medians, or encroach into the travel lanes of opposing flow traffic.

2-3.04 CURB RETURN RADII

For the intersection of two residential access streets, the minimum allowable curb radius shall be 25 feet, which is to be measured from the radius point to the face of curb. For the intersection of a residential access street with any collector or arterial, the minimum radius shall be 30 feet.

On all other street intersections, the minimum allowable radii shall be 30 feet, except where high concentrations of pedestrians (i.e. the downtown business core) would encourage smaller radii. The City Engineer may approve a reduced radius to minimize pedestrian crossing length so long as the turn movement is not subject to a high degree of large truck/bus movements.

Radii of 40 feet or more shall be provided where large trucks and buses turn frequently. Radii of 40 feet or more shall be designed to fit the paths of appropriate design vehicles. Larger

radii are also desirable where speed reductions would cause problems. The WSDOT *Design Manual* shall be used as a guide in evaluating such designs.

2-3.05 DEAD END STREETS

Dead end streets shall be avoided. Cul-de-sacs may be used only when conditions warrant their use. Maximizing the number of lots in a project does not warrant their use. When roads have a potential for extending to adjacent properties (either current or future) they shall do so.

Cul-de-sacs shall be provided at all permanent street ends, and/or on any temporary dead end location when the length of the street is more than 150 feet in length. Cul-de-sacs shall be per Standard Detail R-070 and shall not be longer than 600 feet measured from center of cul-de-sac to the nearest street intersection, unless written approval is granted by the Fire Chief and confirmed with the City Engineer. Private access roads serving less than 3 lots do not require a turnaround.

The maximum slope in any direction within a cul-de-sac bulb is 6%. A temporary road end may exceed 6% with the approval of the Fire Chief.

A drop-curb cul-de-sac is a design option that may be used where multiple driveways around a cul-de-sac bulb will reduce the functionality of vertical curbs, planter strips and sidewalks. Where five or more access points are taken around the bulb, vertical curb and planter strips may be eliminated and a drop-curb (1-inch lip) or rolled curb installed around the cul-de-sac.

On temporary dead ends, when the street is less than 150 feet in length, the required turnaround area may be a hammerhead type (see Standard Detail R-080). However, if four or more access points are located within 50 feet of the road end, then a cul-de-sac is required.

2-3.06 ALLEYS

1) The width of an alley shall be as shown in the Standard Detail R-040.

2) Alley intersections and sharp changes in alignment shall be avoided. Corners shall be cut off sufficiently to permit safe vehicular movement if necessary.

3) Dead-end alleys shall be avoided where possible. If it is unavoidable, adequate turnaround facilities shall be provided at the dead-end as determined by the Fire Chief.

2-3.07 HALF STREETS

Temporary three-fourth streets (i.e., streets of less than the full width of right-of-way and pavement width) may be allowed at the discretion of the City under the following conditions.

1) Where such street, when combined with a similar street developed previously, simultaneously, or anticipated to be built within a reasonable time frame on property adjacent to the subdivision, creates or comprises a street that meets the right-of-way and pavement requirements.

2) Where no more than ten (10) dwelling units will use the three-fourth (¾) street.

3) Where a temporary three-fourth (¾) street is allowed, the portion to be built shall be paved, at a minimum, to a width equal to three-fourth (¾) of ultimate paved width. Curb, gutter, sidewalk, landscape strip, and street trees are to be built in conjunction with each respective half-street (½) on the side adjacent to the proposed project.

4) Where a public right-of-way has been or is being dedicated to the City over those portions of the adjacent property to be used as a half-street.

5) When a temporary three-fourth street is eventually completed to a full-width street, the then Developer shall obtain the right-of-way or easements needed to complete the above improvements and reconstruct the street as necessary to produce a full-width street to meet the current City Standards at their expense.

2-3.08 LOTS

Depth, width, area and shape of lots for commercial or industrial purposes will be in conformance with the *City's Land Use Code*. Off-street service and parking facilities may be required by the type of use and development contemplated.

All corner lots shall have additional width to provide for proper yard setback on the side street and provide an adequate building area.

Double frontage lots shall access only one street, except that the City Engineer may approve dual access for lots where it is essential to provide separation of residential development from major traffic arterial or to overcome specific disadvantages of topography. A 20 foot buffer easement with appropriate screening shall be provided along the lot lines of lots abutting an arterial or railroad. There shall be no right of vehicular access across the buffer easement to eliminate traffic conflicts.

When the rear or side of any lot borders a freeway, highway, or parkway, the Developer may be required to provide a 30 foot, Type A landscape buffer for residential use adjacent to such thoroughfare. No lot shall be created which is divided by County, City, school, or other taxing district boundary lines.

2-3.09 DRIVEWAYS

1) The City shall have the authority to restrict the number, size and location of access driveways. In critical on street parking areas, additional off street parking space(s) are required for the on-street parking spaces eliminated by any driveway(s).

2) No driveway approach shall be permitted to encompass any infrastructure. Permit conditions may authorize the applicant to relocate infrastructure, such as valves, hydrants, meters, blow-offs, pump stations, manholes, catch basins, and etc.

3) At intersections, no portion of any driveway approach, including end slopes, shall be permitted closer than four (4) feet to the end of the curb return.

4) Shared driveways are encouraged to minimize the number of access points on arterials. Shared driveway access for more than one parcel may be approved with the contingency that the driveway is jointly owned and maintained, and that covenants, as approved by the City, are established to provide for this maintenance in perpetuity.

5) Driveways shall not be located adjacent to one another in such a manner as to create a “double width” driveway without any landscaping between the driveways.

6) Commercial and multi-family driveway centerlines shall align with opposing driveways or be offset by a minimum of 125 feet, unless otherwise approved by the City Engineer. Driveways on the same side of streets shall have a separation of least 125 feet if possible.

7) Driveways giving access directly onto arterials may be denied if alternate access is available.

8) The width of residential driveway approaches shall not exceed 25 feet unless otherwise approved by the City Engineer. The driveway approach is defined as the area between full sections of a street’s vertical curb that are lowered to allow vehicular access into the property.

9) The width of commercial driveway approaches shall be a minimum of 35 feet and maximum of 40 feet, or otherwise approved by the City Engineer.

10) Commercial driveways located closer than 150 feet from the approach to an arterial intersection may require medians, type "C" curbing, and/or signing to restrict access to safe movements as determined by the City Engineer.

11) The maximum allowable grade for residential driveways shall be 15% per AMC 20.56.070. The maximum recommended grade for commercial driveways is 8%; however, grades up to 15% may be allowed subject to the approval of the Fire Chief and City Engineer. Vertical curves should be used for smooth transitions at significant grade differentials. See Standard Detail R-090.

2-3.10 HORIZONTAL ALIGNMENT

1) Design speed is a speed selected to determine the various geometric design features of a roadway. Design speed shall be used to determine stopping sight distance (SSD) and intersection sight distance (ISD) requirements for new road facilities. A full discussion of sight distance analysis is provided later on in this section.

   Arterial road design speeds are established by the City during project design process. The design speed for a collector is typically 35 mph. The design speed for a sub-collector or residential access is 25 mph.

2) Operating speed is the observed speed of vehicles during free flow conditions. Operating speed shall be the 85th percentile speed of a roadway as determined by recorded data by the Public Works Department. Where circumstances create a safety concern, the City Engineer may direct that a speed study be performed to determine the 85th percentile (85%) speed.

   Operating speed shall be used on existing roads to determine stopping sight distance and intersection sight distance requirements where the traffic volume on the minor road is less than 80 ADT.

3) Horizontal Curve Radii and Superelevation; the minimum horizontal curve design criteria, including curve radii and superelevation, for design speed of 40 mph or less, should be determined using the AASHTO *Policy on Geometric Design*.

   For design speed above 40 mph, horizontal curve design shall comply with Chapter 6 of the WSDOT *Design Manual*.

   A tangent between reverse curves shall be at least 100 feet long on arterial and collector streets, and 50 feet long for residential access streets.

   The maximum superelevation rates allowed for arterial roads, with design speeds of 35 mph or greater, shall be 6% unless otherwise approved by the City Engineer. The maximum superelevation rates for roads with design speeds of 30 mph shall be 4% or as directed by the City Engineer. Superelevation is not recommended for use on non-arterials in the City with design speeds of less than 30 mph.

2-3.11 VERTICAL ALIGNMENT

1) Grades; road grades shall be 0.5% or greater to provide proper drainage. The maximum grade on any new or reconstructed road shall not exceed the limits in Table 2-1. Grade transitions shall be constructed as vertical curves except at new intersections where the difference in grade is 1% or less.

Table 2-1 Maximum Grade

Road Classification	Max. Grade
Arterial	8%
Collector Arterial	10%
Local Collector	12%
Local Access	14%
Alley	14%
Cul-de-Sac	14%
Cul-de-Sac Bulb	6%
Private Access	15%
Pedestrian Way	Per ADA

2) Vertical curves shall meet or exceed the criteria in AASHTO *Policy on Geometric Design* for crest vertical curves and sag curves, to ensure that minimum stopping sight distance is provided.

2-3.12 SIGHT DISTANCE

1) Sight distance criteria established in this section are based upon AASHTO *A Policy on Geometric Design*, 2001 edition.

   Each new intersection or access point connection must meet the stopping sight distance (SSD) and intersection sign distance (ISD) requirements set forth in this Chapter.

   Sight distance requirements in this section are based on passenger car operation and do not account for heavy vehicle operating characteristics. Access points or intersections that will handle significant numbers of heavy vehicles or trucks, as determined by the City Engineer, shall be designed in accordance with Chapter 9 of AASHTO.

2) Stopping Sight Distance (SSD) is the distance needed for a vehicle traveling at or near design speed to stop before reaching a stationary object in its path. The provision of stopping sight distance at all locations along each highway or street, including intersection approaches, is fundamental to intersection operation.

   SSD requirements as shown in Table 2-2 shall be the minimum acceptable values for designing new vertical and horizontal road alignments and evaluating the adequacy of existing vertical and horizontal alignments. Design speed shall be used to determine SSD requirements for new facilities. Operating speed shall be used to determine SSD for existing facilities.

Table 2-2 Stopping Sight Distance

Speed (mph)	Distance, D (feet)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495

Adapted from Exhibit 3-1, A Policy on Geometric Design of Highways and Streets, AASHTO (2001)

When measuring SSD, the height of the driver's eye is assumed to be 3.5 feet and the height of the object to be seen by the driver is 1.5 feet above the pavement. The driver's line-of-sight may not fall within the limits of the road; for example, on a horizontal curve the sight line will be a chord of the curve. SSD is measured along the center line of the vehicle's travel lane.

3) Effect of Grade on Stopping Sight Distance; the SSD in Table 2-2 is based on flat road grades. For downgrades or upgrades of 3 percent or greater, SSD requirements are shown in Table 2-3. Grades other than those shown in the table may require interpolation.

Table 2-3 Stopping Sight Distance on Grades

SSD (feet) for Downgrade				SSD (feet) for Upgrade			
Speed* (mph)	3%	6%	9%	Speed (mph)	3%	6%	9%
20	116	120	126	20	109	107	104
25	158	165	173	25	147	143	140
30	205	215	227	30	200	184	179
35	257	271	287	35	237	229	222
40	315	333	354	40	289	278	269
45	378	400	427	45	344	331	320
50	446	474	507	50	405	388	375
55	520	553	593	55	469	450	433

** Design speed for new facilities. Operating speed for existing facilities.*

Adapted from Exhibit 3-2, A Policy on Geometric Design of Highways and Streets, AASHTO (2001).

4) Intersection Sight Distance (ISD) is the distance necessary for the driver of a vehicle stopping at an intersection to decide when to enter or cross the intersecting roadway, and for the driver of a vehicle traveling at or near the posted speed on the intersecting roadway to reduce speed to avoid overtaking a vehicle that has entered the roadway.

When measuring ISD, the driver's eye location is assumed to be 15 feet from the edge of the traveled way. The height of driver's eye is assumed to be 3.5 feet and the height of the object to be seen, assumed to be another vehicle, is 3.5 feet above the pavement. Clear sight triangles are shown in Standard Detail R-100.

The ISD requirement is determined by the type of intersection and the traffic volume.

Table 2-4 shall be used for low-volume, non-arterial intersections where the minor road or access point traffic volume is projected to be 80 ADT or less. This table corresponds to the stopping sight distance requirements of AASHTO.

Table 2-5 shall be used when the ultimate traffic volume for the proposed road or access point is projected to be more than 80 ADT, or the intersecting major road is an arterial.

A private residential driveway, serving 20 ADT or less, that intersects an arterial shall use Table 2-4 instead of Table 2-5.

Table 2-4 Intersection Sight Distance < 80 ADT

Speed* (mph)	Distance, D** (feet)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495

** Design speed or new facilities; Operating speed for existing facilities.*
***Table 2-3 applies if grade is 3% or greater.*

Adapted from Exhibit 3-1, A Policy on Geometric Design of Highways and Streets, AASHTO (2001)

Table 2-5 Intersection Sight Distance > 80 ADT

Speed (mph)	Distance, D (feet)
20	225
25	280
30	335
35	390
40	445
45	500
50	555
55	610

Adapted from Exhibit 9-55, A Policy on Geometric Design of Highways and Streets, AASHTO (2001)

For low-volume, non-arterial intersections with 80 ADT or less, use Table 2-3 instead of Table 2-4 to account for an intersecting (major) road with a downgrade or upgrade 3% or greater.

For arterial intersections or intersections serving more than 80 ADT, a driver's time gap acceptance time must be adjusted, and therefore the values of Table 2-5, when vehicles other than passenger cars will be present, or where the intersecting major road has multiple lanes, or where the minor road approach has a significant grade.

Adjustment factors are provided in AASHTO Exhibit 9-54. Note that the adjustment for minor road approach grade is necessary only if the rear wheels of the design vehicle would be on an upgrade that exceeds 3% when the vehicle is at the stop line of the minor road approach.

If a time gap acceptance time is adjusted, then ISD must be recalculated using AASHTO Formula 9-1:

$$\mathbf{ISD = 1.47\ V_{major} T_s}$$

Where ISD = intersection sight distance in feet, measured along the major road.
V_{major} = design speed of major road in mph
T_s = time gap for minor road vehicle to enter major road in seconds (see Exhibit 9-54)

5) Clear Sight Distance; at any intersection or access point connection, there must be a clear sight triangle to allow a driver stopped on an approach to depart from the minor road and enter or cross the major road.

The triangle is defined by the line of sight from a vehicle stopped on a minor road to a vehicle approaching on the major road and back to the intersection. This area, along the intersection approach legs and cross their included corners, must be clear of obstructions that might block a driver's view of potentially conflicting vehicles. Visibility applies to not only drivers on the minor road, but also drivers on the major road, allowing them to see vehicles stopped at an intersection and to prepare to slow or stop, if necessary.

The vertex, or decision point, of the sight triangle on the major road or access point shall be 15 feet from the edge of the major road traveled way. The edge of the traveled way shall be the outside edge of the travel lane. Bicycle lanes, walkways or paved shoulders are not included.

The driver's eye location may be reduced to a minimum of 10 feet from the edge of traveled way, with the approval of the City Engineer, where the reduction in driver's eye location will not adversely affected safety or operation. Examples where this may be allowed include: an intersection on the outside of a horizontal curve; an intersection where one approach is in a cut or fill; or where a bridge abutment obscures the line of sight from 15 feet back but not 10 feet.

The line of sight defining one side of the clear sight triangle may cross private property and be obstructed by objects or vegetation outside the existing public right-of-way. To ensure that sight distance is maintained, the area within a clear sight triangle shall be acquired and conveyed to the City as new public right-of-way or a sight distance easement recorded to allow maintenance of the clear sight triangle.

When provision of sight distance is a condition of an application approval, it shall be the Developer's responsibility to accomplish any activities necessary to provide sight distance, such as trimming or removal of vegetation or regrading of earth.

6) Special Circumstances; if circumstances are different from those presented in these Standards, the City Engineer may establish sight distance standards and requirements that generally conform to the intent of the sight distance guidelines in the latest edition of AASHTO.

7) Documentation of Sight Distance; to verify acceptable sight distance, the City Engineer may require a Developer to evaluate and document an existing sight distance condition. The evaluation and documentation of sight distance shall include the following, or such additional information as may be necessary to make a determination:

- Plan, profile and cross-section drawings along the sight line
- Posted speed, operating speed and/or speed study data
- Right-of-way and easement limits (existing and proposed)

When the City Engineer determines from the documentation presented that a location has insufficient sight distance, a plan to improve the sight distance to meet these Standards will be required.

2-3.13 TRANSIT STOPS

1) Land development applications and City road projects are reviewed by Community Transit for provision of appropriate transit facilities. Facilities may include pedestrian accessibility improvements, bus stops or pullouts, or other related facilities.

   Bus pullouts will be required if (1) traffic volume and passenger loading/unloading conditions warrant; (2) traffic flow would be greatly hindered by in-lane stopping, or (3) the posted speed limit is 35 mph or greater.

2) Bus pullout location shall be determined by the City Engineer in consultation with Community Transit. Generally, bus pullouts should be placed on the far side of both signalized and non-signalized intersections, and immediately following the intersection is preferred. The distance between bus pullouts should be greater than 1,000 feet.

   Bus pullouts should be constructed on both sides of a two-way street in a complementary pair, if possible.

   Driveways should not be located within the limits of a bus pullout.

2-4 TRAFFIC IMPACT ANALYSIS

2-4.01 RESPONSIBILITY AND PURPOSE

Traffic impact analysis (TIA) is governed by the AMC, adopted Ordinances, and the Public Works Department policies on preparation of these analyses. All developments subject to the traffic threshold identified by the City requires a TIA, the extent of which is dependent on the type and size of development. The primary responsibility for assessing the traffic impacts associated with a proposed development rests with the applicant, with the City serving in a review capacity. The analysis is the responsibility of the applicant and must be prepared by a professional engineer, registered in the State of Washington, with experience in traffic engineering and/or transportation planning.

The extent of the analysis will be determined at the pre-application conference for the project and must be consistent with department policies and procedures for the preparation of such analyses. Scoping the requirements for the analysis is intended to identify key issues early in the project planning and development stage, and assist the City during the review and approval process. A checklist will be prepared documenting the requirements for the analysis. Required number of copies of the TIA must be submitted with the land use

application and other completed forms as required by the City permit application procedures. A copy of the completed checklist must also be submitted with the application.

TIA must show how the proposed development will affect the existing and future transportation network. If the final use(s) of the proposal are not determined at the time of the study, the land use with the greatest overall traffic impact must be assumed for the study. Once the City has reviewed the analysis and comments have been returned to the applicant, any required changes must be incorporated in the analysis and a revised report must be submitted to the City for final review and approval.

2-4.02 TRAFFIC IMPACT ANALYSIS CONTENTS

While individual reports may vary in style and format, certain information must be included as identified in the Public Works Department TIA checklist and guidelines on preparation of TIA. The amount of detail required, as well as the overall extent of the study, will be provided during the pre-application conference on a project specific basis. General requirements of the TIA are outlined below with more detailed description of intent provided in the Public Works Department checklist and guidelines.

Project Description

1) Project type and size.

2) Project location, with vicinity map.

3) Proposed site access, with site plan.

4) Horizon planning year (minimum 2 years from existing condition). Longer horizon years may be necessary when determining ultimate sizing of a roadway facility or addressing multiple phases of a project.

Existing Conditions

1) Existing traffic volumes, daily turning movements.

2) Daily and intersection counts completed within one year prior to a complete application date.

3) Roadway network, including traffic control.

4) Level of service calculations at impacted intersections and site entrances, if applicable.

5) Parking supply.

Accident/Safety Conditions

1) Sight distance analysis at intersections and access points. Minimum stopping and entering sight distance as defined by AASHTO is required.

2) Clear zone analysis (document poles, hydrants, or other obstructions near travel edge).

3) Evaluation of accident data as available.

Trip Generation and Distribution

1) Trip generation using the latest ITE Trip Generation Manual or other approved method.

2) Trip distribution and assignment map showing turning movements assigned to roadway network. The proposed development's trips are to be distributed through the street network to a level as prescribed in the City's TIA Guidelines.

Public Transit and Non-Motorized Facilities

1) Identification of existing transit service.

2) Identification of existing trails, bicycle lanes, and other non-motorized facilities.

Future Conditions

1) Annual growth rate determined by actual data or other approved source.

2) Future conditions, with and without the project, with commentary on compliance with concurrency requirements as needed.

3) Level of service calculations sheets at all impacted intersections and site access points, with and without the proposed project.

4) Effect of proposed development on public transit and non-motorized facilities.

5) Any transportation facilities proposed by the Comprehensive Plan which may affect the development.

Mitigation Measures

1) All developments are subject to the City's Traffic Mitigation Ordinance and mitigation payments to the City, County and State are calculated accordingly.

2) Proposed mitigation to correct any deficiencies not addressed through the Traffic Mitigation Ordinance.

3) Dedication of right-of-way and associated frontage improvements.

4) Evaluation of change in accident potential with proposals to correct safety deficiencies.

Other

1) Analysis of internal site circulation for vehicles, transit, non-motorized users, and handicap access.

2) Safe walk analysis - evaluation and coordination with the School District and Public Works for providing safe walking conditions for all new residential short plats and subdivisions.

2-5 TRAFFIC CONTROL

2-5.01 DISTRIBUTION OF TRAFFIC

All construction and/or maintenance within the City right-of-way shall conform to the provisions of the applicable connection/access permit, the MUTCD, WSDOT *Design Manual*, and other applicable referenced requirements of these Standards. The Department of Public Works may restrict hours of construction to minimize traffic disruption on the street system. If construction activity within the right-of-way causes undue disruption of traffic, creates safety hazards on the street system, or if the construction activity is not in compliance with the traffic control specifications in the permit, the City Engineer will advise the Developer or the Developer's Contractor of the need for immediate corrective action, and may order immediate suspension of all or part of the work if deemed necessary. Failure to comply with this provision may result in permit modification or revocation.

All traffic control devices, signing, striping and other pavement delineation shall utilize the latest edition of the MUTCD as a guideline when preparing designs and traffic control plans. It shall be the Developer's responsibility to furnish all materials and labor as necessary to install all traffic control to satisfy project requirements. All required signage, striping, and other delineation, shall be shown on the street improvement plans prior to plan approval.

2-5.02 TRAFFIC SIGNAL PLANS AND SPECIFICATIONS

Preparation of traffic signal plans and specifications and other traffic control devices shall be consistent with Department of Public Works policies and procedures for maintenance and operations. All designs must be prepared by a Professional Engineer, licensed in the State of Washington, with experience in preparation of traffic signal plans and specifications. The

applicant may be required to schedule a pre-design meeting to coordinate with the City on general requirements and identify the parameters of the design.

The permittee is responsible for securing any State and local permits needed for traffic signalization and regulatory signing and marking.

All signals shall be equipped with preemption that is compatible with the equipment approved by the Fire Chief. New traffic signal installations shall include a minimum of one spare conduit run for any arterial crossing.

Warrants for traffic signals shall be consistent with the practices set forth in the MUTCD. The City Engineer shall determine consistency with these practices based on submitted information by the applicant when determining if a traffic signal is warranted and consistent with City planning.

Traffic signal interconnect to nearby affected signals may be required for any new traffic signal installation to promote progression of traffic and improved efficiency of the travel stream.

2-5.03 CHANNALIZATION PLANS

All designs shall be consistent with the MUTCD, WSDOT *Design Manual* and these Standards. Plans must be prepared by a professional engineer licensed in the State of Washington, with experience in preparation of channelization plans. A pre-design meeting may be required to identify key parameters of the design.

All new crosswalk installations shall be Dura-Stripe or equalivalent with supplemental signing as determined necessary by the City. Mid-block crosswalks shall require supplemental lighting or special treatment to maximize safety as determined by the City. Use of raised pavement markers supplemental to pavement lane striping may be required as determined by the City.

Post mounted street signs shall be as shown in Standard Detail R-110. Traffic regulatory signs shall be installed per Standard Detail R-120.

2-6 FIRE DEPARTMENT ACCESS

As required by the Fire Chief, every commercial or industrial building constructed or moved into the City of Arlington shall be accessible by the Fire Department, both during and after construction, by way of access roadways approved by the Fire Chief. The access roadways shall be no less than 20 feet in width and placed within an approved access tract that is no less than 25 feet in width plus slope easements that may be necessary. There shall be no parking or any other obstruction within the required 20 feet. The inside turning radii for all access roadways shall be no less than 30 feet. The minimum outside diameter for cul-de-sac driving area shall be 100 feet measured from inside face of curb to inside face of curb on the opposite side. If an island is proposed in a cul-de-sac it shall be no larger than 30 feet in

diameter. In all cases at least 35 feet of paved surface shall be provided around a cul-de-sac. If landscape islands are provided on public or private streets at least 20 feet of paved roadway shall be provided on either side.

Fire Department access roadways shall be designed and constructed to support the imposed weight of the fire apparatus. The minimum design weight for fire apparatus access roadways shall be 25 tons. All Fire Department access roadways, regardless of width, shall have a clear unobstructed vertical clearance of 13 feet 6 inches.

The maximum allowable grade on fire lanes, fire access roadways, access easements, or any other roadway that may be used by the Fire Department to access a structure within the City, shall not exceed 15%. However, if unusual circumstances exist this requirement may be modified up to an 18% grade if agreed upon by the Fire Chief and City Engineer. Additional fire protection requirements may be necessary.

Fire Department access roadways serving only one or two single family lots may be reduced to 12 feet of paved surface when approved by the City Engineer and the Fire Chief. This access roadway shall be placed in a separate tract at least 20 feet wide plus any slope easements that may be necessary. There shall be no parking or any other obstructions allowed within the required 20 feet.

Prior to the start of combustible construction a temporary approved access roadway shall be constructed of 4 inches of either ATB or the first lift of Class "B" asphalt and must be capable of supporting the imposed weights identified above. At no time during the construction of a project should the access roadway surface consist primarily of dirt, mud, sand or other material that, in the opinion of the Fire Chief, may impair fire fighting or rescue operations. The above required 20 feet width must be maintained so that the driving surface is recognizable day and night and shall not be obstructed in any manner, including the parking of vehicles and the staging of any construction materials or equipment. Temporary construction gates may be used if approved by the Fire Chief. The Fire Chief may stop construction at anytime if he/she believes the conditions of the road has deteriorated or is not adequate for providing emergency services.

2-7 SURVEY MONUMENTS AND CORNERS

2-7.01 GENERAL

1) In accordance with Chapter 332-120 WAC, no survey monument as defined therein shall be removed or destroyed without first obtaining a permit from the Department of Natural Resources. Any party causing the removal or destruction of a survey monument shall be responsible for ensuring that the original survey point is perpetuated.

2) All existing survey control monuments that are disturbed, lost, or destroyed during surveying or construction shall be replaced, at the expense of the Developer, by a Professional Land Surveyor licensed in the State of Washington.

3) Boundaries of final plats, short plats and binding site plans shall be established with standard steel reinforcing bar or steel pipes permanently marked with the Professional Land Surveyor's registration number. The same corner shall be used to mark the subdivision lot, tract and NGPA easement boundaries. Boundary lines or corners that are section or quarter section corners shall be marked with standard monuments.

4) If a property corner is occupied by a fence post, an offset standard steel reinforcing bar shall be installed along one of the boundary lines. Offset concrete monuments shall only be set to witness section and quarter-section corners.

5) A monument shall be installed at each intersection of a new plat road centerline with the centerline of an existing City right-of-way. Monuments at intersections with state highways are subject to the requirements and approval of WSDOT.

6) Each monument, case, and cover shall be set in accordance with Standard Detail R-130, for all PC, PT, center of cul-de-sac, and street centerline intersection points. The point of intersection (PI) will be acceptable in lieu of a PC and PT for plat road curves, provided that PI falls within the paved roadway and approved by the City Engineer.

7) If monuments have not been set prior to recording of a plat or short plat, then a signed and sealed Certificate of Monumentation shall be submitted by the Developer's professional land surveyor prior to construction acceptance of all land subdivision activities and/or road improvements requiring monumentation.

8) Where an existing monument is on the same tangent line, visible and within 250 feet of the nearest plat boundary line projected to the centerline of a City right-of-way, only one monument is required. However, a backsight monument must be on the same tangent and visible at a distance of not less than 250 feet from a controlling monument. The distance tie between the existing monument and the intersection shall be shown on all plat or short plat drawings and the final plat or short plat.

2-7.02 MATERIALS AND INSTALLATION

Materials for monumentation shall conform to Standard Detail R-130. The cover and seat shall be machined so as to have perfect contact around the entire circumference and full width of bearing surface.

Standard steel reinforcing bar shall be 24 inches in length and at least ½ inch in diameter; steel pipes shall be at least ¾ inch inside diameter. Pipe or rebar shall be permanently tagged with the land surveyor's registration number.

2-7.03 PRESERVATION OF MONUMENTS

The Developer or Contractor shall not disturb any survey monuments or markers during excavation until ordered to do so by the City Engineer. All street monuments, property corners, bench marks and other monuments disturbed during the progress of the work shall be replaced by a land surveyor, at the expense of the Developer, to the satisfaction of the City Engineer.

2-8 LIGHTING

All public streets, sidewalks, and other common areas or facilities in new subdivisions shall be sufficiently illuminated to ensure the security of property and the safety of persons using such streets, sidewalks, and other common areas or facilities.

All roads, driveways, sidewalks, parking lots, entrances, exits, and other common areas and facilities in commercial/industrial and multifamily developments shall be sufficiently illuminated to ensure the security of property and the safety of persons using such roads, driveways, sidewalks, parking lots, entrances, exits, and other common areas or facilities.

Street lighting systems shall conform to the applicable portions of the WSDOT/APWA Standard Specifications Section 8-20, except as modified by the City herein, according to the standards of the Snohomish County PUD and AMC 20.60.400. Street light poles shall meet the requirements of PUD. The extent of lighting shall include as a minimum, illumination of all affected frontage roads and internal roads, whether public or private, related to the development. Additional lighting beyond project limits may be required to address safe walk connections as determined by the traffic study for the development. Special pole styles may be installed with the approval of the City Engineer.

All outdoor lights shall be low sodium or similar lamp type and down shielded to prevent light pollution.

Street light locations must be shown in site/civil plans. The City may require the Developer to add, reduce, or relocate street lights at Developer's expense. Street light plans shall be prepared in accordance with PUD standards and approved by PUD. The Developer shall provide the City with a copy of the approved street light plans before Site Civil plan approval.

Operation and maintenance of public street lights are provided by PUD and paid by the City. The Developer is responsible for construction of street lights and all accessories necessary to energize the street light system, which shall be consistent with City and PUD Standards. When feasible, all new street light wiring, conduit and service connections shall be located underground. Other special luminaries, which are not consistent with the PUD Standards, must be approved by the City Engineer. The installation of special luminaries, not provided by PUD, shall be the responsibility of the Developer.

Maintenance of the completed lighting system in City right-of-way is provided by PUD and paid by the City. Maintenance of private lighting shall be the responsibility of the property owner.

2-9 ASPHALT CONCRETE PAVEMENT & PAVEMENT PATCHING

2-9.01 DESCRIPTION

This work shall consist of asphalt concrete paving and the patching of various types of pavement cuts, the performances of which shall be in accordance with these Standards and the WSDOT/APWA Standard Specifications.

The City may require the final lift of asphalt to be bonded for and delayed for up to one (1) year due to weather and other considerations. A geotechnical study and recommendations will normally be required for any proposed new road construction, widening existing roadways or major repair and overlay work. The Developer shall be responsible for providing such reports, prepared by a Professional Engineer licensed in the State of Washington, for review by the City.

2-9.02 MATERIALS

All materials shall conform to the requirements specified in the WSDOT/APWA Standard Specifications as follows:

1) Asphalt concrete pavement, including patching, shall conform to "Class B" meeting the requirements of Section 5-04, 9-02.1(4) and 9-03.8.

2) Asphalt for temporary patch shall be cold mix (MC 250) meeting the requirements of Section 9-02.

3) Asphalt Treated Base (ATB) shall meet the requirements of Section 4-06 and all others referenced therein.

4) Tack coat shall be emulsified asphalt grade CSS-1 as specified in Section 9-02.1(6).

5) Crack sealing shall conform to Section 5-04.3(5)C.

6) Geotextile fabric for pavement reinforcement shall be needle-punch non-woven 100% polypropylene Products such as "Petromat" or "Supac" as manufactured by Phillips Fiber Corporation, or approved equal. Other products may be submitted by the Developer to the City Engineer for review "as equal" substitutions.

7) Asphaltic binder for use with geotextile fabric shall conform to the manufacturer’s recommendations for the fabric used. Cutback asphalts cannot be used with polypropylene fabrics due to reactions with solvents at high temperatures.

8) Crushed Surfacing Top and Base Courses (CSTC) shall meet the requirements of Section 9-03.9(3).

9) Cement concrete pavement patch shall be Class 4000 High Early Strength (HES) meeting the requirements of Section 6-02.

2-9.03 CONSTRUCTION REQUIREMENTS

General

Signs, barricades, lights and other warning devices shall be installed per the requirements of the MUTCD and shall be maintained 24 hours a day until the roadway work is completed and ready for traffic. See Section 1-3.18 TRAFFIC CONTROL PLAN for instructions.

The placing and compaction of the trench backfill and the preparation and compaction of the sub-grade shall be in accordance with the various applicable sections of the WSDOT/APWA Standard Specifications except as approved by the City Engineer.

Compaction of the sub-grade shall be completed prior to the required asphalt work or patching as determined in the WSDOT *Design Manual*.

Pavement patching shall be scheduled to accommodate the demands of traffic and shall be performed as rapidly as possible to provide maximum safety and convenience to public traffic.

Before the pavement patch is to be constructed the pavement shall be saw cut so that the marginal edges of the patch will form a rectangular shape with straight edges and vertical faces.

When required, cold planing along the edge of existing roadways and at interfaces with existing pavements, shall be completed to the widths and depths established in the plans and specifications. The cold planing should be completed prior to trenching, when feasible, so that remaining pavement patching and overlays can be completed in a uniform manner.

Geotextile fabric materials, when required in the plans and specifications, shall be placed and constructed according to the manufacturer's recommendations. Only contractors experienced in the placement of the material shall be responsible for placement. The manufacturer should make available a representative to review the project conditions, proposed placement methods and equipment to be used, with the contractor and the City Inspector.

Asphalt Concrete on Granular Base

After the Crushed Surfacing Top Course subgrade or ATB has been leveled and compacted, Asphalt Concrete Pavement Class B shall be placed to the thickness indicated on the plans. Asphalt shall be compacted to a minimum 92% of the reference maximum density as determined by WSDOT Test Method 705.

Asphalt-Treated Base (ATB)

This work shall consist of one or more courses of ATB placed on the properly prepared subgrade. The ATB shall be compacted per the requirements of WSDOT 4-06.3(7).

Temporary Pavement Patching

The Developer shall furnish, place and maintain temporary pavement patching, at locations as directed by the City, until such time as a permanent pavement patch can be made. Generally, the permanent patch shall be completed within 2 weeks of the completion of trenching and road repairs, unless an extension is granted by the City. Temporary pavement patch shall consist of asphalt treated base (ATB) compacted to at least 90% of maximum dry density as established for the mix by WSDOT Test Method 705.

Temporary asphalt patching shall be required where roadway or walk is needed for vehicular or pedestrian traffic during the construction period, until permanent pavement and sidewalks can be constructed.

In the event that the temporary surface subsides after the initial placement, additional MC 250 and Crushed Surfacing shall be applied to maintain the surface.

Cement Concrete Pavement Patching

Streets which have cement concrete pavements overlaid with asphalt concrete shall be patched as shown on Standard Detail R-140. After the Crushed Surfacing Top Course subgrade for the pavement has been constructed and compacted to line and grade, the cement concrete pavement patch shall be placed and struck off to a thickness of 1 inch greater than the existing pavement or 8 inches minimum, whichever is greater. All work shall be in accordance with Section 5-05 of the WSDOT/APWA Standard Specifications, except as modified by these Standards.

The cement concrete portion of the patch shall be Class 4000, High Early Strength (HES). The thickness shall be 1 inch thicker than the existing concrete base or 6 inches whichever is greater. The top surface of the concrete patch shall match the top surface of the existing concrete base; in no case shall the top of the concrete be higher than the top of the existing concrete base. Joints shall be placed to match existing or as directed by the City.

Expansion joints and control joints shall be placed to match existing or as directed by the City. The surface of the concrete patch shall be finished and brushed with a fiber brush to improve bonding with the asphalt overlay. Approved curing compound shall be placed on the finished concrete immediately after finishing.

Asphalt concrete plant mix shall not be placed until 3 days after the cement concrete base has been placed or otherwise permitted by the City. The asphalt concrete plant mix shall not be placed until the concrete base has received a tack coat of CRS-2 at a rate of 0.12 to 0.20 gallons per square yard. The edges of the existing asphalt and castings shall also be painted with the tack coat. The asphalt concrete pavement shall then be placed, leveled, and compacted to conform to the surface of the existing asphalt pavement. Immediately, thereafter, all joints between the new and original asphalt pavement shall be painted with CSS-1 asphalt emulsion and covered with dry sand before the asphalt solidifies.

2-10 UNDERGROUND UTILITIES

2-10.01 GENERAL

The WSDOT/APWA Standard Specifications shall apply unless modified herein by these Standards.

When excavating existing pavement, the trench cut shall be a neat line made by either saw cutting or jack-hammering. Saw cutting will be required unless the cut is made prior to reconstruction or an overlay.

Temporary pavement patch shall be accomplished by using cold mix (MC 250), Asphalt Treated Base (ATB) or steel plates.

Where trench excavation equals or exceeds a depth of 4 feet, the Developer shall provide, construct, and maintain safety systems that meet the requirements of the Washington Industrial Safety and Health Act (WISHA), RCW 49.17 and WAC 296-155. The trench safety systems shall be designed by a qualified person, and meet accepted engineering requirements. See WAC 296-155.

The Developer shall furnish, install, and operate all necessary equipment to keep trenches free from water during construction, and shall dewater and dispose of the water so as not to cause damage to public or private property or nuisance to the public. Sufficient pumping equipment in good working condition shall be available at all times for all emergencies, including power outage, and shall have available at all times competent workmen for the operation of the pumping equipment.

Compaction tests will be required to ensure adequate compaction on all lifts. All compaction tests shall be conducted by a licensed testing laboratory at the expense of the Developer. Water jetting or settling of backfill in trenches is not permitted.

2-10.02 TRENCH EXCAVATION

Dimensions

The length of trench excavation in advance of pipe laying shall be kept to a minimum and in no case shall exceed 150 feet unless specifically authorized by the City Inspector. The maximum permissible trench width between the foundation level and the top of the pipe shall be 40 inches for pipe 15 inches or smaller; or 1½ times the pipe diameter, plus 18 inches for pipe 18 inches or larger. See Standard Details W-270 and SS-120. If the maximum trench width is exceeded without written authorization of the City Engineer, the Developer will be required to provide pipe of higher pressure class or to provide a higher class of bedding, as required by the City Engineer.

Interferences

The Developer shall not interfere with any existing utility without the written consent of the City Engineer and the utility owner. If it becomes necessary to remove or relocate an existing utility, this shall be completed by its owner. If a utility owned by the City has to be removed or relocated to accommodate the Developer, it shall be approved by the City Engineer and at the Developer's cost. The cost of modifying other public or private utilities shall be similarly paid by the Developer unless other arrangements have been made with the utility owner(s). The Developer shall support and protect by timbers or otherwise all pipes, conduits, poles, wire or other apparatus which may be in any way affected by the excavation work, and do everything necessary to support, sustain and protect them under, over, along or across the work. If any of the pipes, conduits, poles, wires or apparatus are damaged, they shall be repaired by the utility owner and the expense of such repairs shall be charged to the Developer, and their bond shall be liable.

Protection of Adjoining Property

The Developer shall at all times and at their expense preserve and protect from injury any adjoining property. Where in the protection of such property it is necessary to enter upon private property for the purpose of taking appropriate protective measures, the Developer shall obtain permission from the owner of such private property for such purpose. If they cannot obtain permission from such owner, the City Engineer may authorize him to enter the private premises solely for the purpose of making the property safe. The Developer shall at their expense, shore up and protect all buildings, walls, fences or other property likely to be impacted during the progress of the excavation work and shall be responsible for all damage to public or private property or highways resulting from the Developer's failure to properly protect and carry out the work. Whenever it may be necessary for the developers to trench through any lawn area, the sod shall be carefully cut and rolled and replaced after ditches have been backfilled as required in this chapter. All construction and maintenance work shall be completed in a manner to leave the lawn area clean of earth and debris and in a condition as nearly as possible which existed before such work began. The Developer

shall not remove any trees or shrubs which exist in parking strip areas or easements across private property without first having notified and obtained the consent of the property owner, or in the case of public property, the appropriate City Department or City Official having control of such property.

Fences and Barriers

The Developer shall erect the fence, railing or barriers at the project site to prevent danger to pedestrians using the City street or sidewalks, and the protective barriers shall be maintained until the work is completed or the danger removed.

A half hour prior to sunset lights shall be placed on any excavation materials, structures or other obstructions in the streets. These lights shall be maintained throughout the night and must be placed on the street every night until the obstructions are removed. It is unlawful to remove the fence, railing, other protective barriers or any lights provided for the protection of the public.

Removal of Attractive Nuisance

It is unlawful for the Developer to suffer or permit to remain unguarded, at the place of excavation or opening, any machinery, equipment or other device having the characteristics of an attractive nuisance likely to attract children and be hazardous to their safety or health.

2-10.03 TRENCH BACKFILL

Trench backfill shall conform to City Standard Details W-270 and SS-120.

Unsuitable backfill material shall be removed from the site and hauled to an approved disposal site. The Contractor shall provide the City Engineer with the location of all disposal sites to be used and also copies of the permits and approvals for such disposal sites.

Imported material shall meet the requirements of Gravel Borrow, as specified in Section 9-03.14 of the WSDOT/APWA Standard Specifications, or Crushed Surfacing Top Course, as specified in Section 9-03.9(3) of the WSDOT/APWA Standard Specifications.

2-10.04 COMPACTION

Trench backfill shall be spread in layers and compacted by mechanical tampers of the impact type approved by the City Engineer. The backfill material shall be placed in successive layers with the first layer not to exceed 2 feet above the pipe, and the following layers not exceeding 12 inches in loose thickness, with each layer being compacted to the density specified below:

Improved areas such as street and sidewalks shall be compacted to at least 90% of maximum dry density to within 4 feet of sub-grade. The last 4 feet shall be compacted to at least 95% of maximum dry density. Unimproved area or landscape areas shall be compacted to at least 90% of maximum dry density.

2-10.05 TRENCHING LONGITUDINAL TO ROADWAY

All utilities, including but not limited to: sewer, water, drainage, gas, telephone, power, and cable TV, that are within the roadway section and longitudinal to the roadway, shall be backfilled according to the requirements listed in City Standard Details W-270 and SS-120 to the pavement patch level or sub-grade, whichever applies. CDF backfill will be required as directed by the City Engineer.

Pavement restoration of longitudinal trenching for all underground utilities including water, sewer, power, gas, etc. shall be completed according to City Standard Details W-270, SS-120, or R-140. The limits of paving shall be as determined by the City Engineer on a project specific basis, and may require street grinding and overlays.

2-10.06 TRENCHING TRANSVERSE TO ROADWAY

Utility trenching that crosses transversely to the roadway alignment will not be permitted unless it can be shown that alternatives such as jacking, auguring or tunneling are not feasible or unless the utility can be installed just prior to reconstruction or an overlay of the road. Should an open cut be approved, the trench shall be backfilled according to the requirements listed in City Standard Details W-270 and SS-120. One lane shall remain accessible to emergency vehicles at all times unless previous arrangements with the Police, Fire, and Public Works Departments have been approved.

Pavement restoration of transverse trenching for all underground utilities including water, sewer, power, gas, etc., shall be completed according to Standard Details W-270, SS-120, or R-140. The limits of paving shall be as determined by the City Engineer on a case-by-case basis.

2-10.07 JACKING, AUGERING, OR TUNNELING

Tunneling may be required as a condition of permit approval, in certain situations, by the City Engineer, under pavements, buildings, railroad tracks, etc. The Developer shall install the pipe by jacking, auguring or tunneling, or installing the pipe in a casing pipe by a combination of these methods. The Developer shall be liable for damage to any existing facilities as a result of the jacking, auguring, or tunneling installation work. Approvals from other agencies or companies may be required for the proposed work.

The Developer shall obtain all necessary permits, approvals and easements as may be necessary and shall provide copies to the City during the permit review process.

When use of a casing pipe is required, the Developer shall be responsible to select the gauge and size required, unless otherwise indicated on the drawings, and consistent with their jacking or auguring operation, and shall be set to line and grade. During jacking or auguring operations, particular care shall be exercised to prevent caving ahead of the pipe which will cause voids outside the pipe. When the carrier pipe is installed within a casing pipe, the carrier pipe shall be skidded into position in an acceptable manner and to the line and grade as designated. The annular space between the casing and the pipe shall be filled with sand or as otherwise approved.

Prior to jacking or auguring activities, shop drawings describing these activities, including dimensioning of pit length and size of underground borings and complete description of shoring, shall be submitted to the City Engineer for approval.

2-11 SIDE SLOPES

Side slopes along arterial and collector roads shall be constructed no steeper than 3:1 for fill and 2:1 for cut slopes. Along local access and residential roads, fill slopes shall not be steeper than 2:1 and cut slopes shall not be steeper than 1.5:1. Steeper slopes may be approved by the City Engineer upon showing that the steeper slopes, based on geotechnical and hydraulic analysis, will be stable.

Guardrails shall be installed where appropriate pursuant to the WSDOT *Design Manual* and Roadside Safety Manual.

Side slopes shall be stabilized by grass sod, seeding or by other planting or surfacing materials acceptable to the City Engineer.

Slope easements adjacent to the right-of-way may be required for maintenance of cut or fill slopes.

2-12 GUARDRAILS

Beam guardrails shall be designed and installed per WSDOT Standards.

2-13 MAILBOXES

2-13.01 US POSTAL SERVICE (USPS)

Mailbox type, number and location require approval of the Arlington Postmaster. Coordination with the Postmaster early in the project design process is important.

USPS requires installation of cluster box units (CBU) to serve four or more addresses. Specific requirements can be obtained from the Arlington Postmaster.

2-13.02 CONSTRUCTION PLAN

Construction plans shall clearly show the proposed location or relocation of mailboxes, whether single or cluster boxes.
The Developer shall provide the Postmaster with 2 copies of the preliminary project site plans for use in establishing locations, types and numbering of the mailboxes. The Postmaster will retain one copy and return the other redlined set to the Developer for use in preparing the final plan.

Postmaster approval of the proposed mailbox type(s) and location(s) shall be documented as part of the construction plan approval process. Any change of mailbox type(s) or location(s) shall be re-approved by the Postmaster.

2-13.03 LOCATION AND INSTALLATION

Where a choice of roadway location exists, mailbox shall be located on the lower volume roadway unless otherwise approved by the City Engineer and the Postmaster.

Mailboxes shall be located so as not to impede access or sight distance visibility.

Mailboxes located within a roadway clear zone shall have breakaway features in accordance with WSDOT Standard Plans.

If it becomes necessary to remove or otherwise disturb existing mailboxes within the limits of any project, the Developer shall coordinate through the Arlington Postmaster for acceptable box locations and to ensure uninterrupted mail service. Approved locations for mailboxes shall be shown on street construction plans. The mailboxes shall be temporarily placed in such a position that their function will not be impaired. The boxes shall be reinstalled in accordance with the approved construction plans. Any damage caused by the relocation of mailboxes shall be repaired at the expense of the responsible party. If mailboxes are installed within a sidewalk where the sidewalk is next to a curb, the sidewalk shall be widened to provide a minimum horizontal clearance of 48 inches from back of mailbox structure to back of sidewalk.

2-13.04 ROAD IMPROVEMENTS

Turnouts for mail delivery vehicles shall be installed to serve cluster mailbox units located along arterial or collector roads, or any road with a posted speed of 35 MPH or above.

A turnaround shall be provided at the end of any non-through road along which mailboxes are located.

2-14 BOLLARDS

Bollards may be installed at the City Engineer's discretion to deny motor vehicle access to an easement, tract, or trail. This may include one or more fixed bollards on each side of the traveled way and removable, locking bollards across the traveled way to allow maintenance and emergency vehicle access.

Spacing intervals shall not exceed 50 inches on center.

Bollard design shall be in accordance with WSDOT Standard Plan H-13 and H-13a.

Fire apparatus access roads shall not be blocked in this manner without the concurrence of the Fire Chief.

2-15 ROADWAY BARRICADES

Temporary or permanent barricades shall conform to the MUTCD and these Standards.

1) Type I and Type II barricades are intended for use where traffic is maintained through an area under construction. They may be used singly or in groups to mark a specific hazard or in a series for channeling traffic.

2) When a road section is closed to traffic, Type III barricades shall be erected at the points of closure. Type III barricades may extend completely across a roadway and its shoulders or from curb to curb. Where provision must be made for authorized access, Type III barricades may be provided with movable sections that can be closed when work is not in progress, or with indirect openings that will discourage public entry. Where job site access is provided through a Type III barricade, the Developer or Contractor shall ensure proper closure at the end of each working day.

3) Type III permanent barricades shall be installed to close arterial roadway or other through roads when hazardous to traffic. They shall also be used on lanes where tapers are not sufficiently delineated.

4) Road signs may be erected on fixed barricades. The Road Closed, Detour Arrow, and Large Arrow warning signs can be mounted effectively on or above a barricade on a closed road.

5) For night use, it is desirable to add flashing warning lights when barricades are used singly and steady-burn lights when barricades are used in a series for channelization.

2-16 ROCKERIES AND ROCKWALLS

2-16.01 GENERAL

1) Rockeries shall be designed by a Geotechnical Engineer if the height will exceed 6 feet in a stable cut section or 4 feet in a fill section. Construction of rockeries requiring an engineering design shall be carried out under the periodic or full-time observation of a Geotechnical Professional. A typical rockery is shown in Standard Detail R-150.

2) Terracing of rockeries is subject to approval by the Engineer.

3) Where a rockery or retaining wall is proposed, all warrants for a guardrail or pedestrian safety rail shall apply.

2-16.02 MATERIALS

1) Rock material shall be as rectangular as possible. No stone shall be used which does not extend through the wall. The quarried rock shall be hard, sound, durable and free from weathered portions, seams, cracks and other defects. The rock density shall be a minimum of 160 pounds per cubic foot, measured according to WSDOT Test Method 107 (Bulk Specific Gravity - S.S.D. basis). Additionally, rock subjected to the U.S. Army Corps of Engineers Test Method CRD-C-148 (Method of Testing Stone for Expansive Breakdown on Soaking in Ethylene Glycol") must have less than 15% break down.

2) Size requirements shall conform to the Table 2-7:

Table 2-7 Material Size Requirements

MATERIAL SIZE REQUIREMENTS		
SIZE	**WEIGHT (LBS)**	**DIAMETER (INCHES)**
2-MAN	200-700	18-28
3-MAN	700-2000	28-38
4-MAN	2000-4000	36-48
5-MAN	4000-6000	48-54
6-MAN	6000-8000	54-60

2-16.03 KEYWAY

A keyway, consisting of a shallow trench of minimum 12-inch depth, shall be constructed the full rockery length, and slightly inclined downward toward the face being protected. It shall be excavated the full rockery width and its subgrade shall be firm and acceptable to the City Engineer.

2-16.04 UNDERDRAINS

A minimum of 4 inch perforated drain pipe shall be placed in a shallow excavated trench located along the inside edge of the keyway. The pipe shall be bedded on and surrounded by "Gravel Backfill for Drains", WSDOT/APWA 9-3.12(4) to a minimum height of 18 inches above bottom of pipe. The perforated pipe shall be connected to the storm drain system or to an acceptable outfall. No drain shall discharge onto the face of a slope.

2-16.05 ROCK SELECTION AND PLACEMENT

Rock selection and placement shall be such that there will be minimum voids and, in the exposed face, no open voids over 6 inches across in any direction. The final course shall have a continuous appearance and be placed to minimize erosion of the backfill material. The larger rocks shall be placed at the base of the facing so that it will be stable and have a stable appearance. The longitudinal axis of each rock shall be at right angles to the face. Inclined rock faces shall slope to the back of the rockery. Each course of rocks shall be seated tightly and as evenly as possible on the course beneath. The rocks shall be placed so that no continuous joint planes are created, either horizontally or vertically. After setting each course of rock, all voids between the rocks shall be placed on the back with quarry spalls to eliminate any void sufficient to pass a 2 inch square probe.

2-16.06 ROCK FILTER LAYERS

The rock filter layer shall consist of a layer of quarry spalls, with a maximum size of 4 inches and a minimum size of 2 inches, placed on the back of the rock facing and a minimum 12 inch thick layer of drain rock between the quarry spalls and the cut or fill slope. The drain rock shall meet WSDOT/APWA Standard Specification 9-03.12(4). The backfill material shall be placed in lifts to an elevation approximately 6 inches below the top of each course of rocks as they are placed, until the uppermost course is placed. Any backfill material on the bearing surface of one rock course shall be removed before setting the next course.

2-16.07 EMBANKMENTS

Embankments behind rockeries, in fill sections exceeding four feet in height above the keyway, shall be reinforced with a geosynthetic fabric or geogrid specifically manufactured for soil reinforcement and designed on a project specific basis by a Professional Engineer licensed in the State of Washington.

2-16.08 SIDEWALKS ABOVE ROCKERY FACINGS

When a sidewalk is to be built over a rock facing, the top of the facing shall be sealed and leveled with a cap constructed of cement concrete Class 3000 in accordance with the applicable provisions of Section 6-02 of the WSDOT/APWA Standard Specifications. Water content shall be reduced so that slump does not exceed 2 inches.

2-16.09 FENCES AND HANDRAILS

A chain link fence or metal handrail shall be installed when a rockery is 30 inches or greater in height.

2-17 PEDESTRIAN HAND RAILINGS AND GUARDRAILS

Safety railings may be required for pedestrians and/or bicyclists along roadways, bridges or pedestrian facilities. See Standard Detail R-160. Reference standards for design and installation, depending on the type of facility may be constructed, include the following:

- AASHTO Standard Specifications for Highway Bridges
- International Building Code
- WSDOT *Design Manual*

2-18 CEMENT CONCRETE SIDEWALKS

This work shall consist of constructing cement concrete sidewalks, thickened edge for sidewalks, curb ramps, and bus shelter pads, including excavation for the depth of the sidewalk and sub-grade preparation, in accordance with these Standards, the WSDOT/APWA Standard Specifications and City Standard Detail R-170.

2-18.01 SIDEWALKS

1) Sidewalk cross slopes shall not exceed 2 percent.

2) Sidewalk located along a road shall follow the road grade in most cases. Where a sidewalk is separated from a road, its grade may or may not be controlled by the road grade. If not, the sidewalk grade shall not exceed 8.33% (1 foot vertical in 12 feet horizontal).

3) In single-family residential zoned areas, the minimum width of sidewalk is 5 feet. In commercial/industrial and multi-family residential zoned areas, sidewalks of 6 or 7 feet may be required by the City Engineer. Where a sidewalk is located adjacent to a curb, the width of sidewalk is measured from the back of the curb to the back of the sidewalk.

4) If it is necessary to install facilities, such as mailboxes, fire hydrants, sign posts, poles, pedestals, etc. within a sidewalk, then the sidewalk shall be widened to provide a minimum horizontal clearance of 48 inches around any part of the obstruction.

5) Meandering sidewalks, where approved by the City, shall be constructed to maintain a full 5-foot width plus 1 foot of clearance around obstructions, including mailbox mountings that cannot be relocated. Additional right-of-way may be required to accommodate a meandering sidewalk or to relocate the obstruction behind the sidewalk.

6) Sidewalk concrete thickness depends on the type of curb section, sidewalk location and whether the sidewalk is part of the driveway.

- 4 inches in vertical curb section,
- 5 inches in rolled curb section if the sidewalk next to curb (cul-de-sac only),
- 6 inches in driveway approaches.

7) Subgrade compaction requirements shall comply with the WSDOT Standard Specifications and shall be as shown in Standard Detail RR-170.

8) In cut areas, a drainage collection system shall be installed behind the sidewalk.

2-18.02 CURB RAMPS

In accordance with State law, curb ramps shall be provided at all pedestrian crossings with curb sections. It is required that when a ramp is constructed giving handicap access to the roadway area, the corresponding ramp at the opposite side of the roadway will also be required. Exact locations at each curb return will be determined in the field during construction.

Curb ramps shall be constructed in accordance with the WSDOT Standard Plan F-40.10-00. Curb ramps shall be constructed where shown on the plans or as directed by the City Engineer. This work shall include curb ramps installed in new sidewalks and curb ramps to be installed in existing sidewalks. Existing sidewalks shall be neatly saw cut full depth prior to construction of curb ramps.

Curb ramps shall fall within crosswalks, marked or unmarked. Ramps may be as wide as the approaching sidewalk or walkway, but shall have a minimum width of 3 feet.

A diagonal curb ramp, located at the midpoint of a curb radius, is not permitted in a new construction sidewalk. It may be allowed only when required in the modification of an existing curb/sidewalk.

A curb ramp shall not be located outside a curb radius unless approved by the City Engineer. Such a location places pedestrians where they are not readily seen by right turning vehicles.

Curb ramps shall not be obstructed by fire hydrants, sign posts, poles, pedestals or other utilities, or any other obstruction. A drainage low point and a catch basin or inlet within a curb ramp or crosswalk shall be avoided.

Curb ramps shall include detectable warnings, using a raised truncate dome design, in accordance with the ADA Accessibility Guidelines for Buildings and Facilities. A design is provided in WSDOT Standard Plan F-3a.

Ramp texturing is to be done with an expanded metal grate placed and removed from wet concrete to leave a diamond pattern as shown in WSDOT Standard Plan F-40.10-00.

Curb ramps shall not be poured integral with sidewalk. Curb and gutter shall be isolated from curb ramps by expansion joint material on all sides.

2-18.03 MATERIALS

Materials shall meet the requirements of the following section of the WSDOT/APWA Standard Specifications:

Portland Cement	9-01
Concrete Aggregate	9-03
Pre-molded Joint Filler	9-04
Curing Compounds & Mixtures	9-23

Slump of the concrete mix shall not exceed 2½ inches. Lamp black coloring agent for matching the color of newly constructed cement concrete sidewalks to the color of adjacent existing cement concrete sidewalks shall be added to the concrete during mixing in an amount not to exceed 1½ pounds per cubic yard of concrete. No lamp black shall be used in curb ramps. The use of calcium chloride as an admixture is prohibited.

2-18.04 CONSTRUCTION REQUIREMENTS

General

The sidewalk section shall be placed after the placement of the curb and gutter section unless otherwise directed by the City Engineer.

The sub-grade shall be approved by the City Inspector prior to concrete being placed. Expansion joints shall be one-half inch by full depth and placed to match those placed

in curbs if new sidewalk is poured adjacent a curb and gutter, in all other cases the maximum spacing on expansion joints shall be 10 feet on center. Control joints shall be ¼ the thickness of the concrete on 5 foot centers.

A minimum distance of 5 feet is required from the face of curb to any obstruction on or within the sidewalk unless otherwise noted. Mailboxes shall be set at locations approved by the Postmaster and may be adjacent to the curb in residential areas.

Where there is insufficient suitable native material on the project site, the Contractor shall furnish, place and compact Gravel Borrow. All sidewalks shall be constructed over a minimum 2 inches of Crushed Surfacing Top Course meeting the requirements of Section 9-03.9(3) of the WSDOT/APWA Standard Specifications compacted to 95% of maximum dry density.

Form and Fine Grading

Wood forms shall be 2 inch x 4 inch (nominal) in lengths of not less than 10 feet. Steel forms may also be used. Forms shall be staked to a true line and grade. A sub-grade template shall then be set upon the forms and the fine grading completed so that the sub-grade will be a minimum of 4 inches below the top of the forms. Forms shall be provided around all street name sign posts and traffic sign posts that are placed in concrete areas. Forms used for this purpose shall be 1 foot square or 1 foot minimum diameter cutout, as approved by the City.

Placing and Finishing Concrete

The concrete shall be spread uniformly between the forms and thoroughly compacted with a steel shod strikeboard. Expansion joints and control joints shall be located and constructed in accordance with the Standard Details. In construction of expansion joints, the pre-molded joint filler shall be adequately supported until the concrete is placed on both sides of the joint.

Whenever castings are located in the sidewalk area, joints shall be installed at the casting location to control cracking of the sidewalk. If spacing of joints or scoring is such that installation of joint material would be unsuitable, the contractor shall install rebar to strengthen the sidewalk section.

Control joints shall be formed by first cutting a groove in the concrete with a tee bar of a depth equal to, but not greater than the joint filler material, and then working the pre-molded joint filler into the groove. Pre-molded joint filler for both expansion and control joints shall be positioned in true alignment at right angles to the line of the sidewalk and normal to and flush with the surface.

After the concrete has been thoroughly compacted and leveled, it shall be floated with wood floats and finished at the proper time with a metal float. Joints shall be edged with a ¼ inch radius edger and the sidewalk edges shall be tooled with a ½ inch radius edger.

The surface shall be brushed with a fiber hair brush of an approved type in a transverse direction except that at driveway and alley crossings it shall be brushed longitudinally. The placing and finishing of all sidewalks shall be performed under the control of the City Engineer, and the tools used shall meet with his/her approval. After brush finish, the edges of the sidewalk and all joints shall be lightly edged again with an edging tool to give it a finished appearance.

Curing and Protection

The curing materials and procedures specified in Section 5-05.3(13) of the WSDOT/APWA Standard Specifications shall prevail, except that white pigment curing compounds shall not be used on sidewalks.

The Contractor shall have readily available sufficient protective covering, such as waterproof paper or plastic membrane, to cover the pour of an entire day in event of rain or other unsuitable weather.

The sidewalk shall be protected against damage or defacement of any kind until it has been accepted by the City. Sidewalk which is not acceptable to the City because of damage or defacement shall be removed and replaced by the Developer at their expense.

Curing and Hot Weather

In periods of low humidity, drying winds, or high temperatures, a fog spray shall be applied to concrete as soon after placement as conditions warrant in preventing the formation of shrinkage cracks. The spray shall be continued until conditions permit the application of a liquid curing membrane or other curing media. The City Engineer shall make the decision when the use of a fog spray is necessary.

Cold Weather Work

When the air temperature is expected to reach the freezing point during the day or night, the concrete shall be protected from freezing. The Contractor shall provide a sufficient supply of blankets or other suitable blanketing material and spread it over the pavement to a sufficient depth to prevent freezing of the concrete. The Contractor shall be responsible for the quality and strength of the cured concrete. Any concrete damaged by frost action or freezing shall be removed and replaced at the Developer’s expense.

2-19 CURB AND GUTTER SECTIONS

2-19.01 DESCRIPTION

The standard curb and gutter section shall be Type 1, per Standard Detail R-180. Type 1 standard curb and gutter shall be used on both public and private roadways.

Curb sections conforming to City Standard Details R-190 through R-210 are intended for use in parking lot areas, temporary road sections and other locations subject to the review and approval of the City Engineer.

2-19.02 MATERIALS

Materials shall meet the requirements of the following Sections of the WSDOT/APWA Standard Specifications:

Portland Cement	9-01
Concrete Aggregate	9-03
Reinforcing Steel	9-07
Pre-molded Joint Filler	9-04
Curing Compounds & Mixtures	9-23

The Portland Cement Concrete shall meet the requirements of Section 5-05 of the WSDOT/APWA Standard Specifications. Concrete mix for curbs shall be Class 3000. Slump of the concrete shall not exceed 3½ inches.

All new curb and gutter shall be placed over Crushed Surfacing Top Course not less than 4 inches and compacted to 95% maximum dry density.

Forms may be of wood or metal at the option of the contractor, provided that the forms as set will result in a curb, or curb and gutter of the specified thickness, cross section, grade and alignment shown on the construction plans.

2-19.03 PLACING CONCRETE

The sub-grade shall be properly compacted and brought to specified grade before placing concrete. The sub-grade shall be thoroughly dampened immediately prior to the placement of concrete. No new curb and gutter is to be placed until forms have been checked and approved for line, grade and compaction by the City Inspector. Concrete shall be spaded and tamped thoroughly into the forms to provide a dense, compacted concrete free of rock pockets. The

exposed surfaces shall be floated, finished and brushed longitudinally with a fiber hair brush approved by the City Inspector.

The rate of concrete placement shall not exceed the rate at which the various placing and finishing operations can be performed in accordance with these Standards.

If concrete is to be placed by the extruded method, the Contractor shall demonstrate to the satisfaction of the City Engineer that the machine is capable of placing a dense, uniformly compacted concrete to exact section, line and grade.

2-19.04 CURING AND PROTECTION

Transparent curing compounds shall be applied to all exposed surfaces immediately after finishing. Transparent curing compounds shall contain a color dye of sufficient strength to render the film distinctly visible on the concrete for a minimum period of 4 hours after application.

The Contractor shall have readily available sufficient protective covering, such as waterproof paper or plastic membrane, to cover the pour of an entire day in event of rain or other unsuitable weather.

Additional requirements for curing in hot weather shall be as specified in these Standards. Additional requirements for curing in cold weather may be found in of these Standards.

The curb shall be protected against damage or defacement of any kind until it has been accepted by the City. Sidewalk which is not acceptable to the City Engineer because of damage or defacement shall be removed and replaced by the Developer at their expense.

The curing materials and procedures specified in Section 5-05.3(13) of the WSDOT /APWA Standard Specifications shall prevail, except that white pigment curing compounds shall not be used on curb and gutter.

2-20 CEMENT CONCRETE DRIVEWAYS

2-20.01 DESCRIPTION

This work shall consist of cement concrete driveway and alley returns constructed at the locations shown on the construction plans and where directed by the City, and shall be in accordance with these Standards, the WSDOT/APWA Standard Specifications and City Standard Details R-220 and R-230.

2-20.02 MATERIALS

Materials shall meet the requirements of the following sections of WSDOT/APWA Standard Specifications:

Portland Cement	9-01
Fine Aggregate	9-03
Coarse Aggregate	9-03
Joint Materials	9-04
Curing Compounds and Admixture	9-23

The concrete mix shall be as specified for Class 3000 and the slump of the concrete shall not exceed 3 inches.

2-20.03 CONSTRUCTION REQUIREMENTS

General

No driveway approach shall project beyond the extension of the side property line to the curb, unless the owner of the adjacent property is a co-signer of the driveway permit.

There must be at least 20 feet of full height curb between driveways serving any one property frontage.

There must be at least 6 feet of full height curb between driveways on adjacent lots. Driveway aprons shall be constructed per City Standard Details R-090 and R-100 as applicable. The minimum thickness of the driveway apron shall be 6 inches, placed over a minimum of 4 inches of Crushed Surfacing Top Course compacted to 95% maximum dry density over a compacted sub-grade. In all cases, sub-grade and rock grade shall be approved by the City Inspector prior to concrete being placed. Driveway aprons over 15 feet wide shall have an expansion joint placed in the center of the apron. In locations where a new driveway is to be constructed and the sidewalk/curb/gutter is in existence, it must be totally removed and replaced to driveway standards. It is not permissible to "knock-off" existing curb and install driveway apron, the total curb and gutter section must be removed, either by sawcutting or to the nearest expansion joint, and replaced to driveway standards.

New driveways installed in areas where curb and gutter improvements are not existing, and not required to be installed, shall be paved from the existing edge of pavement to

the property line regardless of whether the remainder of the driveway on the private property is paved.

In areas not fully improved with curbs and sidewalks, the elevation of the driveway at the point where it crosses the property line shall not be more than 3 inches higher than the elevation of the centerline of the existing paved street if the driveway is rising on the private property side, and no lower than level with the elevation of the centerline of the existing street if the driveway is going down on the private property side.

Excavation and Sub-grade

Where directed by the City Engineer, unsuitable material in the subgrade shall be removed to a specific depth and backfilled with select material such as Gravel Borrow conforming to the requirements of Section 9-03.14(1) of WSDOT/APWA Standard Specifications.

Before any concrete is placed, the Contractor shall bring the subgrade to the required line, grade and cross-section. The Contractor shall maintain the subgrade in the required condition until the concrete is placed. Compaction shall be to 95% standard density.

Forms and Fine Grading

Forms for the straight sections of the driveway or alley return shall have a minimum thickness of 2 inches and be equal to the nominal depth of the concrete. Plywood or 1 inch lumber may be used on radii. All forms shall be securely staked and blocked to true line and grade.

A template shall be set upon the forms and the subgrade shall be fine graded to conform to the required section. The subgrade shall then be compacted to the approval of the City Inspector. Prior to placement of the concrete, the subgrade shall be thoroughly dampened.

Placing and Finishing

The concrete shall be spread uniformly between the forms and thoroughly compacted with an approved type of strikeboard. Expansion joints and control joints shall be located and constructed in accordance with the City Standard Details. In the construction of expansion joints, the pre-molded joint filler shall be adequately supported until the concrete is placed on both sides of the joint.

Control joints shall be formed with a tee bar by first cutting a groove in the concrete to a depth equal to, but not greater than the joint filler material and then working the pre-molded joint filler into the groove. Pre-molded joint filler for both expansion and control joints shall be positioned in true alignment and at right angles to the center line of the driveway or alley return.

After the concrete has been thoroughly compacted and leveled, it shall be floated with wood floats and finished at the proper time with a metal float. Joints shall be edged with ¼ inch radius edger and the driveway or alley return edges shall be tooled with ½ inch radius edger.

The surface shall be brushed in a transverse direction in relation to the center line of the driveway or alley return with a fiber hair brush of approved type.

Curing and Protection

The curing materials and procedures specified in Sections 5-05 and 9-23 of the WSDOT/APWA Standard Specifications and these Standards shall be used. The driveway and the alley return shall be protected against damage or defacement of any kind until acceptance by the City. Any driveway or alley return not acceptable, in the opinion of the City Engineer because of damage or defacement, shall be removed and be replaced by the Developer at their expense.

Before placing any concrete, the Contractor shall have on the job site enough protective paper to cover the pour of an entire day, in event of rain or other unsuitable weather conditions.

2-21 PROPORTIONING OF MATERIALS

2-21.01 CONTROLLED DENSITY FILL

Controlled Density Fill (CDF) shall conform to the requirements of Section 2-09.3(1) E of the WSDOT/APWA Standard Specifications.

2-21.02 GRAVEL BORROW

The gradation for Gravel Borrow shall conform to the requirements of Section 9-03.14(1) of the WSDOT/APWA Standard Specifications.

2-21.03 QUARRY ROCK

Quarry Rock shall meet the requirements of Section 9-13.6 of the WSDOT/APWA Standard Specifications.

All percentages are by weight.

2-21.04 NON-SHRINK CEMENT SAND GROUT

Non-shrink cement sand grout shall be proportioned as follows:

1) One part high early strength (HES) cement.

2) Two parts clean fine-grained sand by weight and well-mixed with sufficient water to obtain a stiff consistency.

Unpolished aluminum powder shall be added to the dry cement in the proportion of one heaping teaspoonful per sack of cement no more than 30 minutes before the grout mixture reaches its final in-place position.

The required strength of the non-shrink concrete or grout shall be fc=4,000 psi and be verified by the cube strength test. The strength shall be confirmed by Schmidt hammering of the pads.

Prior to placing the grout, the contact surface shall be thoroughly cleaned, roughened and wetted with water. The grout shall be covered with burlap sacks after the initial concrete set and wetted at regular intervals until the required strength is obtained.

2-22 PARKING

2-22.01 NUMBERS OF PARKING SPACES

Except as exempted by AMC 20.72.010(b), all developments shall provide a sufficient number of parking spaces to accommodate the number of vehicles that are ordinarily and likely to be attracted to the development in question.

Number of parking spaces required for different developments is included in AMC 20.72 and Table 20.72-6. If a type of development is not listed in AMC Table 20.72-6, the Director of Community Development will determine the parking requirements using this table as a guide.

The City may require that bicycle parking facilities be provided for commercial and multi-family residential development projects per AMC 20.72.110.

2-22.02 PARKING SPACE DIMENSIONS

Each parking space shall contain a rectangular area at least 19 feet long and 9 feet wide.

In parking areas containing 10 or more parking spaces, up to 20% of the parking spaces need only contain a rectangular area of 8 feet in width and 15 feet in length. If such spaces are provided, they shall be conspicuously designed as reserved for small or compact cars only.

Where parallel parking is provided, the dimensions of such parking spaces shall not be less than 26 feet by 8 feet.

Aisle widths for parking lots are shown in Standard Detail R-240 and R-250. Aisle widths may be required to be widened if multiple utility lines are located within the aisle corridor.

2-22.03 GENERAL DESIGN REQUIREMENTS

Whenever possible, parking areas shall be designed so that, without resorting to extraordinary movements, vehicles may exit such areas without backing onto a public street. This requirement does not apply to parking areas consist of driveways that serve 1 or 2 dwelling units, although backing onto arterial streets is discouraged.

Parking areas of all developments shall be deigned so that sanitation, emergency, and other public service vehicles can serve such developments without the necessity of backing unreasonable distances or making other dangerous or hazardous turning movements.

Every parking area shall be designed so that vehicles cannot extend beyond the perimeter of such area onto adjacent properties or public right-of-way. Such areas shall also be designed so that vehicles do not extend over sidewalks or tend to bump against or damage any wall, vegetation, or other obstruction.

Circulation areas shall be designed so that vehicles can proceed safely without posing a danger to pedestrians or other vehicles and without interfering with parking areas.

2-22.04 CONSTRUCTION

In accordance with AMC 20.76.060, all parking areas shall be graded and surfaced with asphalt, concrete, or other material that will provide equivalent protection against potholes, erosion, and dust.

All parking lot construction shall be inspected by the City for conformance with the approved plans for size, layout, drainage control and structural section.

The minimum acceptable structural section for parking lots shall be 2 inches of Class “B” asphalt placed over 4 inches of Crushed Surfacing Top Course, unless otherwise approved by the City Engineer. Heavier pavement sections may be required for truck traffic, vehicle storage or as determined by the Developer’s Geotechnical Engineer due to soil conditions. Prior to placing any surfacing material on the parking area, it will be the responsibility of the Developer to provide density test reports certified by a Professional Engineer licensed in the State of Washington or an approved testing laboratory.

Crushed Surfacing Top Course shall be compacted to 95% maximum density. Density testing for asphalt pavement including the necessity and frequency of core samples will be determined by the City Engineer on a case by case basis.

2-22.05 HANDICAP REQUIREMENTS

Handicap parking stalls shall meet the requirements of Washington State Regulations for Barrier Free Facilities (WAC 51-10), RCW 19.27, International Building Code and RCW 70.92, Public Buildings - Provisions for Aged and Handicapped. Safe, convenient handicap access is required from the street to all buildings on site. This is in addition to safe, convenient handicap access between buildings. Sidewalks constructed adjacent to City streets/roadways shall provide handicap access, including ramps, landings and handrails as necessary.

2-22.06 ILLUMINATION

Parking lot illumination shall be provided for all parking lots containing more than ten (10) parking spaces, and shall be designed and constructed to meet the following requirements:

Provide adequate illumination for security and safety to all parking spaces, pedestrian walkways and sidewalks. Driveway entries and exits should receive special illumination and signage, where necessary. Pedestrian scale lighting may be required to illuminate pedestrian trails/paths and walkways on site if required by the City.

Be shielded in a manner that does not disturb residential uses, airport operations, or public rights-of-way adjacent to the parking facility.

2-22.07 PEDESTRIAN CONCERNS

Pedestrian walkways and sidewalks shall conform to requirements of Title 12 of the AMC.

Internal vehicle and pedestrian circulation for parking lots shall be approved by the City Engineer. Parking lot circulation shall allow pedestrians and wheelchairs to easily gain access from public sidewalks and bus stops to building entrances through the use of pedestrian paths which are physically separated from vehicle traffic and maneuvering areas. In shopping center parking lots containing more than 100 spaces, such pedestrian/wheelchair paths shall be a minimum of 5 feet wide and constructed in a manner that they cannot be used as a holding area for shopping carts.

Access driveways for parking areas shall be located to avoid conflict with vehicular and pedestrian traffic on public rights-of-way.

The City may require joint use of driveways by more than one property.

2-22.08 THROAT LENGTH REQUIREMENTS

The throat length is the unobstructed storage length requirement measured from the inside face of curb to the first driveway or parking stall. Distances may be reduced for multiple driveways as approved by the City. The minimum throat length shall be at least 25 feet for all land uses unless it is determined by the City that greater throat length is required, based upon

project specific traffic volumes and site conditions. Throat lengths for collectors and arterials will generally be larger to accommodate higher driving speeds and traffic site distance requirements.

2-23 LANDSCAPING

Landscaping in the City right-of-way provides numerous aesthetic, environmental and safety benefits. The following specifications provide information for the landscaping of City streets and stormwater facilities.

2-23.01 PLANTER STRIPS

A planter strip is the portion of the right-of-way between the curb and the sidewalk or between the sidewalk and the right-of-way line used for the planting of trees, shrubs, groundcover or grass. Planter strips are required, as shown in Standard Details R-260 through R-280, along arterial or non-arterial City roads. Planter strips may be installed, but are not required, around permanent or temporary road ends. The design of planter strips must be approved by the City Engineer through a landscaping plan in which plant maintenance, utilities and traffic safety requirements are addressed.

The preferred planter strip location is between the vertical curb and sidewalk to enhance the urban road appearance. However, planter strips may be located behind sidewalks or on both sides of sidewalks if approved by the City Engineer.

2-23.02 MEDIANS

A median is the portion of the right-of-way separating the traveled ways of traffic in opposite directions.

1) Medians and planting shall be designed so that neither sight distance nor vehicle turning radii are limited.

2) Medians may be covered with grass, landscape plantings, aggregate, asphalt or concrete.

3) Medians design shall be reviewed for pedestrian accessibility based on the WSDOT *Design Manual* and ADA criteria.

4) Medians shall be illuminated as determined by the City.

2-23.03 PLANTING TYPES

Landscape plantings, approved for use in public right-of-way, are grouped into 4 categories described below. Height, spacing, and plant root development have been evaluated to prevent interference with overhead and underground utilities.

1) Small Trees (25 to 35 feet high +/-)
   Suitable for use under overhead utility wires, may be used in planter strips in front of or behind sidewalks. Average tree spacing shall be 25 feet to 30 feet on center.

2) Medium Trees (35 to 50 feet high +/-)
   Not for use under overhead utility wires. May be used in planter strips in front of sidewalks where utilities are located underground. Average tree spacing shall be 35 feet to 40 feet on center.

3) Large Trees (51 feet high or larger)
   Not for use under overhead utility wires. Use only behind sidewalks or where large planter strips, 8 to 10 feet wide, are planned. Conifers may be placed only behind sidewalks. Average tree spacing shall be 35 feet to 40 feet on center.

4) Shrubs and Groundcover
   Suitable for use in narrow planter (2 to 5 feet wide) in front of a sidewalk, where trees are planted behind the sidewalk, or interspersed between trees in planters either in front of or behind sidewalk.

As stated in Chapter 5, no willows, poplars, cottonwoods, birches, soft maple, gum or any other tree or shrub whose roots are likely to obstruct public sewers are allowed within 30 feet of any public sewer. Any of these trees found to be located within 30 feet of a proposed sewer main shall be removed at the Developer's expense.

Due to the sensitive nature of critical areas, no non-native species may be planted for landscaping in a public right-of-way that borders a critical area.

2-23.04 TREE PLANTING AND MAINTENANCE

1) Trees shall be planted so that the center of each trunk is 3 feet from the back of curb or, if planted behind a sidewalk, 3 feet from the back of sidewalk.

2) Where trees are to be planted adjacent to a sidewalk, a root barrier shall be installed on the sidewalk side of each tree, parallel to and 6 inches from the sidewalk. The barrier shall be 15 feet long, centered horizontally on the tree trunk and extend from the ground surface to a depth of 18 inches.

3) Trees shall be trimmed so that no branches extend below 14 feet above a traffic lane, or 7 feet above a bicycle lane or pedestrian facility.

2-23.05 STORMWATER FACILITY LANDSCAPING

Stormwater detention facilities shall be landscaped with vegetative buffer/screens pursuant to AMC 20.76. Fencing around the facilities may be required by the City for safety and security. Chain link fence is specified. To improve the visual appearance of the facility, vinyl-coated fencing in a dark and natural color is preferred.

For additional landscaping guidelines see the *City of Arlington Landscaping Requirements* brochure.

CITY OF ARLINGTON

APPROVED BY	DATE	REF STD SPEC
L. OLIVE	07/31/2008	

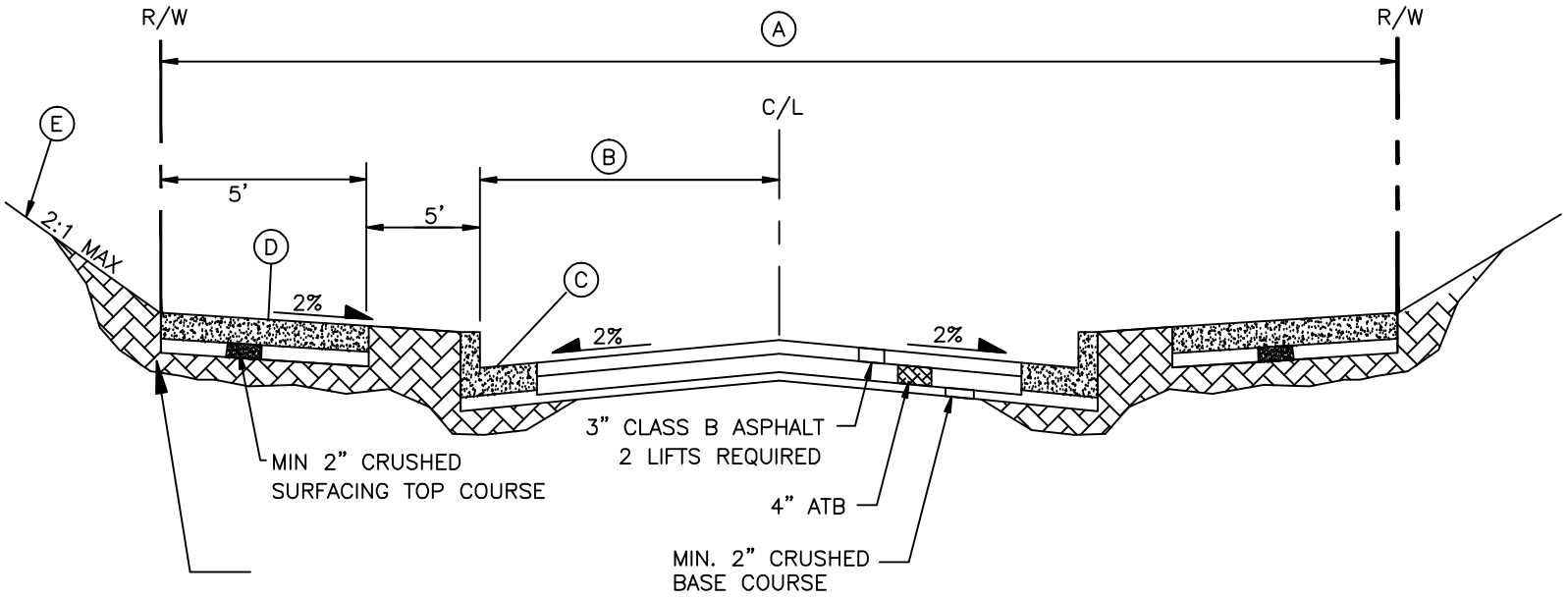
DEPARTMENT OF PUBLIC WORKS

STANDARD DETAILS

TYPICAL ROADWAY SECTION
LOCAL ACCESS STREET

STANDARD DETAIL NUMBER

R-010



STANDARD ROADWAY SECTION

- (A) RIGHT OF WAY REQUIREMENTS – 60'
- (B) PAVEMENT WIDTH – 20'
- (C) CONCRETE CURB AND GUTTER TYPE 1
  SEE STD DETAIL R–180
- (D) CEMENT CONCRETE SIDEWALK
  SEE STD DETAIL R–170
- (E) CONSTRUCTION EASEMENT REQUIRED

NOTES:

1. IN WIDENING AREAS, THE EXISTING PAVEMENT EDGE SHALL BE SAW–CUT TO LEAVE A JOIN POINT. ANY TRAFFIC STRIPING REMOVED OR DAMAGED DURING WIDENING WORK SHALL BE REPLACED IN KIND OR AS DIRECTED BY THE CITY ENGINEER.

2. COMPACTION TESTS ON SUBGRADE AND SURFACING ARE REQUIRED. THE NUMBER OF TESTS SHALL BE AT THE DISCRETION OF THE CITY INSPECTOR. ALL TESTING SHALL BE THROUGH A LICENSED TESTING LABORATORY. THE MINIMUM COMPACTION SHALL BE 95% OF MAXIMUM DENSITY ON BOTH SUBGRADE AND SURFACING.

3. ADJUSTMENT OF CATCH BASIN LIDS OR GRATES, MONUMENTS CASES, VALVE BOXES, MANHOLE COVERS, ETC SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR OR DEVELOPER AS REQUIRED'ROADWAY SECTION MAY BE ADJUSTED WITH THE APPROVAL OF THE CITY ENGINEER UPON SUBMISSION OF SUBSTANTIATING ENGINEERING DATA (CBR, ETC) TO SUPPORT THE ADJUSTMENT. FOR DESIGN PURPOSES, THE MINIMUM THICKNESS OF CLASS B ASPHALT SHALL BE 3" COMPACTED DEPTH. COMPACTION SHALL BE AN AVERAGE OF 92% OF DRY, DENSITY PER WSDOT TEST METHOD 729.

CITY OF ARLINGTON

APPROVED BY	DATE	REF STD SPEC
L. OLIVE	07/31/2008	

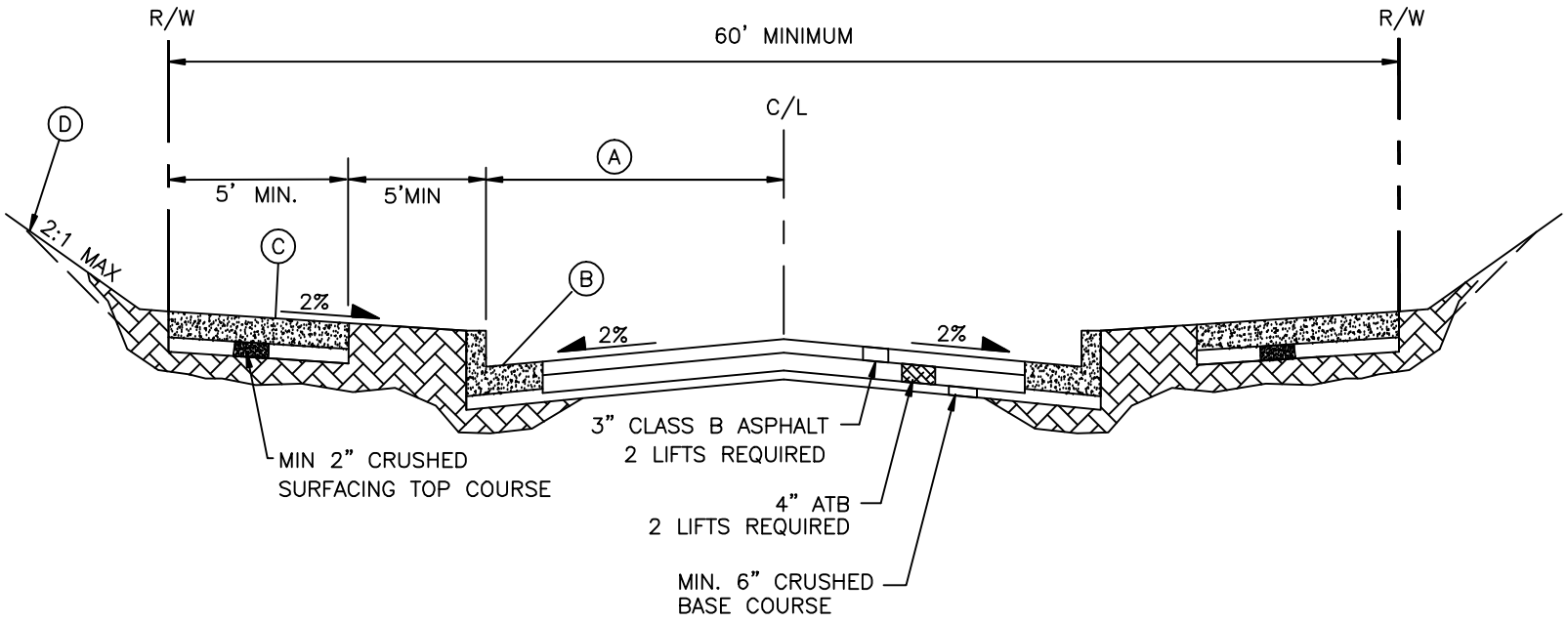
DEPARTMENT OF PUBLIC WORKS

STANDARD DETAILS

TYPICAL ROADWAY SECTION
ARTERIAL & INDUSTRIAL ACCESS

STANDARD DETAIL NUMBER

R-020

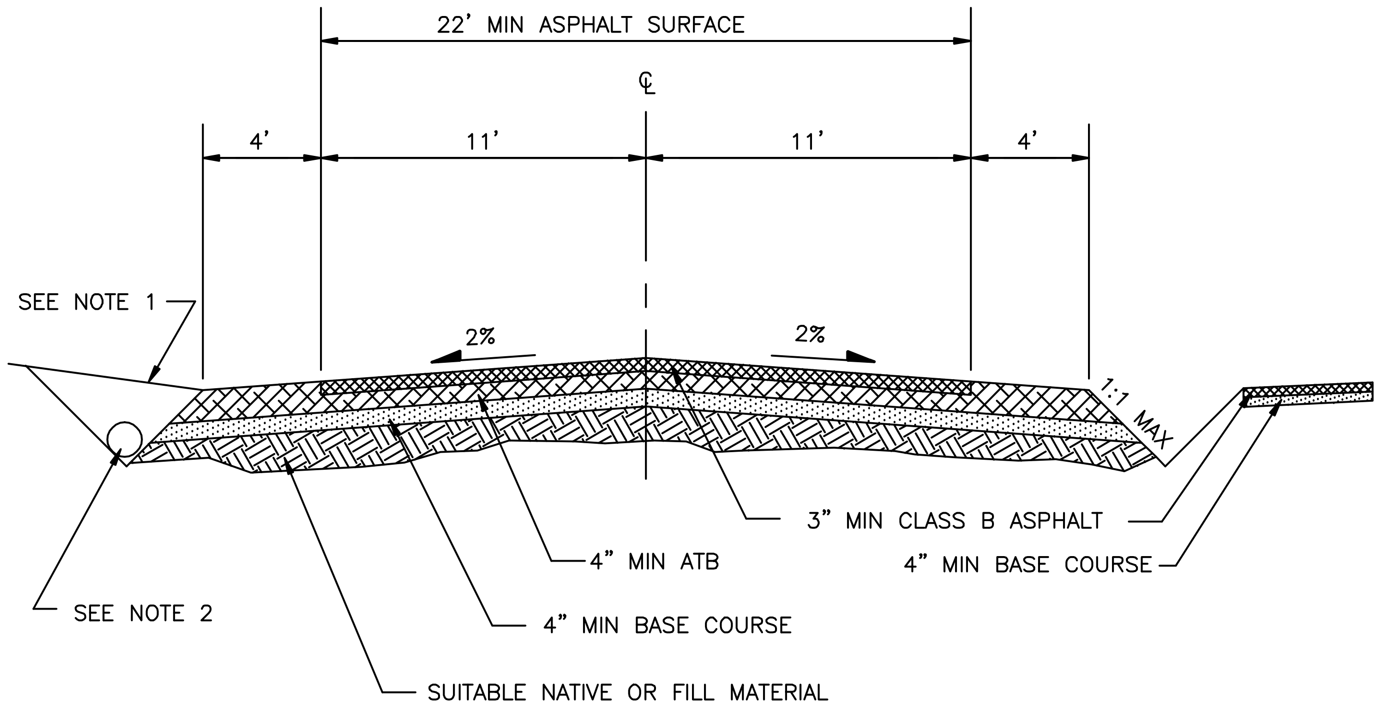


STANDARD ROADWAY SECTION:

- (A) PAVEMENT WIDTH
  24' MINIMUM (VARIES)
- (B) CONCRETE CURB AND GUTTER TYPE 1
  SEE STD DETAIL R-180
- (C) CEMENT CONCRETE SIDEWALK
  SEE STD DETAIL R-170
- (D) CONSTRUCTION EASEMENT REQUIRED

NOTES:

1. IN WIDENING AREAS, THE EXISTING PAVEMENT EDGE SHALL BE SAW-CUT TO LEAVE A JOIN POINT. ANY TRAFFIC STRIPING REMOVED OR DAMAGED DURING WIDENING WORK SHALL BE REPLACED IN KIND OR AS DIRECTED BY THE CITY ENGINEER.
2. COMPACTION TESTS ON SUBGRADE AND SURFACING SHALL BE REQUIRED. THE NUMBER OF TESTS SHALL BE AT THE DISCRETION OF THE CITY INSPECTOR. ALL TESTING SHALL BE THROUGH A LICENSED TESTING LABORATORY. THE MINIMUM COMPACTION SHALL BE 95% OF MAXIMUM DENSITY ON BOTH SUBGRADE AND SURFACING.
3. ADJUSTMENT OF CATCH BASIN LIDS OR GRATES, MONUMENTS CASES, VALVE BOXES, MANHOLE COVERS, ETC SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR OR DEVELOPER AS REQUIRED.
4. ROADWAY SECTION MAY BE ADJUSTED WITH THE APPROVAL OF THE CITY ENGINEER UPON SUBMISSION OF SUBSTANTIATING ENGINEERING DATA (CBR, ETC) TO SUPPORT THE ADJUSTMENT. FOR DESIGN PURPOSES, THE MINIMUM THICKNESS OF CLASS B ASPHALT SHALL BE 3" COMPACTED DEPTH. COMPACTION SHALL BE AN AVERAGE OF 91% OF DRY DENSITY, WSDOT TEST METHOD 705.



NOTES:

1. DRIVEWAY GRADE AT RIGHT-OF-WAY LINE SHALL CONFORM TO CHAPTER 2 OF THE CITY STANDARDS UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER.

2. A 12-INCH MINIMUM CONCRETE OR CORRUGATED POLYETHYLENE SMOOTH INTERIOR PIPE IS REQUIRED UNDER ALL DRIVEWAYS.

CITY OF ARLINGTON

APPROVED BY	L. OLIVE
DATE	07/31/2008
REF STD SPEC	

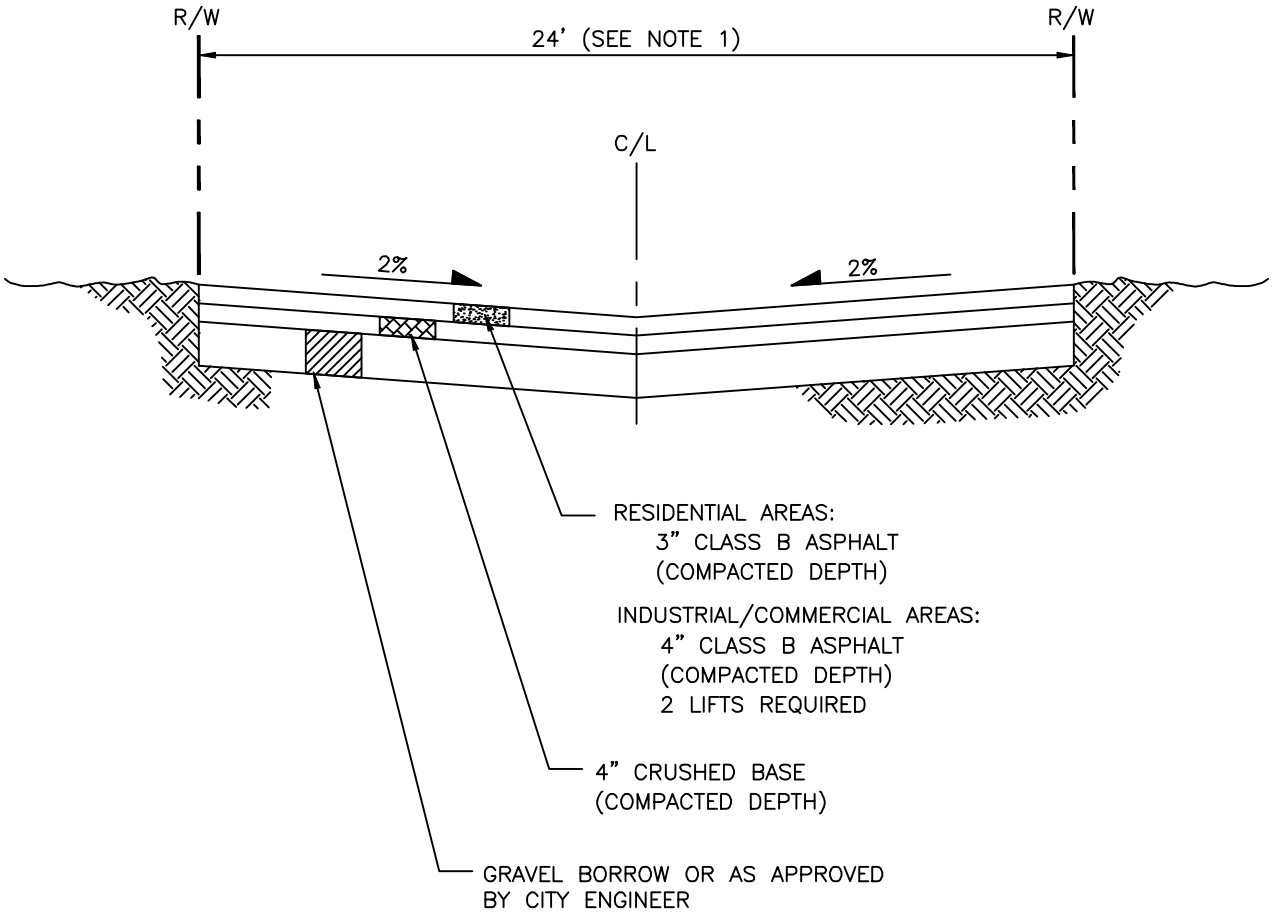
DEPARTMENT OF PUBLIC WORKS

STANDARD DETAILS

TYPICAL ROADWAY SECTION
MODIFIED STREET

STANDARD DETAIL NUMBER

R-030

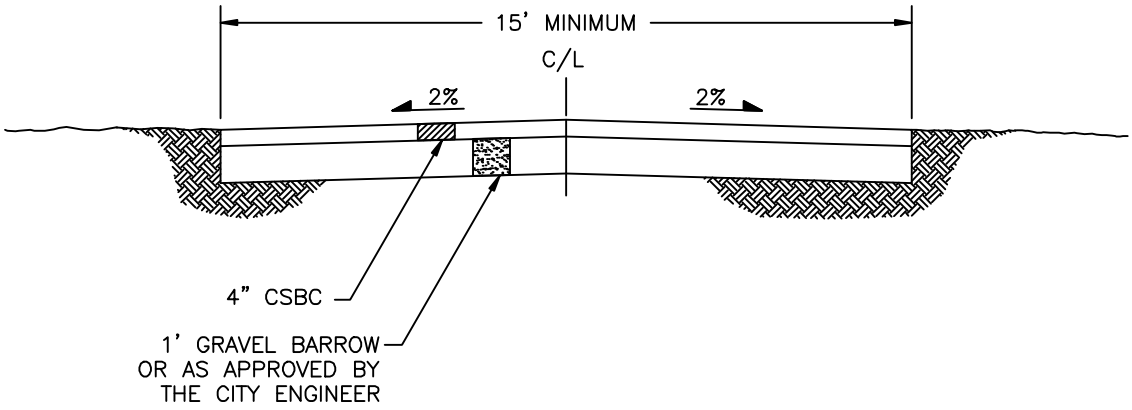


NOTES:

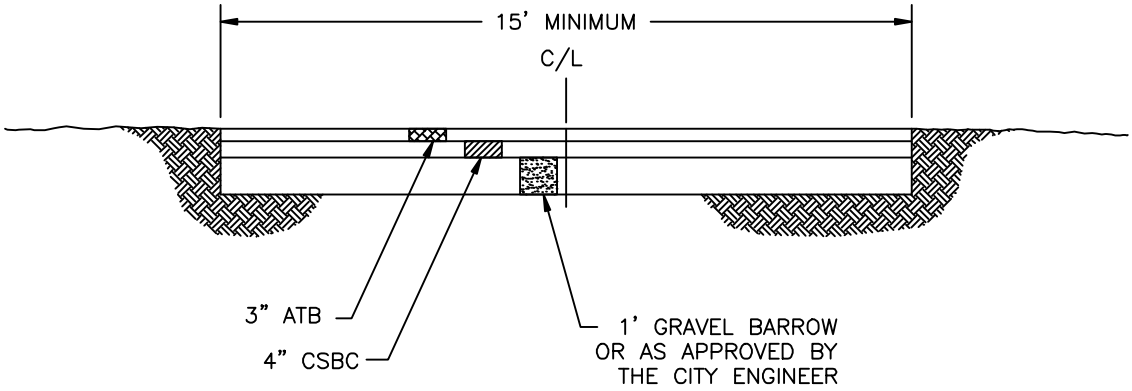
1. ALL NEW ALLEYS SHALL HAVE A MINIMUM WIDTH OF 24'. EXISTING ALLEY RIGHT–OF–WAYS MAY VARY FROM 12' TO 24'.
2. DRAINAGE TO BE COLLECTED AT LOW END OF IMPROVED SECTION WITH CATCH BASIN CONNECTED TO STORM DRAINAGE SYSTEM.
3. COMPACTION TESTS ON SUBGRADE AND AT THE TOP OF SUBGRADE WILL BE REQUIRED. THE NUMBER OF TESTS SHALL BE AT THE DISCRETION OF THE CITY INSPECTOR. ALL TESTING SHALL BE THROUGH A LICENSED TESTING LABORATORY. THE MINIMUM COMPACTION SHALL BE 95% OF MAXIMUM DENSITY OF BOTH SUBGRADE AND SURFACING.
4. ADJUSTMENT OF CATCH BASIN LIDS OR GRATES, MONUMENT CASES, VALVE BOXES, MANHOLE COVERS, ETC SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR OR DEVELOPER AS REQUIRED.

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS	STANDARD DETAIL NUMBER
	DATE	07/31/2008		
	REF STD SPEC		TYPICAL ROADWAY SECTION ALLEY	R–040

GRADES LESS THAN 8%



GRADES 8% AND OVER

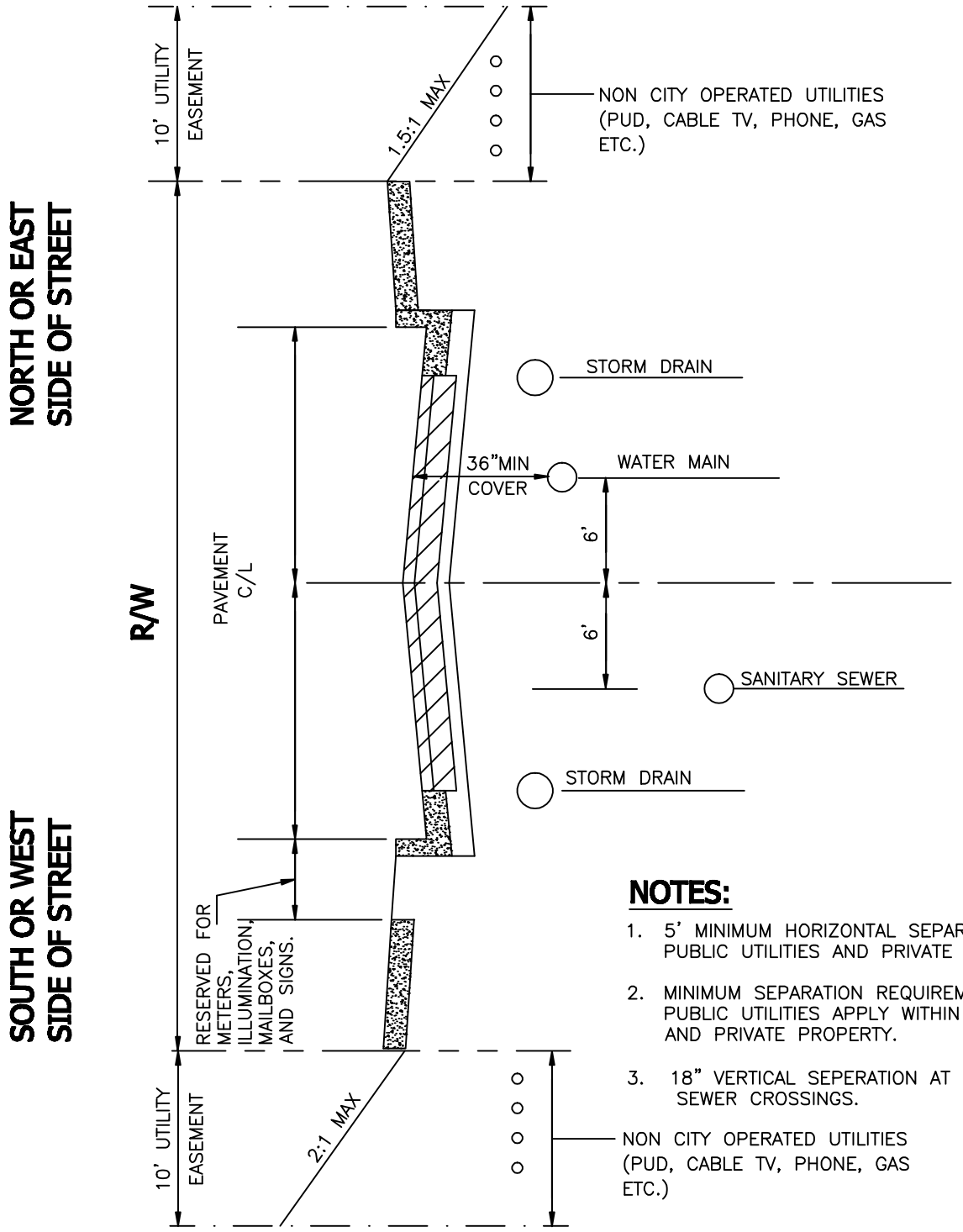


NOTES:

1. COMPACTION TESTS ARE REQUIRED. THE NUMBER OF TESTS TO BE FIELD DETERMINED BY THE CITY INSPECTOR. ALL TESTING SHALL BE PERFORMED BY A LICENSED TESTING LABORATORY. MINIMUM COMPACTION SHALL BE 95% MAXIMUM DENSITY OF BOTH SUBGRADE AND CSBC.

2. GRADES 8% AND OVER REQUIRE 3" ATB. COMPACTION SHALL BE AN AVERAGE OF 92% OF DRY DENSITY.

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS	STANDARD DETAIL NUMBER
	DATE	07/31/2008		
	REF STD SPEC		ALL WEATHER SURFACES FOR UTILITY ACCESS	R-050



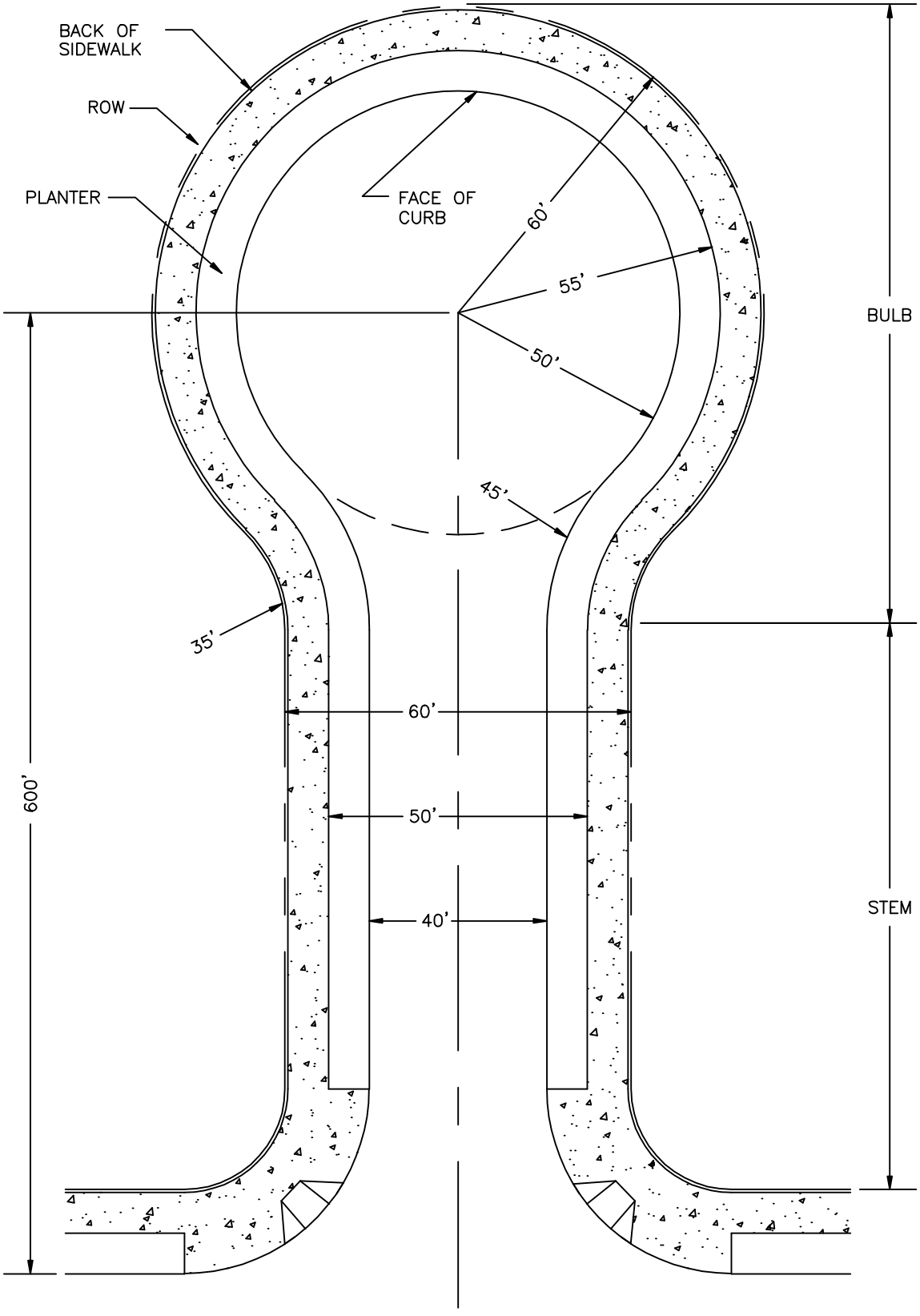
NOTES:

1. 5' MINIMUM HORIZONTAL SEPARATION BETWEEN PUBLIC UTILITIES AND PRIVATE UTILITIES.
2. MINIMUM SEPARATION REQUIREMENTS FROM PUBLIC UTILITIES APPLY WITHIN EASEMENTS AND PRIVATE PROPERTY.
3. 18" VERTICAL SEPERATION AT WATER AND SEWER CROSSINGS.

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS
	DATE	07/31/2008	
	REF STD SPEC		TYPICAL UTILITY LOCATIONS

STANDARD DETAIL NUMBER

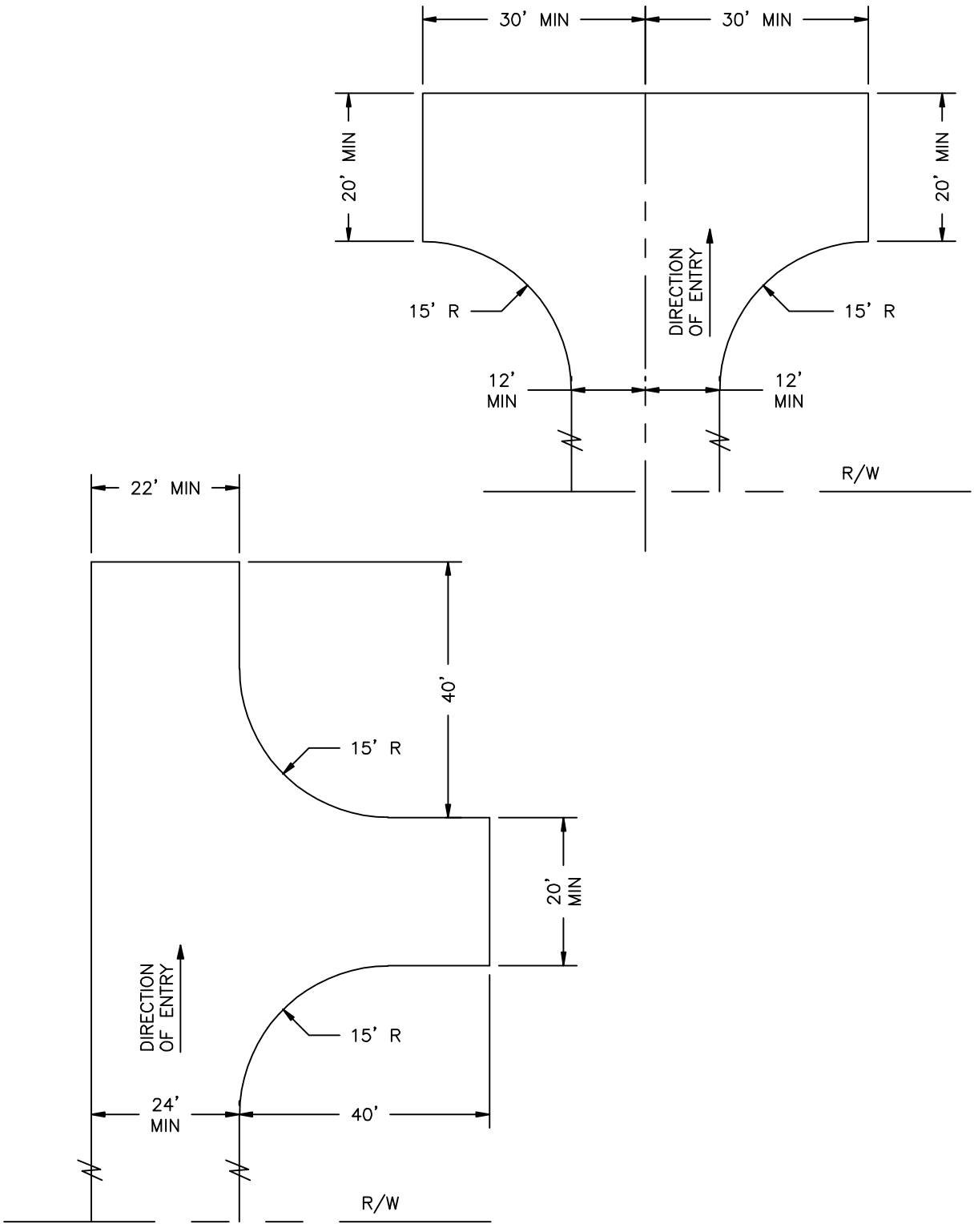
R-060



CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS
	DATE	07/31/2008	
	REF STD SPEC		TYPICAL CUL-DE-SAC

STANDARD DETAIL NUMBER

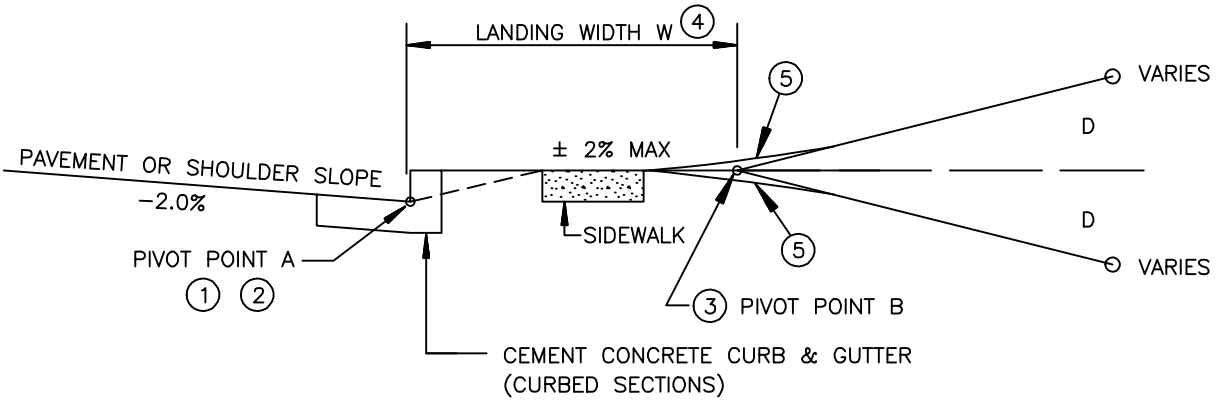
R-070



CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS
	DATE	07/31/2008	
	REF STD SPEC		TEMPORARY TURNAROUNDS

STANDARD DETAIL NUMBER

R-080



TYPE OF ACCESS	ACCESSING	LANDING WIDTH W ④	ACCESS GRADE D
RESIDENTIAL (URBAN)	NON−ARTERIAL	15'	± 15% MAX.
RESIDENTIAL (URBAN)	ARTERIAL	15'	± 7% MAX.
COMMERCIAL/INDUSTRIAL	NON−ARTERIAL	30'	± 8% MAX.
COMMERCIAL/INDUSTRIAL	ARTERIAL	30'	± 5% MAX.

NOTES:

① SEE STD DETAIL R−180 FOR CURB DETAILS.

② WHEN ACCESSING SHOULDERED ROADWAYS, MAINTAIN SHOULDER SLOPE TO PIVOT POINT A.

③ ACCESS POINT GRADE SHALL BE MEASURED FROM PIVOT POINT B.

④ LANDING WIDTH W MAY BE REDUCED SUBJECT TO APPROVAL OF THE CITY ENGINEER.

⑤ A VERTICAL CURVE SHALL BE CONSTRUCTED TO TRANSITION THE LANDING TO THE ACCESS APPROACH. THE VERTICAL SEPARATION BETWEEN THE CURVE AND A 10−FOOT CHORD OF THE CURVE SHALL NOT EXCEED 3.25 INCHES (WHERE D IS POSITIVE) OR 2.00 INCHES (WHERE D IS NEGATIVE).

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS
	DATE	07/31/2008	
	REF STD SPEC		ACCESS POINT GRADES
			STANDARD DETAIL NUMBER R−090

CITY OF ARLINGTON

APPROVED BY	DATE	REF STD SPEC
L. OLIVE	07/31/2008	

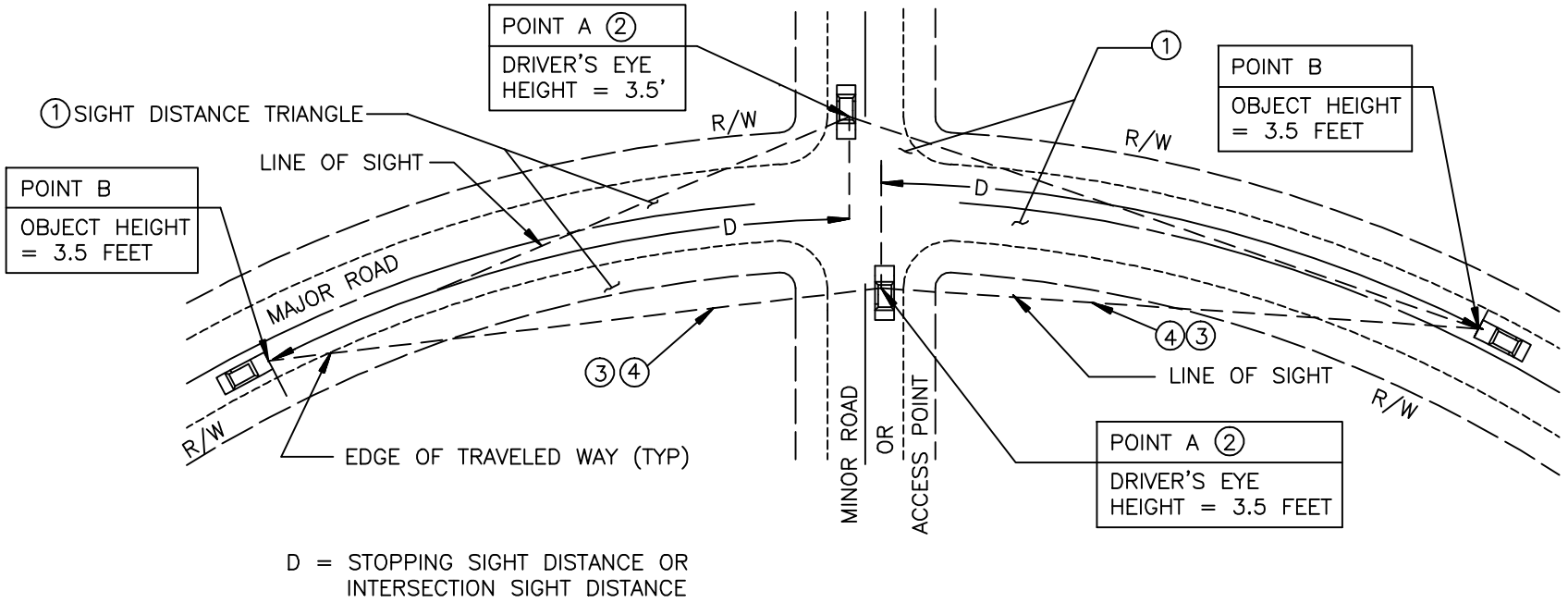
DEPARTMENT OF PUBLIC WORKS

STANDARD DETAILS

CLEAR SIGHT TRIANGLES

STANDARD DETAIL NUMBER

R-100



D = STOPPING SIGHT DISTANCE OR INTERSECTION SIGHT DISTANCE

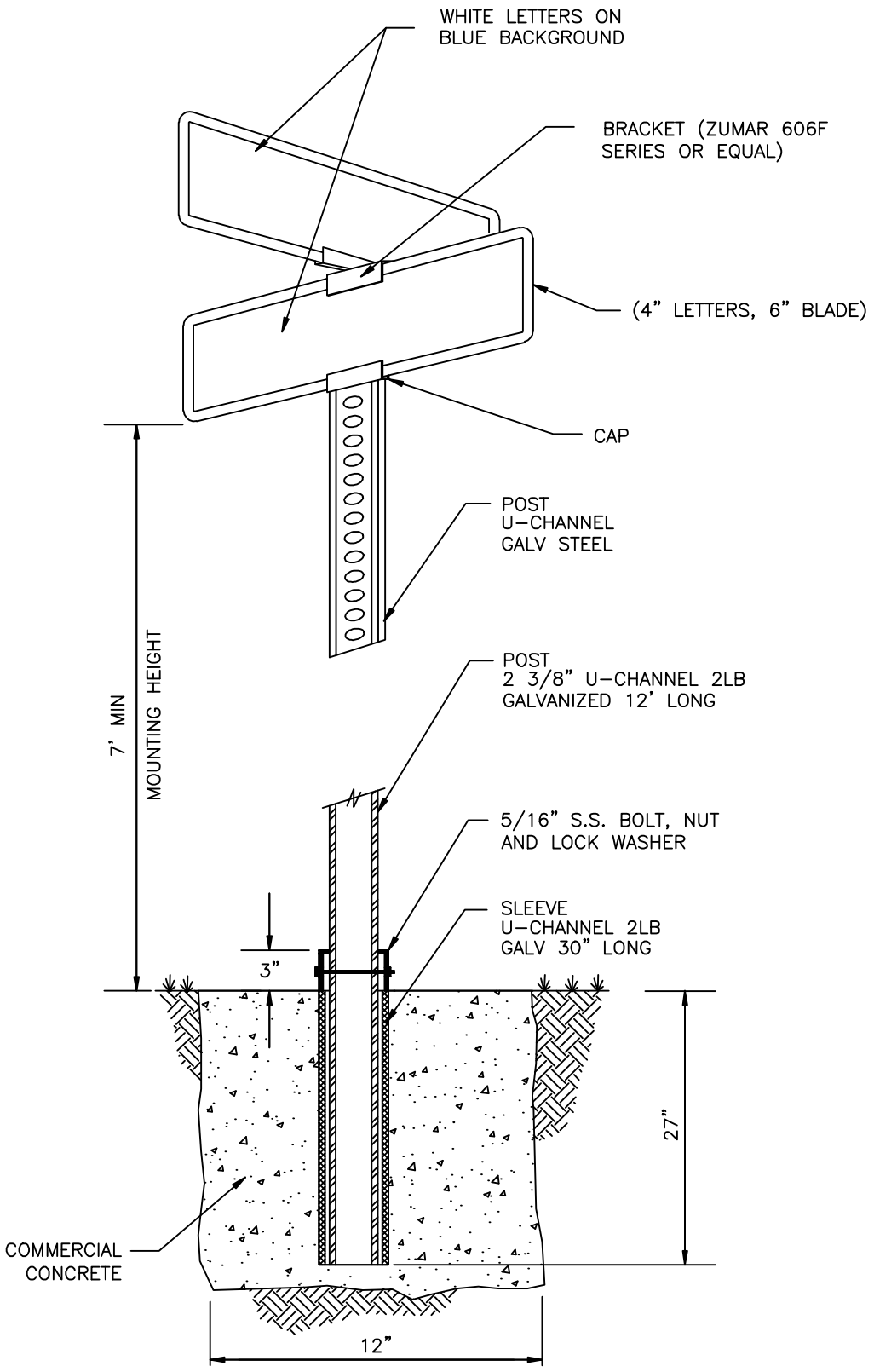
NOTES:

1. AT ANY INTERSECTION OR ACCESS POINT CONNECTION, THERE MUST EXIST CLEAR SIGHT TRIANGLES, FREE OF SIGHT OBSCURING OBJECTS. UNOBSTRUCTED LINES OF SIGHT MUST BE PROVIDED FROM A POINT ON THE MINOR ROAD 15 FEET BEHIND THE EDGE OF TRAVELED WAY (POINT A) TO ALL POINTS IN THE TRAVELED WAY INCLUDED IN THE CLEAR SIGHT TRIANGLES. THE BASE OF EACH CLEAR SIGHT TRIANGLE SHALL BE AT LEAST EQUAL TO THE STOPPING SIGHT DISTANCE D.

2. THE DRIVER'S EYE TO DETERMINE LINE OF SIGHT AT INTERSECTIONS IS 3.5 FEET ABOVE THE MINOR ROAD PAVEMENT, WITH AN OBJECT HEIGHT OF 3.5 FEET ABOVE THE MAJOR ROAD PAVEMENT.

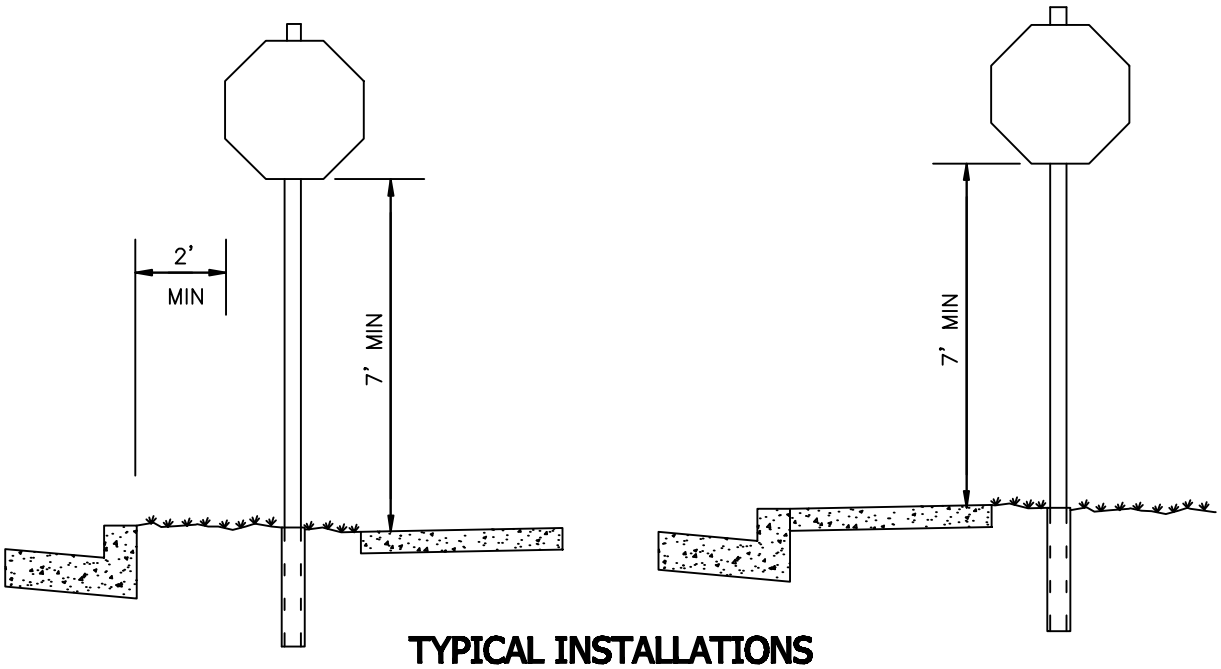
3. THE AREA WITHIN THE CLEAR SIGHT TRIANGLE MUST BE FREE FROM ANY SIGHT OBSCURING OBJECTS. GROUND SHALL BE REGRADED AND VEGETATION TRIMMED OR REMOVED SO THAT NO OBJECT PROTRUDES CLOSER THAN 18 INCHES TO THE LINE OF SIGHT BETWEEN THE MINOR ROAD/ACCESS POINT AND THE MAJOR ROAD.

4. AREA WITHIN THE CLEAR SIGHT TRIANGLE BUT OUTSIDE OF EXISTING PUBLIC RIGHT-OF-WAY SHALL EITHER BE ACQUIRED AS NEW PUBLIC RIGHT-OF-WAY OR A SIGHT DISTANCE EASEMENT RECORDED FOR FUTURE CITY MAINTENANCE.

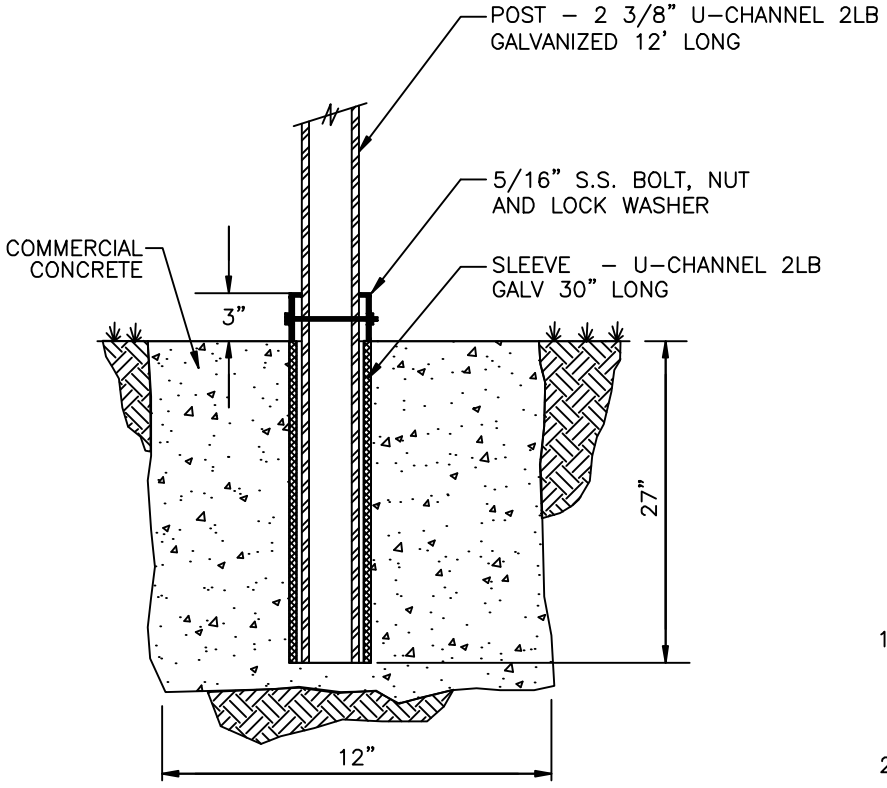


TYPICAL SECTION

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS	STANDARD DETAIL NUMBER
	DATE	07/31/2008		
	REF STD SPEC		POST MOUNTED STREET NAME SIGNS	R-110



TYPICAL INSTALLATIONS



TYPICAL SECTION

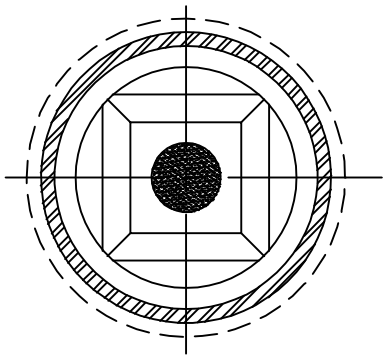
NOTES:

1. STANDARD STOP SIGNS SHALL BE 30"x30" PRIZMATIC SPECIFICATION UNLESS OTHERWISE APPROVED OR DIRECTED BY THE CITY ENGINEER.
2. STREET NAME SIGNS MAY BE INSTALLED AT TOP OF POST.

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS
	DATE	07/31/2008	
	REF STD SPEC		TRAFFIC REGULATORY SIGN INSTALLATION

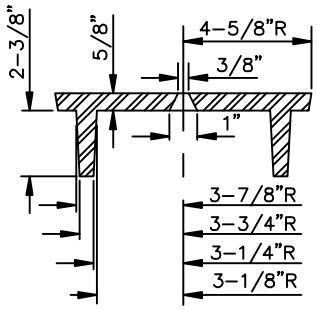
STANDARD DETAIL NUMBER

R–120

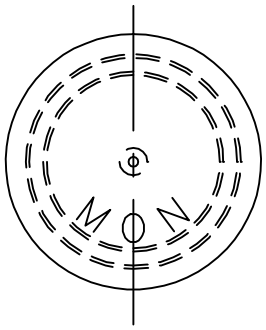


PLAN

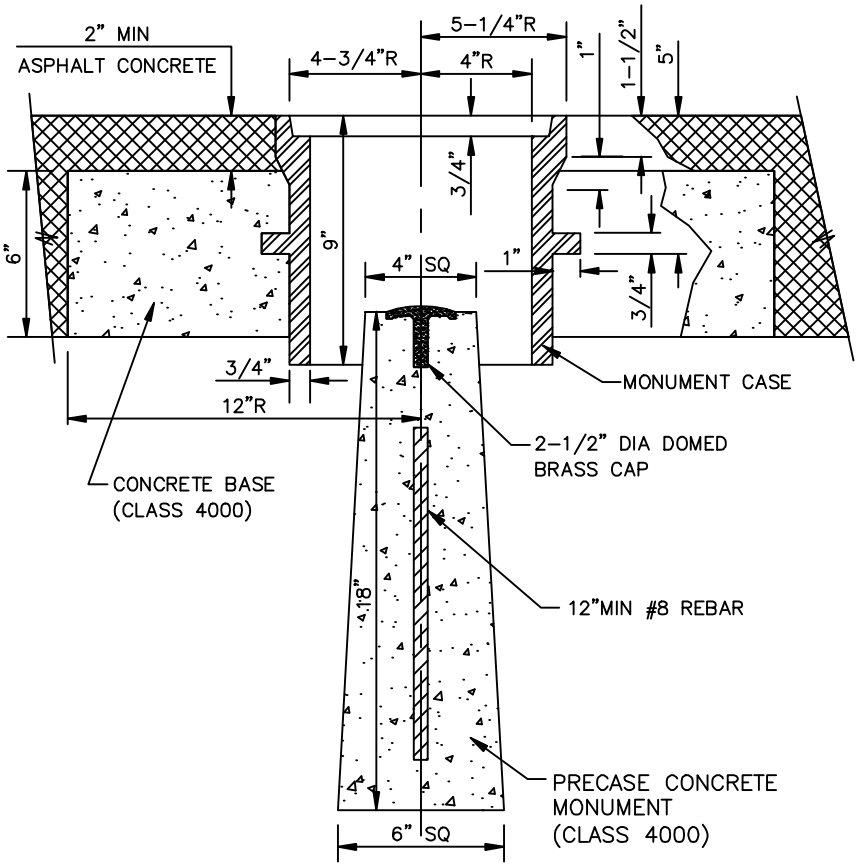
COVER REMOVED



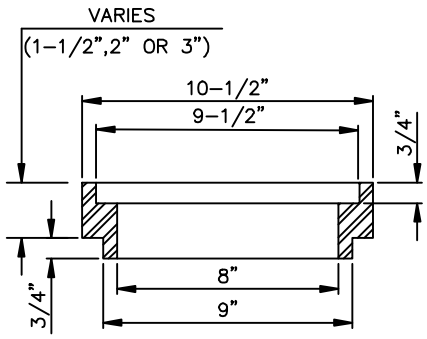
COVER SECTION



COVER PLAN



SECTION



EXTENSION SECTION

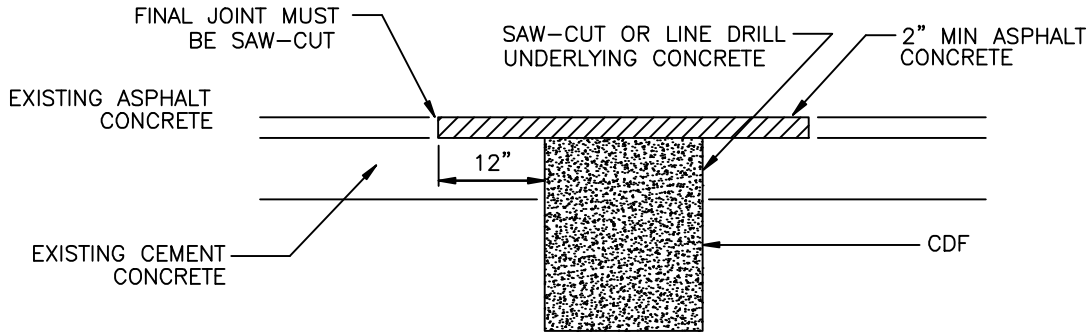
NOTES

1. MONUMENTS IN NON-PAVED AREAS SHALL BE 3" ABOVE GRADE.
2. ALL MONUMENTS SHALL BE PRECAST CONC. WITH REBAR AND 2-1/2" DIA BRASS CAP.
3. MONUMENT CASE AND RISER SECTION SHALL BE CAST IRON PER ASTM-A48, CLASS 30, WITH BITUMINOUS COATING.
4. COVER SHALL BE DUCTILE IRON PER ASTM-A536, GRADE 80-55-06, WITH BITUMINOUS COATING.
5. LEGEND ON COVER SHALL BE 1/8" RAISED INTERGRALLY CAST LETTERS 1" HIGH WITH A MIN FACE WIDTH OF 3/16".

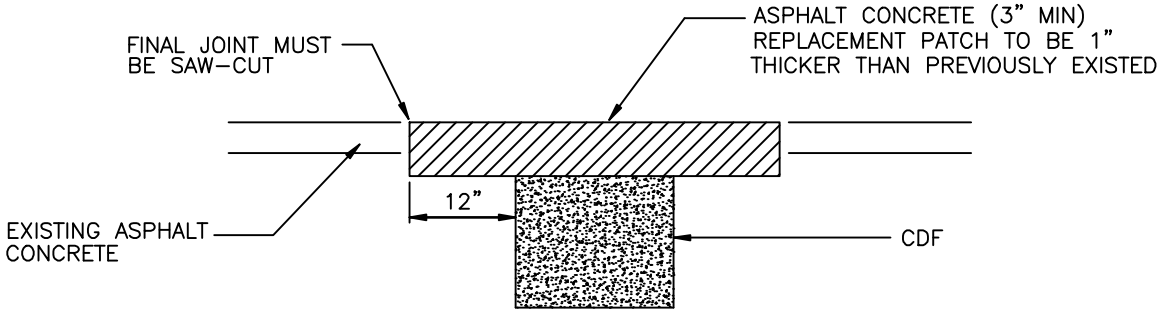
CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS
	DATE	07/31/2008	
	REF STD SPEC		SURVEY MONUMENT

STANDARD DETAIL NUMBER

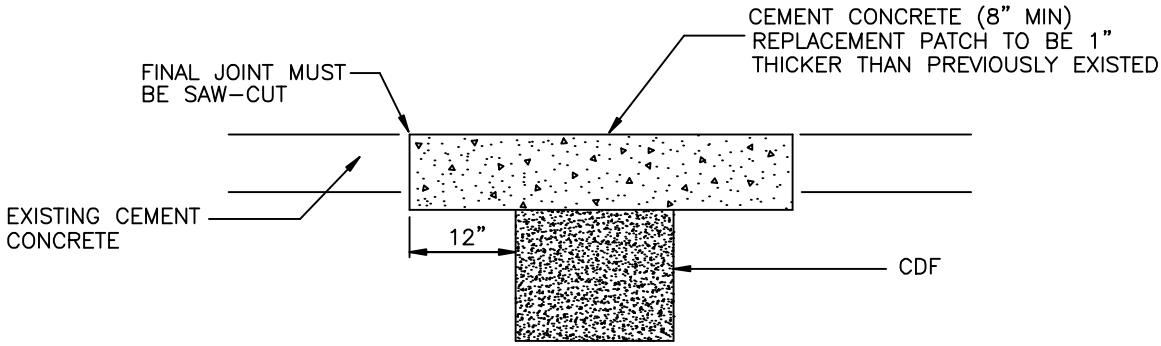
R-130



EXISTING ASPHALT CONCRETE OVER CEMENT CONCRETE



EXISTING ASPHALT CONCRETE OVER PREPARED GRADE



EXISTING CEMENT CONCRETE OVER PREPARED GRADE

NOTES:

1. ALL TRENCHES IN ROADWAY AREAS SHALL BE BACKFILLED AND PATCHED WITH TEMPORARY ASPHALT AT THE END OF EACH WORK DAY, UNLESS PERMISSION IS GRANTED TO DO OTHERWISE BY THE CITY ENGINEER.

2. ALL TEMPORARY PATCHES ON TRENCHES SHALL BE PERMANENTLY PATCHED WITHIN 2 WEEKS OF COMPLETION OF WORK WITHIN THE ROADWAY AREA.

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS	STANDARD DETAIL NUMBER
	DATE	07/31/2008		
	REF STD SPEC		PAVEMENT PATCH	R–140

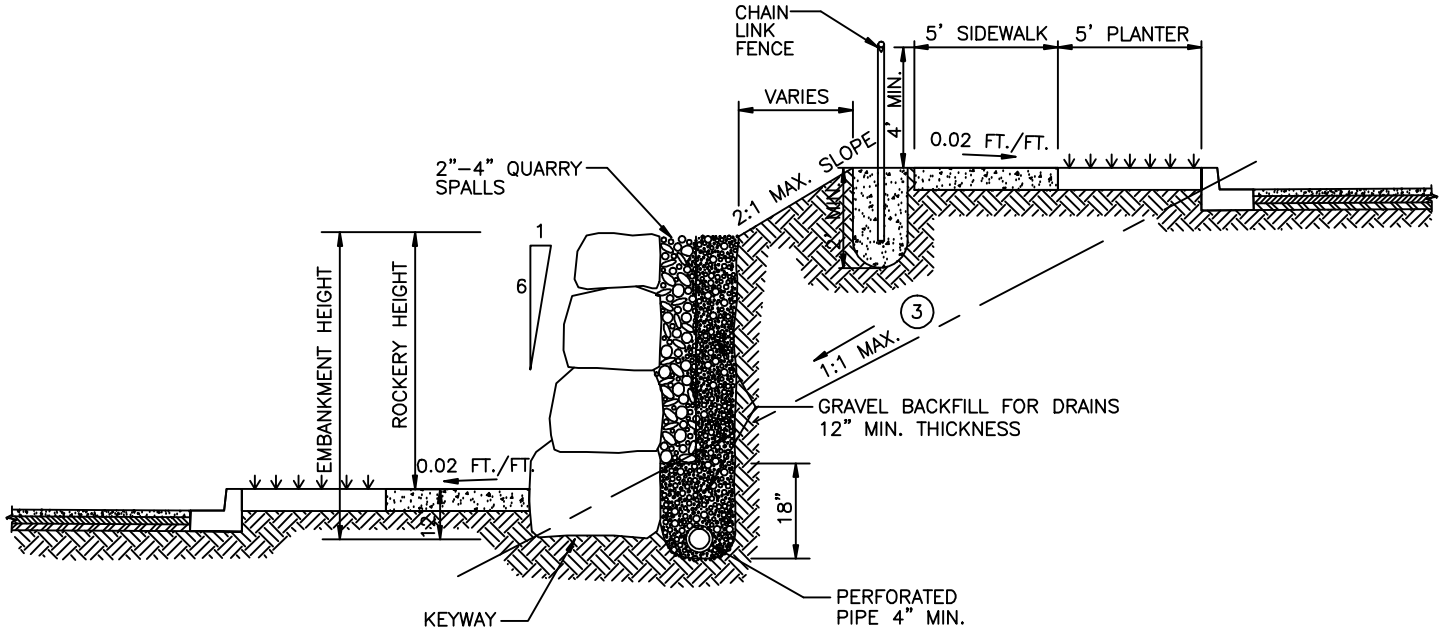
CITY OF ARLINGTON

APPROVED BY	DATE	REF STD SPEC	
L. OLIVE	07/31/2008		

DEPARTMENT OF PUBLIC WORKS

STANDARD DETAILS

ROCKERY



NOTES: NOT TO SCALE

1. SEE TEXT CHAPTER 2. ROCKERIES SHALL BE DESIGNED BY A GEOTECHNICAL ENGINEER IF EMBANKMENT HEIGHT EXCEEDS 6 FT. IN A CUT SECTION OR 4 FT. IN A FILL SECTION.

2. GRAVEL BACKFILL SHALL MEET WSDOT/APWA STANDARD SPECIFICATION 9–03.12[4]

3. FLATTER SLOPE MAY BE REQUIRED IN LESS STABLE SOIL.

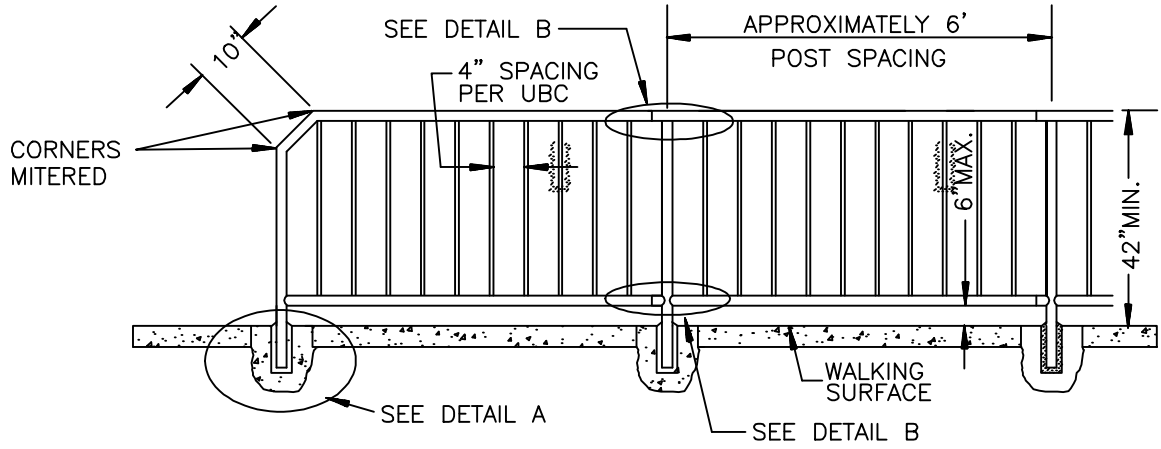
4. CHAIN LINK FENCE, TYPE NO. 4 OR 6 (WSDOT/APWA STANDARD), REQUIRED WHEN ROCKERY HEIGHT IS 30 INCHES OR GREATER. VINYL–COATED FENCING IN A DARK, NATURAL COLOR MAY BE USED TO IMPROVE VISUAL APPEARANCE.

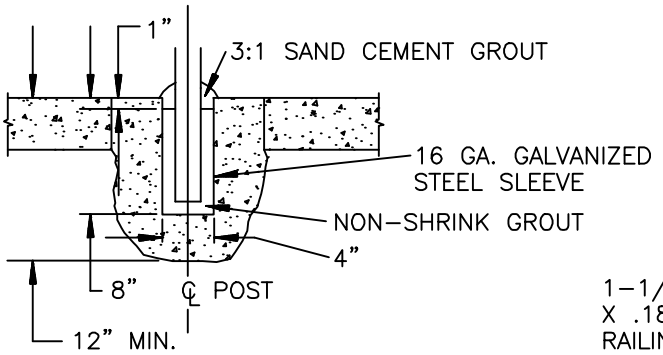
5. TRAFFIC BARRIERS MAY BE REQUIRED ON ROADS WITH SPEED LIMITS OF 40 MPH OR GREATER, WHERE ROCKERY HEIGHTS EXCEED 6'. SEE CHAPTER 7 OF THE WSDOT DESIGN MANUAL.

6. IF ROCKERY IS BEHIND A ROLLED CURB OR A RURAL SHOULDER SECTION, THE ROCKERY FACE SHALL BE A MINIMUM OF 10 FT FROM EDGE OF TRAVELED WAY.

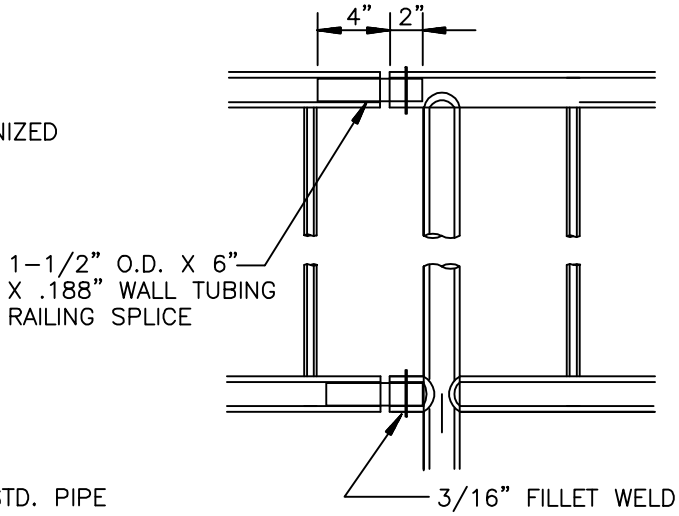
STANDARD DETAIL NUMBER

R–150

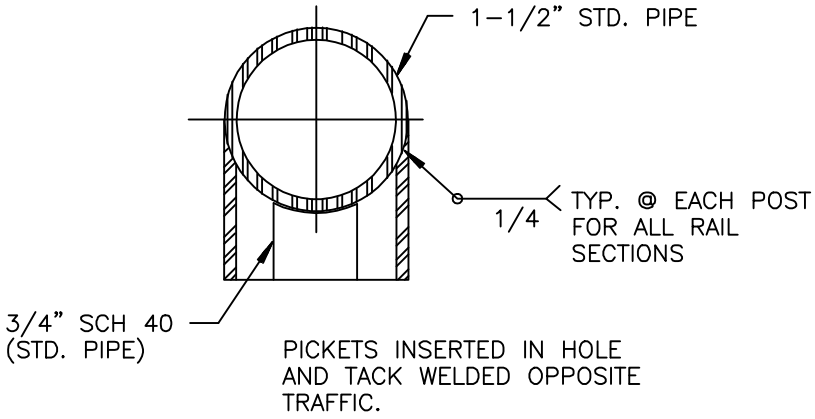




DETAIL A



DETAIL B



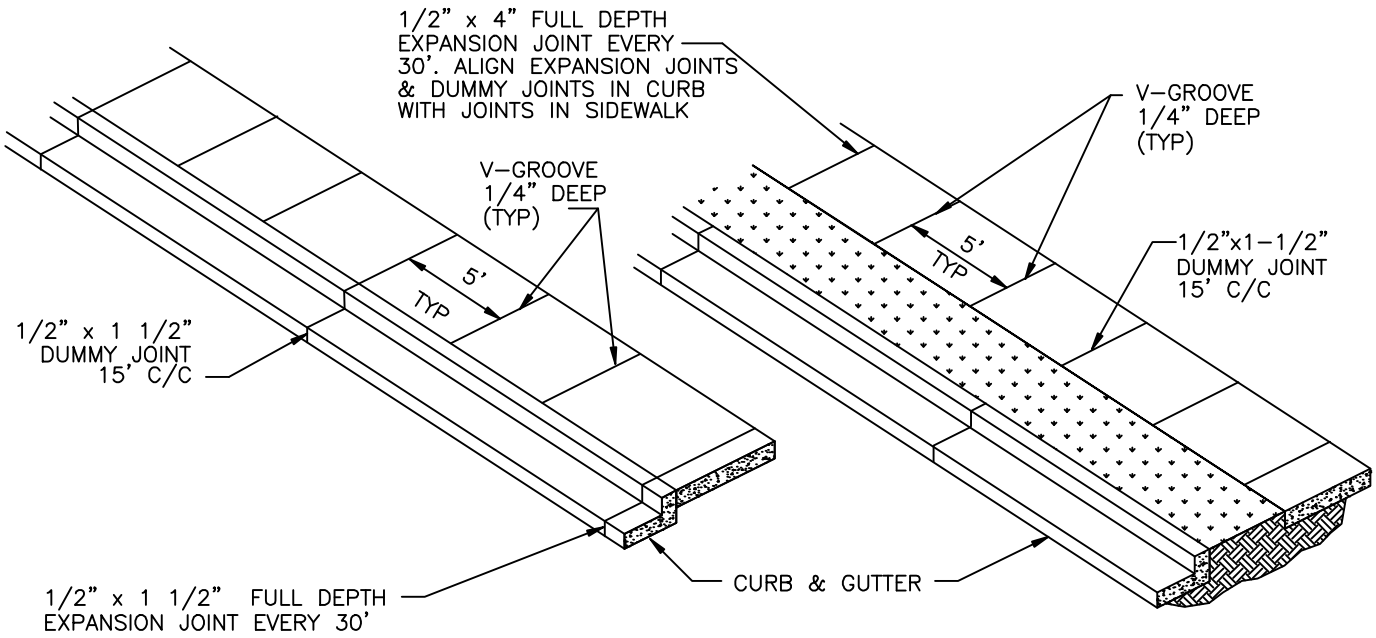
NOTES:

MATERIAL FOR PEDESTRIAN HANDRAIL SHALL BE STEEL (ASTM A120) OR ALUMINUM (ASTM B241 OR B429 ALLOY 6061-T6).

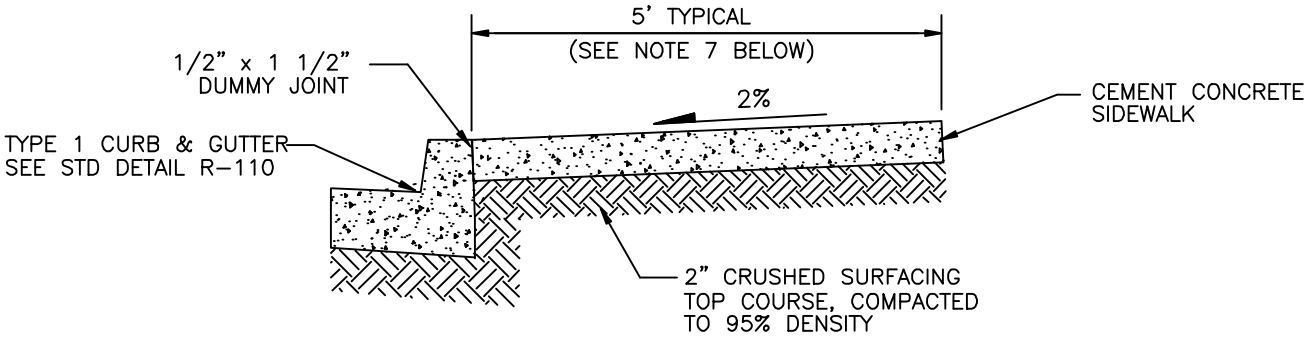
CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS
	DATE	07/31/2008	
	REF STD SPEC		PEDESTRIAN HANDRAIL DETAILS

STANDARD DETAIL NUMBER

R-160



PLAN VIEWS

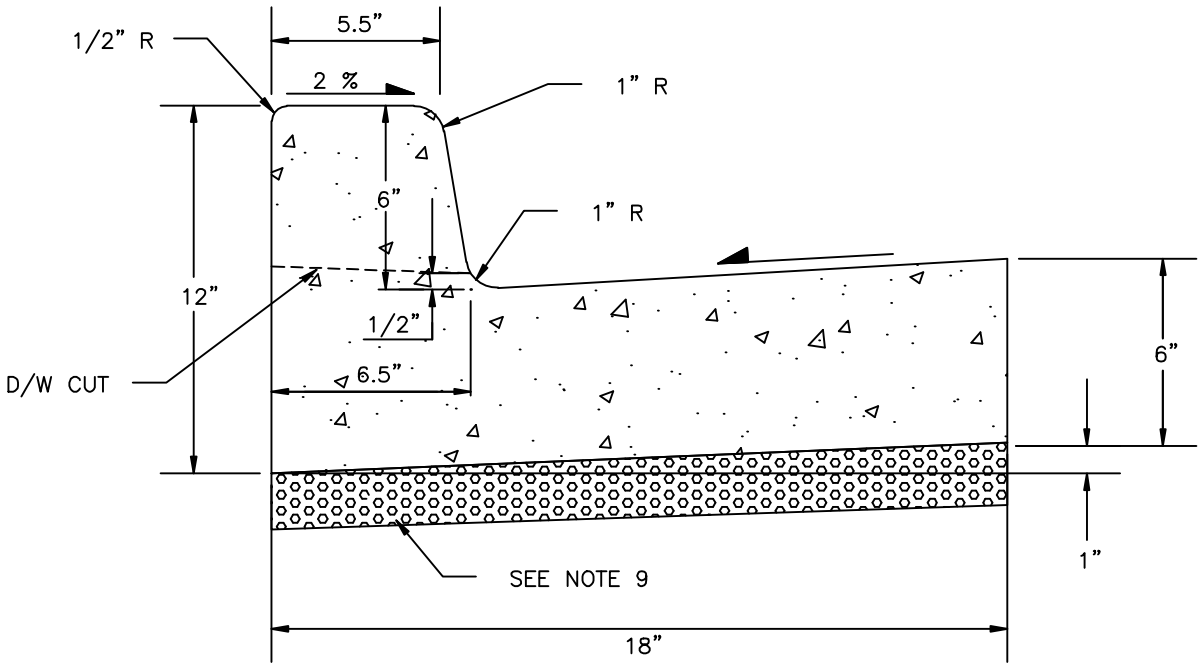


TYPICAL SECTION

NOTES:

1. SIDEWALKS SHALL BE A MINIMUM OF 4" THICK, AND SHALL BE CLASS 3000 CEMENT CONCRETE, WITH AIR ENTRAINMENT (MIN 4.5% – MAX 6.5%).
2. FULL EXPANSION JOINTS SHALL GENERALLY BE PLACED TO MATCH THOSE PLACED IN ADJACENT CURB & GUTTER, WITH MAXIMUM SPACING OF 30 FEET, FINAL SPACING DETERMINATION SHALL BE DECIDED BY THE INSPECTOR IN THE FIELD.
3. SUBGRADE SHALL BE COMPACTED TO NOT LESS THAN 95% OF MAXIMUM DENSITY.
4. SIDEWALK SHALL BE AT LEAST 6" THICK IN DRIVEWAYS.
5. THE FINISHED SIDEWALK SHALL BE SPRAYED WITH A TRANSPARENT CURING COMPOUND COVERED BY WATERPROOF PAPER OR PLASTIC SHEETING IN THE EVENT OF RAIN OR OTHER INCLEMENT WEATHER. CURING TIME SHALL BE FOR A MINIMUM OF 72 HOURS.
6. ALL JOINTS SHALL BE CLEANED AND EDGED WITH AN EDGER HAVING A 1/4" RADIUS.
7. SIDEWALKS ARE TYPICALLY 5' WIDE, WIDER SIDEWALK MAY BE REQUIRED BY THE CITY.

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS	STANDARD DETAIL NUMBER
	DATE	07/31/2008		
	REF STD SPEC		CEMENT CONCRETE SIDEWALK	R-170

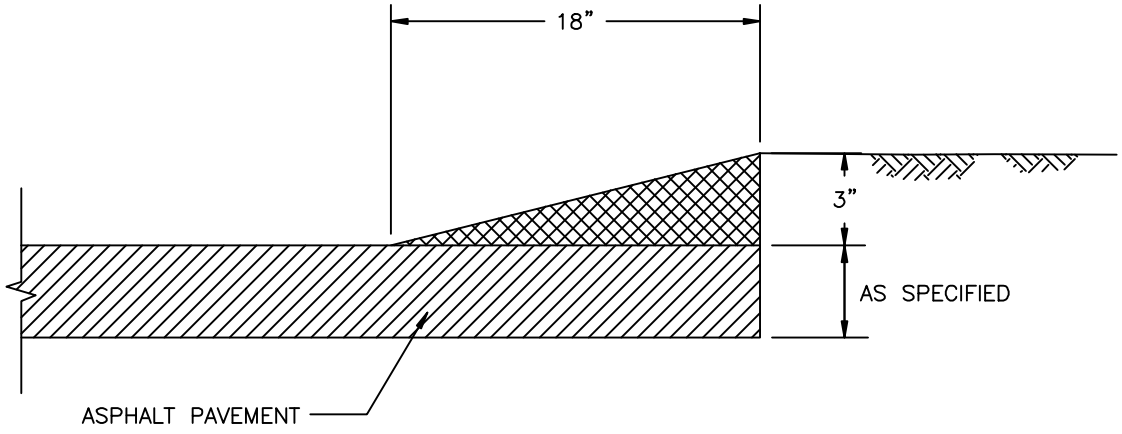


TYPICAL SECTION

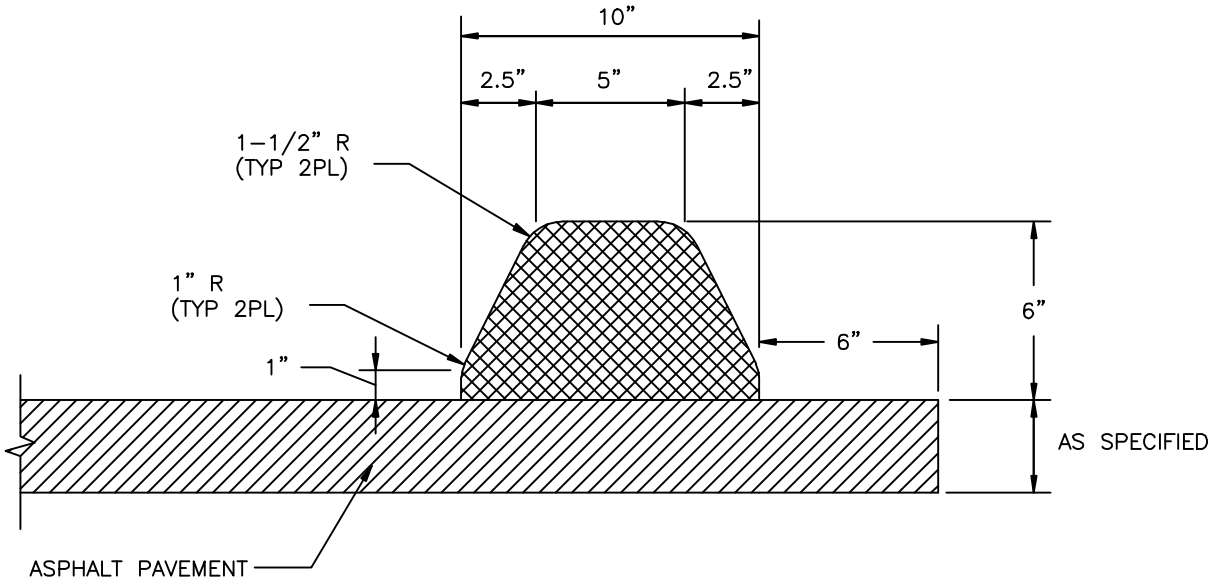
NOTES:

1. FORMS SHALL BE TRUE TO LINE AND GRADE AND SECURELY STAKED.
2. DUMMY JOINTS SHALL BE PLACED 15 FEET ON CENTERS. DUMMY JOINTS SHALL BE 1/2" x 1–1/2".
3. THRU JOINTS SHALL BE PLACED ADJACENT TO CATCH BASINS, INLETS AND AT POINTS OF TANGENCY ON STREETS, ALLEY AND DRIVEWAY RETURNS. MAXIMUM SPACING SHALL BE 30 FT. PRE–MOLDED JOINT FILLER SHALL BE 1/2" WIIDE AND CONFORM TO AASHTO DESIGN M213.
4. ALL JOINTS SHALL BE CLEAN AND EDGED.
5. CONCRETE SHALL BE CEMENT CONCRETE, CLASS 3000.
6. STEEL FORMS ONLY SHALL BE USED ON TANGENT SECTIONS. WOOD FORMS MAY BE USED ON CURVED SECTIONS.
7. FINISH SHALL BE LIGHT BROOM FINISH.
8. THE FINISHED CURB SHALL BE SPRAYED WITH A TRANSPARENT CURING COMPOUND AND COVERED BY WATERPROOF PAPER OR PLASTIC MEMBRANE IN THE EVENT OF RAIN OR OTHER INCLEMENT WEATHER. CURING TIME SHALL BE A MINIMUM OF 72 HOURS.
9. ALL CURB AND GUTTER SHALL BE PLACED ON A MIN OF 2" OF CRUSHED SURFACING TOP COURSE.
10. DUMMY JOINT 1/2" x 1 1/2" BETWEEN TYPE 1 CURB AND GUTTER AND THE SIDEWALK.

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS	STANDARD DETAIL NUMBER
	DATE	07/31/2008		
	REF STD SPEC		CEMENT CONCRETE CURB AND GUTTER TYPE 1	R–180

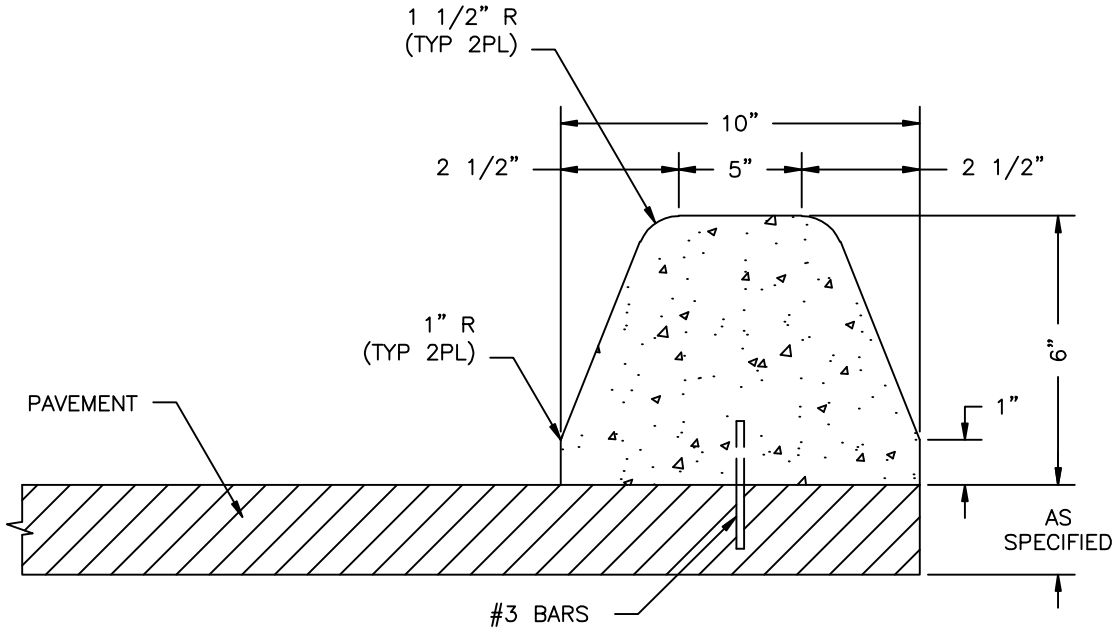


ASPHALT THICKENED EDGE

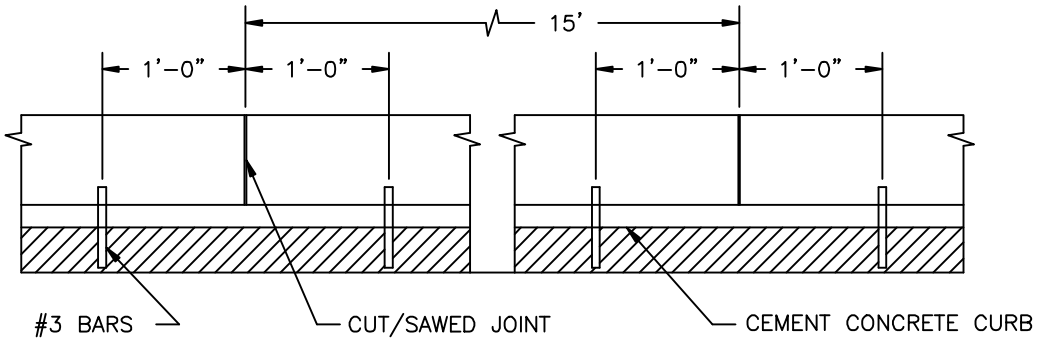


EXTRUDED ASPHALT CONCRETE CURB

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS	STANDARD DETAIL NUMBER
	DATE	07/31/2008		
	REF STD SPEC		ASPHALT THICKENED EDGE AND EXTRUDED ASPHALT CURB	R–190



EXTRUDED CEMENT CONCRETE CURB

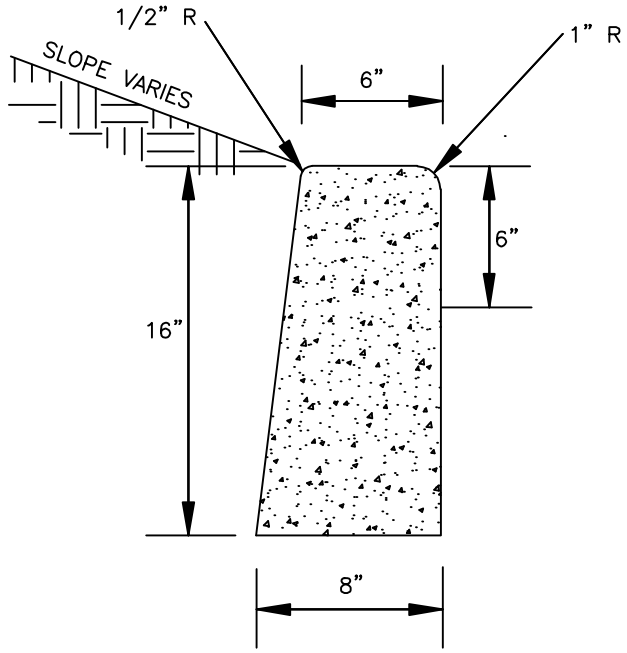


SPACING OF ANCHOR BARS

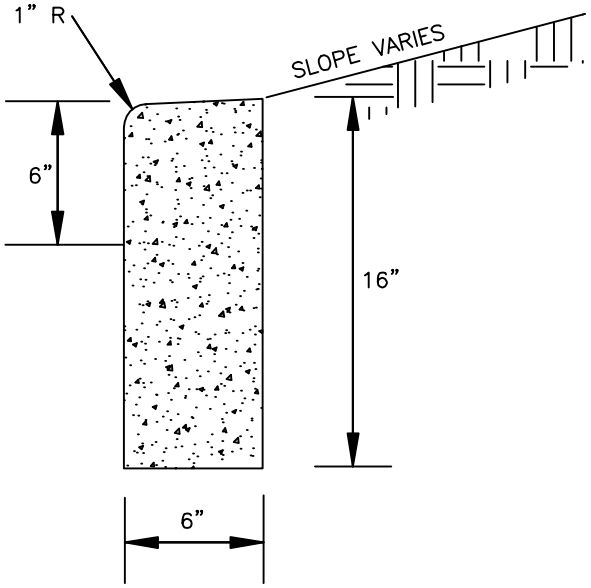
NOTES:

1. DUMMY JOINTS SHALL BE PLACED NOT TO EXCEED 15' ON CENTER. THRU JOINTS SHALL BE PLACED ONLY AT POINTS OF TANGENCY ON STREET ALLEY AND DRIVEWAY RETURNS AND WHERE THRU JOINTS OCCUR IN THE PAVEMENT SLAB.
2. CONCRETE SHALL BE CLASS 3000 OR COMMERCIAL WITH AIR-ENTRAINMENT.
3. AT THE CONTRACTOR'S OPTION CONCRETE CURBS MAY BE ANCHORED TO THE SIDE OF EVERY JOINT, OR BY USING AN ADHESIVE. THE ADHESIVE SHALL MEET THE REQUIREMENTS OF SECTION 9-20 OF THE WSDOT/APWA STANDARD SPECIFICATIONS FOR TYPE II EPOXY RESIN.

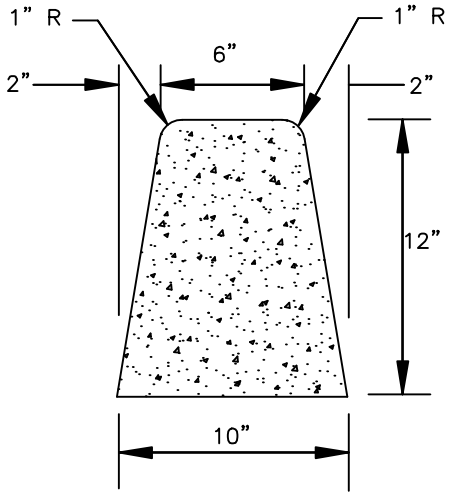
CITY OF ARLINGTON	APPROVED BY: L. OLIVE DATE: 07/31/2008 REF STD SPEC:	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS EXTRUDED CONCRETE CURB	STANDARD DETAIL NUMBER R-200



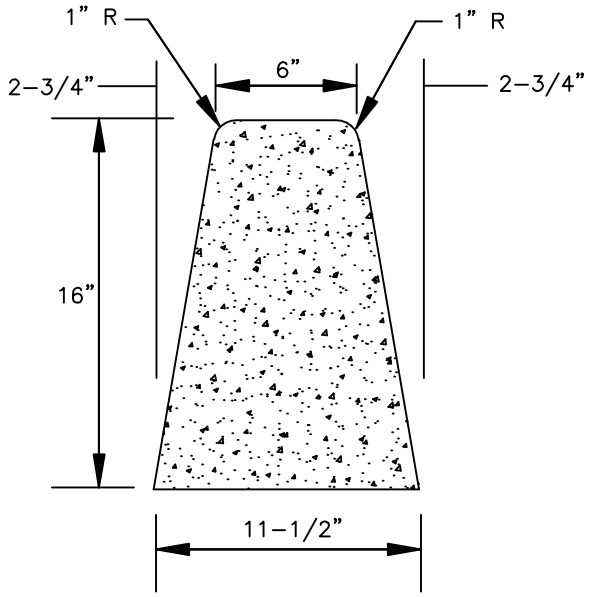
TYPE E-1 CURB



TYPE E-2 CURB



TYPE E-3 CURB

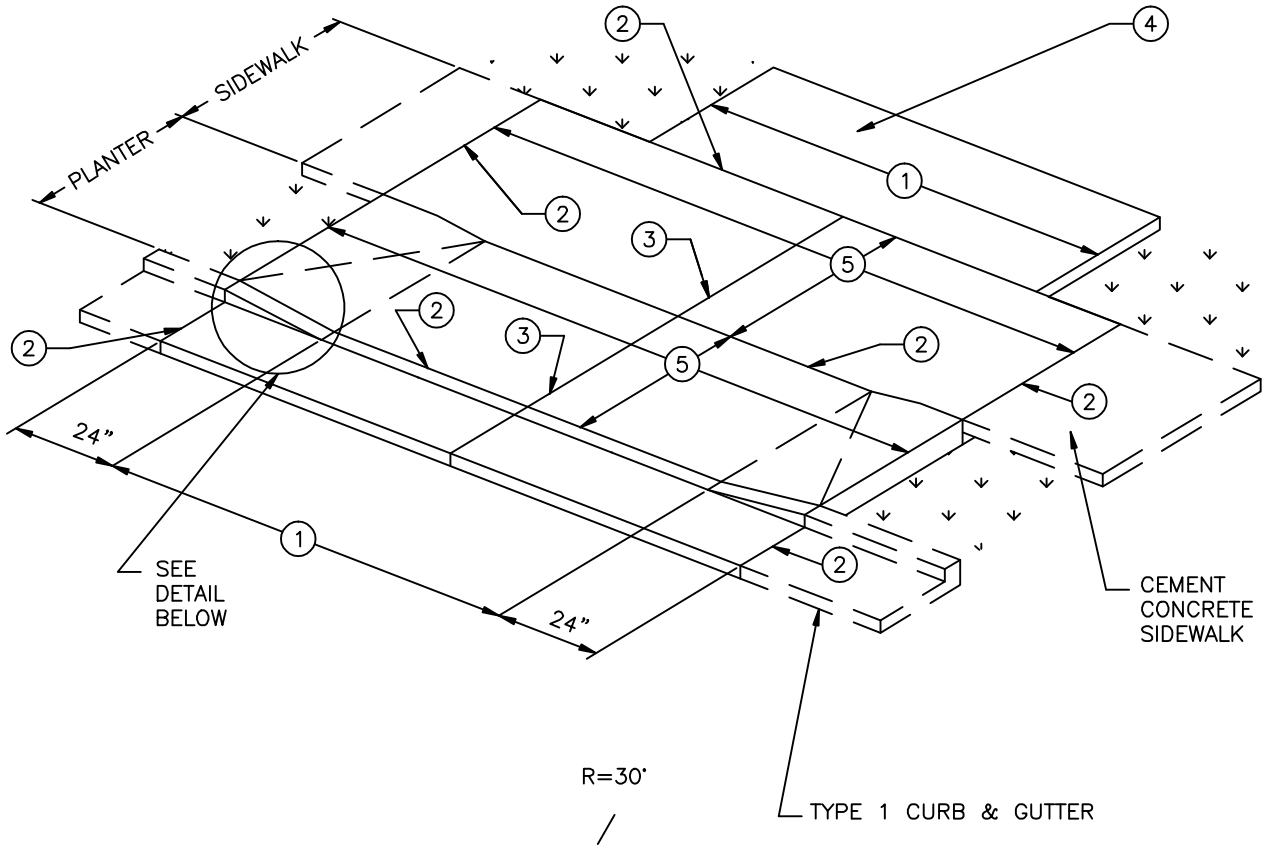


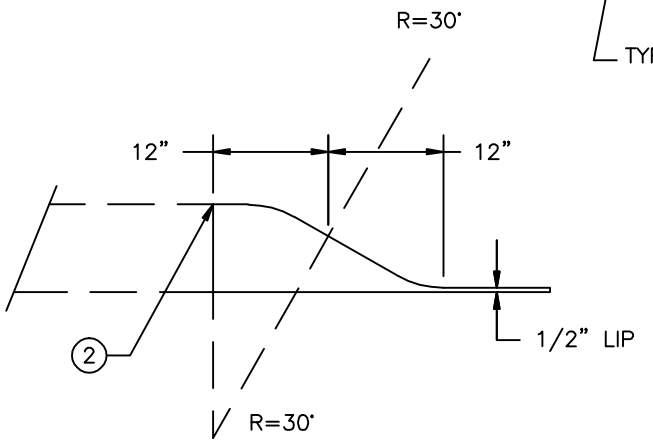
TYPE E-4 CURB

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS
	DATE	07/31/2008	
	REF STD SPEC		CEMENT CONCRETE CURB TYPE E-1, E-2, E-3 & E-4

STANDARD DETAIL NUMBER

R-210



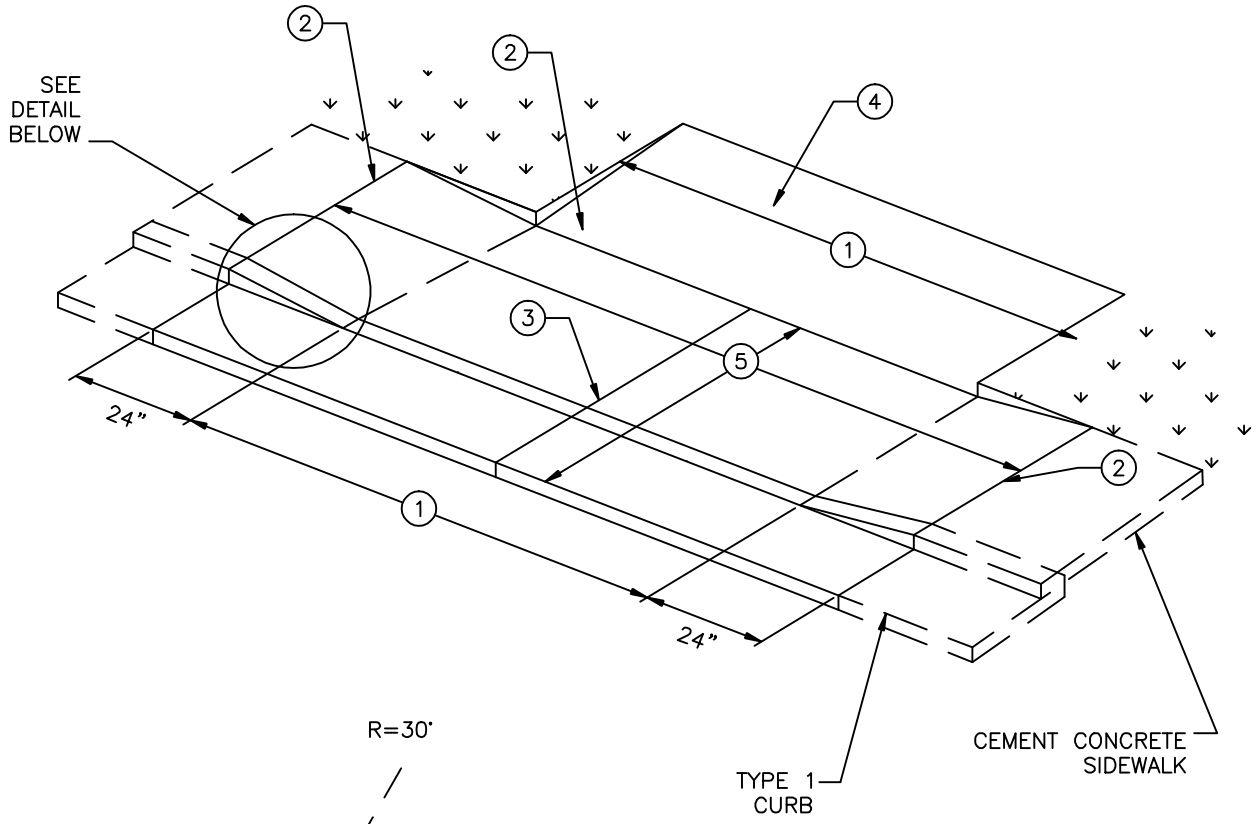


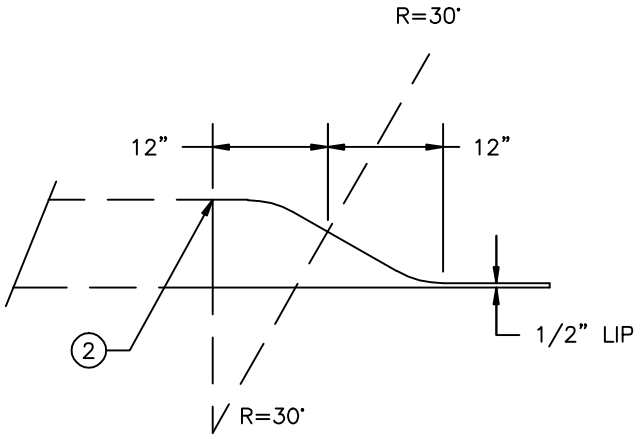
CURB TRANSITION DETAIL

NOTES:

1. WIDTH OF DRIVEWAY AT PROPERTY LINE.
2. 1/2" WIDE FULL DEPTH EXPANSION JOINT.
3. FULL DEPTH EXPANSION JOINT IF (1) IS 15' OR GREATER
4. DRIVEWAY TO BE SURFACED WITH ASPHALT OR CONCRETE.
5. DRIVEWAY CEMENT CONCRETE SHALL BE A MIN OF 6" THICK IN RESIDENTIAL AREAS, 8" THICK IN COMMERCIAL AREAS, AND IS TO BE PLACED ON A MINIMUM OF 2" CRUSHED SURFACING TOP COURSE COMPACTED TO 95% MAXIMUM DENSITY.

CITY OF ARLINGTON	APPROVED BY: L. OLIVE DATE: 07/31/2008 REF STD SPEC:	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS CEMENT CONCRETE DRIVEWAY APPROACH TYPE 1	STANDARD DETAIL NUMBER R-220



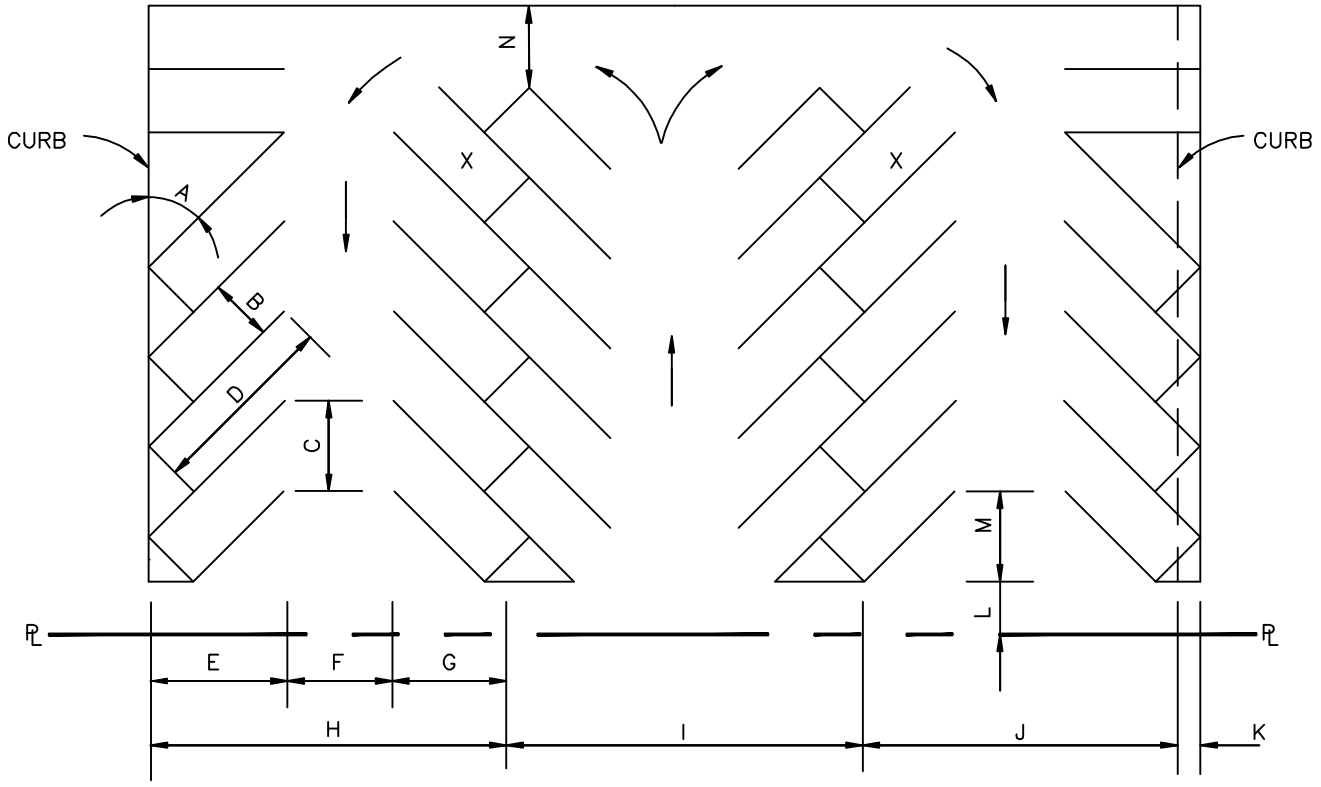


CURB TRANSITION DETAIL

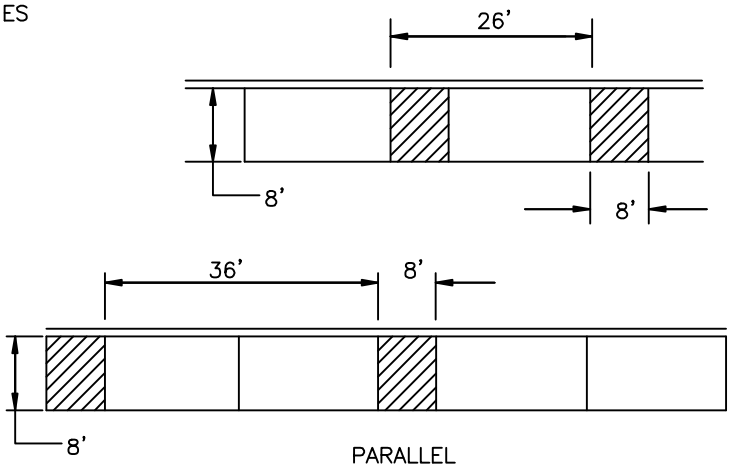
NOTES:

1. WIDTH OF DRIVEWAY AT PROPERTY LINE.
2. 1/2" WIDE FULL DEPTH EXPANSION JOINT.
3. FULL DEPTH EXPANSION JOINT IF (1) IS 15' OR GREATER.
4. DRIVEWAY TO BE SURFACED WITH ASPHALT OR CONCRETE.
5. DRIVEWAY CEMENT CONCRETE SHALL BE A MIN OF 6" THICK IN RESIDENTIAL AREAS, 8" THICK IN COMMERCIAL AREAS, AND IS TO BE PLACED ON A MINIMUM OF 2" CRUSHED SURFACING TOP COURSE COMPACTED TO 95% MAXIMUM DENSITY.

CITY OF ARLINGTON	APPROVED BY: L. OLIVE DATE: 07/31/2008 REF STD SPEC:	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS CEMENT CONCRETE DRIVEWAY APPROACH TYPE 2	STANDARD DETAIL NUMBER R-230



A = PARKING ANGLE
B = STALL WIDTH, PERPENDICULAR TO STALL LINES
C = STALL WIDTH, PARALLEL TO AISLE
D = LENGTH OF STALL LINE
E = STALL DEPTH, PERPENDICULAR TO AISLE
F = AISLE WIDTH, BETWEEN STALL LINES
G = STALL DEPTH, INTERLOCKING
H = MODULE, WALL TO INTERLOCK
I = MODULE, INTERLOCK TO INTERLOCK
J = MODULE, INTERLOCK TO CURB
K = BUMPER OVERHANG
L = OFFSET
M = SETBACK
N = CROSS AISLE, ONE WAY
N = CROSS AISLE, TWO WAY
X = STALL NOT ACCESSIBLE IN CERTAIN LAYOUTS.



PARALLEL

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS
	DATE	07/31/2008	
	REF STD SPEC		TYPICAL PARKING LAYOUT

STANDARD DETAIL NUMBER

R-240

PARKING STALL GEOMETRY DETAIL

SEE STD PLAN NO. R-210 FOR TYPICAL PARKING LAYOUT.

PARKING ANGLE (DEGREES) A		STALL WIDTH PERPENDICULAR TO STALL LINES B	STALL WIDTH PARALLEL TO AISLE C	LENGTH OF STALL LINE D	STALL DEPTH PERPENDICULAR TO AISLE E	AISLE WIDTH BETWEEN STALL LINES (SEE NOTE 1) F	STALL DEPTH INTERLOCKING G	MODULE, WALL TO INTERLOCK H	MODULE, INTERLOCK TO INTERLOCK I	MODULE, INTERLOCK TO CURB J	BUMPER, OVERHANG (TYPICAL) K	OFFSET L	SETBACK M	CROSS AISLE (ONE WAY) N	CROSS AISLE (TWO WAY) N
45°		9.0	12.7	27.5	19.5	12	16.5	48.0	45	46.0	2.0	6.4	13.1	14	24
		9.5	13.4	27.5	19.5	11	16.5	47.0	44	45.0	2.0	6.4	13.1	14	24
	C	8.0	11.3	22.5	16.0	11					2.0			14	24
	H	13.0	18.3	27.5	19.5	11					2.0			14	24
	V	16.0	22.5	32.0	22.6	12					2.0			14	24
60°		9.0	10.4	23.7	20.5	16	18.5	55.0	53	53.7	2.3	2.6	9.3	14	24
		9.5	11.0	23.7	20.5	15	18.5	54.0	52	51.7	2.3	2.6	9.3	14	24
	C	8.0	9.3	19.5	16.7	14					2.3			14	24
	H	13.0	15.0	23.7	20.5	15					2.3			14	24
	V	16.0	18.5	26.9	23.3	16					2.3			14	24
75°		9.0	9.3	20.9	20.0	23	19.0	62.0	61	59.5	2.5	.6	4.8	14	24
		9.5	9.8	20.9	20.0	22	19.0	61.0	60	58.5	2.5	.6	4.8	14	24
	C	8.0	8.3	17.0	16.3	18					2.5			14	24
	H	13.0	13.5	20.9	20.0	22					2.5			14	24
	V	16.0	16.6	23.2	22.4	24					2.5			14	24
90°		9.0	9.0	19.0	19.0	26	19.0	66	66	66	2.5	0	0	14	24
		9.5	9.5	19.0	19.0	25	19.0	63	63	63	2.5	0	0	14	24
	C	8.0	8.0	15.0	15.0	22					2.5		0	14	24
	H	13.0	13.0	18.5	18.5	25					2.5		11	14	24
	V	16.0	16.0	20.0	20.0	24					2.5			14	24

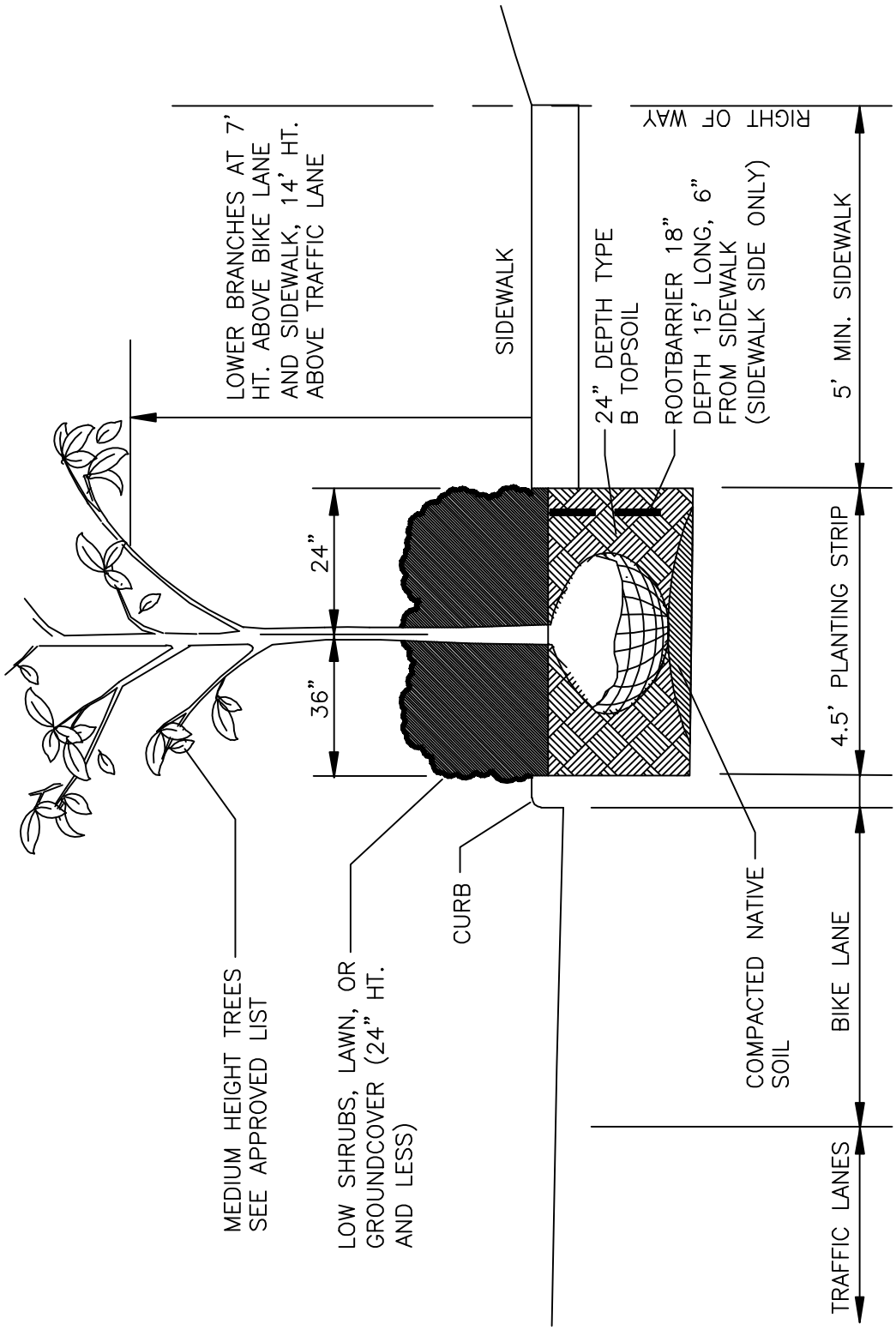
NOTES:

1. AISLE WIDTH MAY BE REQUIRED TO BE WIDER IF MULTIPLE UTILITY LINES ARE LOCATED WITHIN THE AISLE CORRIDOR.
2. C = COMPACT SPACE. EACH SPACE SHALL BE IDENTIFIED BY PAINTING "COMPACT" ON PAVEMENT.
3. H = HANDICAP SPACE, SEE WASHINGTON STATE REGULATIONS FOR BARRIER FREE FACILITIES.
4. V = HANDICAP VAN ACCESSIBLE SPACE, SEE WASHINGTON STATE REGULATIONS FOR BARRIER FREE FACILITIES.

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS
	DATE	07/31/2008	
	REF STD SPEC		PARKING LOT DETAIL

STANDARD DETAIL NUMBER

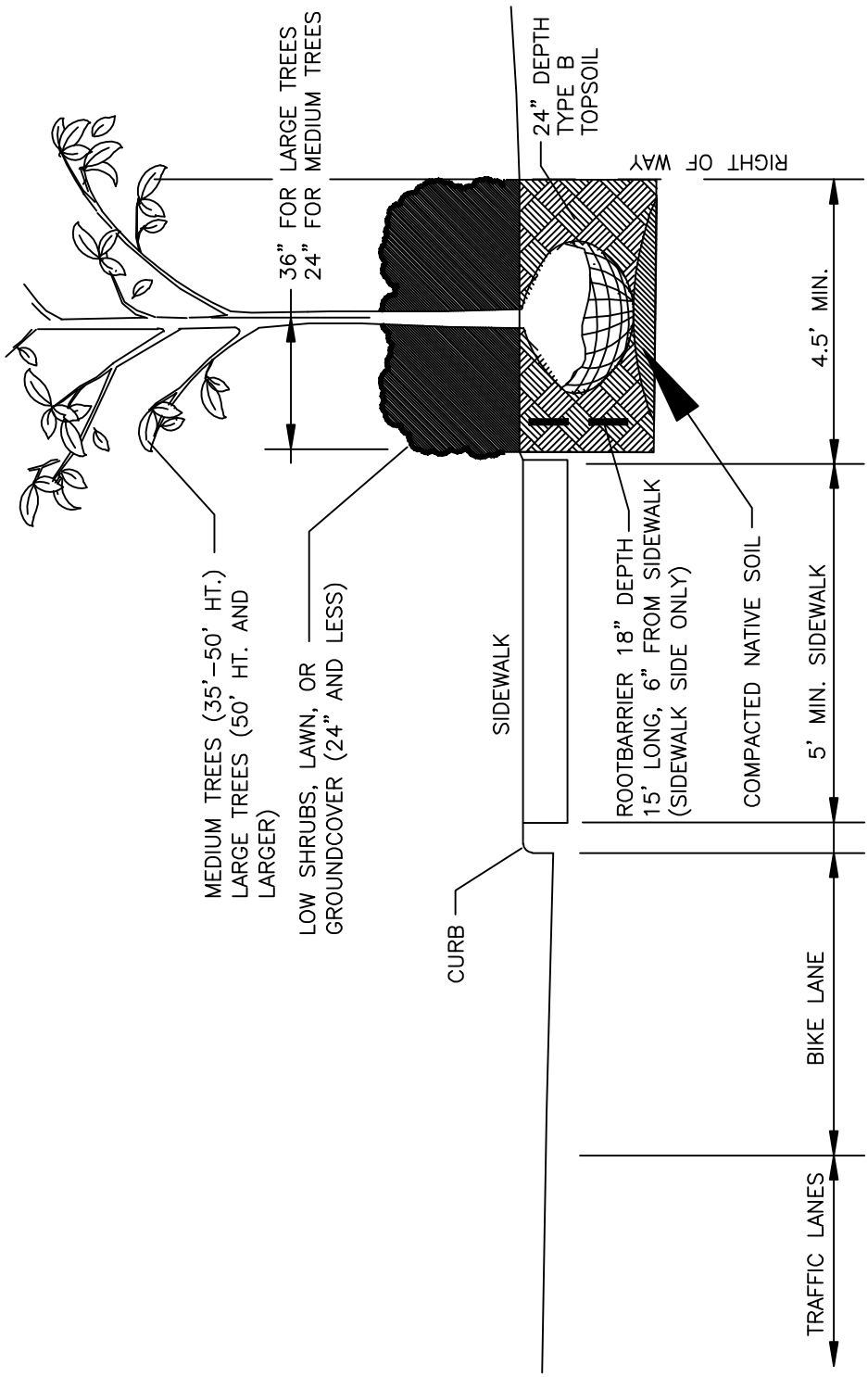
R-250



CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS
	DATE	07/31/2008	
	REF STD SPEC		PLANTING STRIP

STANDARD DETAIL NUMBER

R–260

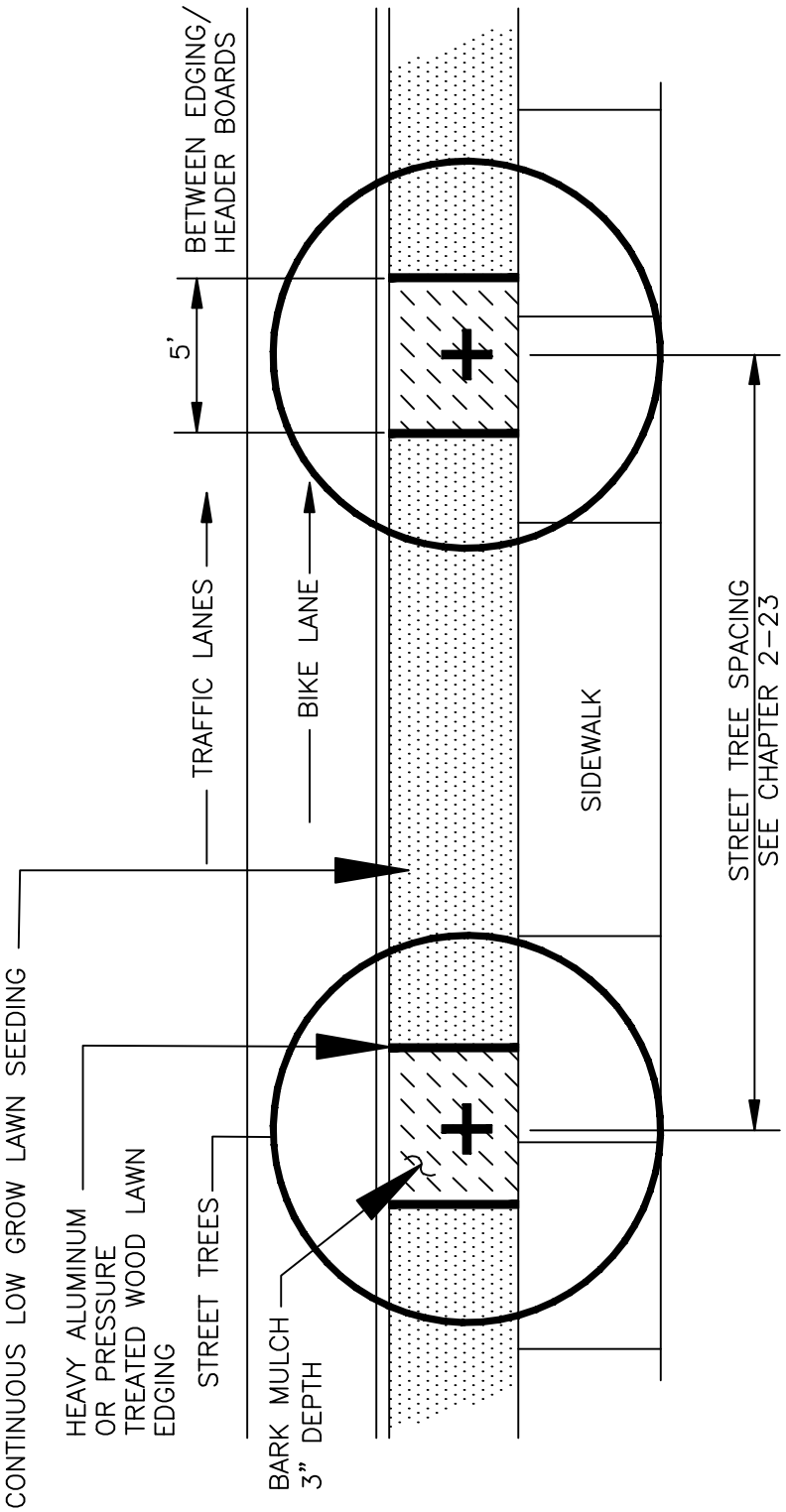


MEDIUM AND LARGE TREES BEHIND SIDEWALK

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS
	DATE	07/31/2008	
	REF STD SPEC		PLANTING STRIP BEHIND SIDEWALK

STANDARD DETAIL NUMBER

R–270



CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS	STANDARD DETAIL NUMBER
	DATE	07/31/2008		
	REF STD SPEC		TREE AND LAWN PLANTING STRIP	R-280

CHAPTER 3

STORMWATER

TABLE OF CONTENTS

3-1 GENERAL

This section of the Standards provides guidelines for the design of storm and surface water drainage systems, including open channels, pipes, culverts, catch basins, flow control structures and stormwater treatment facilities. Each of the sections in this chapter contains the design guidelines and references Standard Details for the various systems or facilities.

Flow control and stormwater treatment shall be provided for all development projects within the City of Arlington per these Standards, the currently adopted *Department of Ecology Stormwater Management Manual for Western Washington* (*DOE Stormwater Management Manual*), and the *City of Arlington Land Use Code* Title 20. In case of conflict the more stringent requirements shall apply. The Design Engineer may impose additional or more stringent requirements than those specified in this chapter to mitigate drainage impacts or to protect public health, safety and welfare.

3-2 CONVEYANCE SYSTEMS

3-2.01 OVERVIEW

Conveyance systems include all drainage facilities that transport storm and surface water runoff, both natural and artificial, except those features protected as environmentally sensitive areas under the *City of Arlington Land Use Code*. Environmentally sensitive areas may only be modified as allowed under the *City of Arlington Land Use Code*. Stormwater must be treated and detained prior to discharge to an environmentally sensitive area, including those features created for mitigation.

3-2.02 HYDRAULIC DESIGN

Generally conveyance systems shall be designed to convey runoff from the 25-year storm event. Conveyance systems for major creeks and streams may be designed to convey runoff for a 100-year storm, if required by the City. The method used to determine the design flow will depend on the characteristics of the drainage area and the type of conveyance. These methods of determining design flows are explained in detail in the *DOE Stormwater Management Manual*.

A backwater analysis may be required for a proposed or existing pipe system if the ability of the pipe system to convey the peak rate of runoff from the 25-year storm event may be affected by tailwater conditions (outlet control) anywhere in the pipe system.
Structures for proposed pipe systems, such as catch basins and manholes, must provide a minimum of 0.5 foot of freeboard between the headwater surface (hydraulic grade line) and the top of the structure for flow from a 25-year storm. However, structures may overtop for flow resulting from a 100 year storm. When overtopping occurs for the 100 year storm, the additional flow over the ground surface is analyzed using the methods described in the *DOE Stormwater Management Manual* and is added to the flow capacity of the pipe system.

3-3 CONVEYANCE PIPE SYSTEMS

The hydraulic analysis of flow in the storm drain pipes is typically limited to "gravity flow". The following subsections give design guidelines for different components and aspects of pipe systems.

3-3.01 PIPE MATERIALS

1) Pipe material, joints, and protective treatment shall conform to the requirements set forth in Section 9-05 of the *WSDOT/APWA Standard Specifications*. The following pipe materials may be use for stormwater systems in the City of Arlington; other pipe materials may be approved on a case-by-case basis:

   - Plain concrete pipe (12 inches in diameter, used only for driveway culvert).
   - Reinforced concrete pipe.
   - PVC pipe (ASTM D 3034 SDR 35 with 3 feet of cover, minimum).
   - PVC pipe (C-900 used when cover is less that 3 feet).
   - Corrugated high density polyethylene pipe, with smooth interior. (AASHTO M294 Type S or D)
   - Ductile iron pipe (epoxy coated, class 50 or 52, used when cover is less than 3 feet).

2) Materials for concrete, rubber gaskets, metal castings, reinforcing steel, and masonry units shall meet the requirements of the appropriate sections of the *WSDOT/APWA Standard Specifications*.

3) Corrugated metal pipes (galvanized aluminum or steel) are not accepted by the City of Arlington.

3-3.02 PIPE SIZES, SLOPES, AND VELOCITIES

1) No storm drain pipe between catch basins or manholes in the public right-of-way shall be less than 12 inches in diameter; with the exception that 8-inch pipe may be used between inlets and catch basins in runs of 50 feet or less.

2) Pipes up to 18 inches in diameter shall be laid with a minimum slope of 0.5%. Pipes installed as water level equalizer, fish passages, and/or internal components of a detention/retention system may have a smaller slope.

3) The minimum velocity in any pipe or culvert carrying the design storm flow shall be 3

feet per second.

4) The maximum allowable velocity in concrete pipe shall be 30 feet per second.

5) Downstream decrease in pipe size is not a recommended practice and will only be allowed under special conditions.

6) Pipes shall be sized to convey 25-year storm using the Manning's equation.

3-3.03 PIPE ALIGNMENT, CONNECTIONS AND COVER

1) Pipes must be laid true to line and grade with no curves, bends, or deflections in any direction, except for HDPE and ductile iron pipe with flanged restrained joint bends (not greater than 30 degrees) on steep slopes.

2) A catch basin or manhole will be required at all changes in storm drain diameter and changes in grade or alignment.

3) Connections to a pipe system shall be made only at catch basins or manholes. No wyes or tees are allowed except for roof, footing, or yard drain systems for pipes 8 inches in diameter or less, with cleanouts upstream of each wye or tee.

4) Six inches minimum vertical clearance and 5 feet minimum horizontal clearance (between outside surfaces) shall be provided between storm drain pipes and other utility pipes and conduits.

5) Any closed storm drainage system collecting runoff from paved areas in the public right-of-way or private property shall provide for floatable material separation prior to discharge to the main storm drainage system in the public right-of-way, unless otherwise approved by the City Engineer.

6) All PVC connections to catch basins or manholes shall be made by grouting in an approved manhole adapter into which the PVC pipe is inserted.

7) Activities such as trench excavation, tunneling or boring, pipe embedment, backfilling, compaction, safety and pavement patching, whether for public or private pipes, shall conform to the requirements set forth in these Standards.

3-4 MANHOLES, CATCH BASINS AND INLETS

3-4.01 GENERAL

1) Manholes, catch basins, and inlets shall be constructed of pre-cast concrete units in accordance with Standard Details SD-010 through SD-040.

2) Catch basin or manhole diameter shall be determined by pipe sizes and orientation at the junction structure. A plan view of the junction structure, drawn to scale, will be required when more than four pipes enter the structure on the same plane, or if angles of approach and clearance between pipes is of concern. The plan view (and sections if necessary) must insure a minimum solid concrete wall distance between pipe knockouts of 8 inches for 48 inch and 54 inch catch basins and 12 inches for 72 inch and 96 inch catch basins.

3) Catch basin evaluation of structural integrity for H-20 loading may be required for multiple junction catch basins and other structures.

4) Catch basins shall be provided within 50 feet of the entrance to a pipe system to provide for silt and debris removal.

5) HDPE pipe systems longer than 100 feet must be secured at the upstream end and the downstream end must be placed in a 4 foot section of the next larger pipe size. This sliding sleeve connection accounts for the high thermal expansion/contraction coefficient of this pipe material.

6) The maximum slope of the ground surface for a radius of 5 feet around a catch basin grate shall be 3:1.

7) A Type 2 catch basin or a manhole shall be required when the depth to the invert exceeds 5 feet, regardless of the pipe size.

8) All Type 2 catch basins and all manholes shall be equipped with ladders per Standard Detail SD-050.

9) Concrete inlets shall not be used where the discharge goes directly into the main storm drain system.

10) As shown on the Standard Details, catch basin and manhole design assumes soil load-bearing capacity of 3,300 pounds per square foot (psf). Where the capacity is less, the base shall be designed by an engineer.

11) Manholes shall not be used except for special situations, such as angle points, difficult access or constricted areas, approved by the City Engineer.

3-4.02 FRAMES, LIDS, GRATES AND COVERS

1) In general, frames and grates shall be installed per Standard Details SD-060 through SD-110.

2) The cover or grating of a manhole or catch basin shall not be grouted to final grade until the final elevation of the pavement, gutter, ditch, or sidewalk in which it is to be placed has been established, and until permission thereafter is given by the City Inspector to grout the cover or grating in place.

3) Lids, grates, and covers shall be seated properly to prevent rocking.

4) All catch basins and manholes shall be equipped with locking frames and lids or grates per Standard Details SD-060 and SD-110.

5) Type 2 catch basins and manholes functioning exclusively as access structures shall be equipped with circular 24-inch covers and frames per Standard Details SD-110.

6) Circular lids on all storm drain structures shall have “DRAIN” cast into the lid.

7) The top surfaces of grates shall be embossed in block letters “OUT FALL TO STREAM, DUMP NO POLLUTANTS”. The block letters shall measure a minimum of ½ inch in height.

8) Where the roadway grade is 4% or greater, a ductile iron vaned grate in accordance with Standard Detail SD-070 shall be used.

3-4.03 THROUGH–CURB INLET

A through-curb inlet frame and grate shall be furnished and installed by the Developer per Standard Detail SD-100. Through-curb inlets are used when the high likelihood of clogging from leaf fall, especially in sag vertical curves; when the inlet is a surface drainage end point, such as a cul-de-sac; and when road grades exceed 12% which may cause normal inlet grates to be passed over, due to the road grade. Grates used in through-curb inlets shall be ductile iron vaned grates.

3-4.04 CATCH BASIN, MANHOLE AND INLET SPACING

Maximum spacing on surface drainage courses between catch basins, manholes or inlets shall be as shown in Table 3-1.

Table 3-1 Catch Basin, Manhole and Inlet Spacing

ROAD GRADE	SPACING
LESS THAN 1.0%	150 FEET
1.0% TO 3.0%	200 FEET
3.0% OR GREATER	300 FEET

Additional catch basins shall be installed as needed to confine drainage to the gutter and prevent flow into traffic lanes or intersections. On cul-de-sacs and curves, inlet spacing shall be measured along the flow line of the roadway. The maximum spacing between storm drain access structures, whether catch basins or manholes, or between a high point and an access structure, shall be 300 feet.

3-4.05 RESTRICTOR DEVICES

1) The minimum orifice size diameter allowed for use in the City of Arlington is 1 inch. Orifices less than 1 inch will need approval by the City Engineer.

2) Restrictor devices shall be constructed and installed in accordance with Standard Details SD-150 and SD-160.

3-4.06 DEBRIS BARRIERS

Debris barriers (trash racks) are required on all pipes entering or leaving a closed pipe system, including pipes entering or leaving a control/restrictor manhole or catch basin from a surface-type BMP (detention pond, infiltration basin, wetpond, biofiltration swale, etc.).

3-5 OPEN CHANNELS

Open channels, either natural or artificial, may be used to convey stormwater on and from a site. In general, however, natural channels are protected as environmentally sensitive areas under the *City of Arlington Land Use Code* and may not be used to convey untreated, undetained stormwater. Alteration of these channels, including bank stabilization projects, requires special permits. Artificial channels are those constructed from upland areas specifically to convey storm and surface water.

3-5.01 NATURAL CHANNELS

Natural channels are defined as those that have occurred naturally due to the flow of surface waters, or those that, although originally constructed by human activity, have taken on the appearance of a natural channel including a stable route and biological community. They may vary hydraulically along each channel reach and should be left in their natural condition, wherever feasible or required, in order to maintain natural hydraulic functions and wildlife habitat benefits from established vegetation.

3-5.02 CONSTRUCTED CHANNELS

Constructed channels are those constructed or maintained by human activity and include bank stabilization of natural channels. Constructed channels shall be either vegetation-lined, rock-lined, or lined with appropriate bioengineered vegetation.

1) Vegetation-lined channels are the most desirable of the constructed channels when properly designed and constructed. The vegetation stabilizes the slopes of the channel, controls erosion of the channel surfaces, and removes pollutants. The channel storage, low velocities, water quality benefits, and greenbelt multiple use benefits create significant advantages over other constructed channels. The presence of vegetation in channels creates turbulence which results in loss of energy and increased flow retardation; therefore, the Design Engineer must consider sediment deposition and scour, as well as flow capacity, when designing the channel.

2) Rock-lined channels are necessary where a vegetation lining will not provide adequate protection from erosive velocities. They may be constructed with riprap, gabions, or slope mattress linings. The rock lining increases the turbulence, resulting in a loss of energy and increased flow retardation. Rock lining also permits a higher design velocity and therefore a steeper design slope than grass-lined channels. Rock linings are also used for erosion control at culvert and storm drain outlets, sharp channel bends, channel confluences, and locally steepened channel sections.

3) Bioengineered vegetation lining is a desirable alternative to the conventional methods of rock armoring. Soil bioengineering is a highly specialized science that uses living plants and plant parts to stabilize eroded or damaged land. Properly bioengineered systems are capable of providing a measure of immediate soil protection and mechanical reinforcement. As the plants grow they produce a vegetative protective cover and a root reinforcement matrix in the soil mantle. The vegetative cover of bioengineered systems provides immediate protection during high flows by laying flat against the bank and covering the soil like a blanket. It also reduces pore pressure in saturated banks through transpiration by acting as a natural “pump” to pull the water out of the banks after the flows have receded.

When constructing artificial channels, vegetation-lined channels are preferred when properly designed and constructed. Rock-lining may be necessary along the length of channels or at

specific locations (such as bends and outfalls) when a vegetative lining will not provide adequate protection from erosive velocities.

3-5.03 ARTIFICIAL CHANNELS

1) Open channels shall be designed to provide conveyance capacity while minimizing erosion and allowing for aesthetics, habitat preservation, and enhancement.

2) Channel section geometry shall be trapezoidal. Side slopes shall not be steeper than 3H:1V for vegetation-lined channels and 2H:1V for rock-lined channels, unless the channel is engineered specifically for steeper slopes. Roadside ditches must comply with Chapter 2 of these Standards and the *WSDOT Design Manual* and *Standard Plans*.

3) A minimum 0.5 foot freeboard above 100 year design flow must be provided.

4) Vegetation-lined channels shall have bottom slope gradients of 6% or less and a maximum average velocity at the design flow of 5 fps.

5) Rock-lined channels shall be used when design flow velocities exceed 5 fps.

6) A maintenance access easement of 10 feet wide (minimum) is required along all publicly maintained constructed channels located on private property. However, required easement widths and building setback lines may vary with channel top width. A minimum 20 feet setback must be provided between any structures and the top of the bank of the channel.

3-5.04 ROCK-LINING

In rock-lined channels, stone (riprap) is placed on the channel sides and bottom to protect the underlying material from erosion. Proper riprap design requires the determination of the median size of stone, the thickness of the riprap layer, the gradation of stone sizes, and the selection of angular stone which will interlock when placed. Research by the U.S. Army Corps of Engineers has provided criteria for selecting the median stone weight W_{50}. If the riprap is to be used in a highly turbulent zone, such as a culvert outfall, downstream of a stilling basin, at sharp changes in channel geometry, etc., the median stone W_{50} should be increased from 200% to 600%, depending on the severity of the locally high turbulence. The thickness of the riprap layer should generally be twice the median stone diameter D_{50} or at least that of the maximum stone diameter D_{max}. The riprap should have a reasonably well graded assortment of stone sizes within the following gradation:

$$1.25 \leq D_{max} / D_{50} \leq 1.50$$
$$D_{15} / D_{50} = 0.50$$
$$D_{min} / D_{50} = 0.25$$

For more detailed analysis and design procedures for riprap requiring water surface profiles and estimates of tractive force, refer to the paper by Maynord et al in the *Journal of Hydraulic Engineering* (ASCE), July 1989.

3-5.03 RIPRAP FILTERS

Riprap should be underlain by a sand and gravel filter (or filter fabric) to keep the fine materials in the natural or artificial channel from being washed through the voids in the riprap. Likewise, the filter material must be selected so that it is not washed through the voids in the riprap. Adequate filters can usually be provided by a reasonably well graded sand and gravel material where:

$$D_{15} < 5\ d_{85}$$

The variable d_{85} refers to the sieve opening through which 85% of the material being protected will pass, and D_{15} has the same interpretation for the filter material. A filter with a D_{50} of 0.5 mm will protect any finer material including clay. Where very large riprap is used it is sometimes necessary to use two filter layers between the material being protected and the riprap.

For additional information and procedures for specifying filters for riprap and general guidance, refer to the *Army Corps of Engineers Manual EM 1110-2-1601* (1970), *Hydraulic Design of Flood Control Channels,* paragraph 14, "Riprap Protection".

3-6 CULVERT DESIGN CRITERIA

3-6.01 HEADWATERS

1) For circular culverts, box culverts and pipe arches, the maximum headwater depth for the design storm shall not exceed 2.0 times the culverts height for culverts 18 inches and less, or 1.5 times the culverts height for culverts greater that 18 inches.

2) For bottomless culverts, the headwater depth of the 100 year storm shall not exceed the top of the culvert.

3-6.02 INLETS

1) For culverts 18 inches in diameter and larger, the embankment around the culvert inlet shall be protected from erosion by rock lining, the length and width shall be a minimum of five feet (upstream of the culvert) and the height shall be at the design headwater elevation.

2) Trash racks/debris barriers are required on culverts that are over 60 feet in length and are 12 inches to 36 inches in diameter. Culverts on fish bearing streams do not need trash racks.

3) In order to maintain the stability of roadway embankments, concrete headwalls, wingwalls, or tapered inlets and outlets may be required if right-of-way and/or easement constraints prohibit the culvert from extending to the toe of the embankment slope. Normally, a concrete inlet structures/headwalls installed in or near roadway embankments must be flush with and conform to the slope of the embankment.

3-6.03 OUTLETS

The receiving channel at the outlet shall be protected from erosion by rock lining, except the height shall be one foot above the maximum tailwater elevation or one foot above the crown of the pipe, whichever is higher.

3-6.04 FISH PASSAGE

In fish-bearing waters, water-crossing structures must provide for fish passage as required by the *Washington State Department of Fish and Wildlife* (WDFW) Hydraulic Project Approval permit. The water-crossing must comply with AMC 20.88.730, WAC 222.16.020 and WAC 222.16.030. Culverts designed for fish passage must also meet conveyance system requirements.

Fish passage can generally be ensured by providing structures that do not confine the streambed, that is, a structure wide enough so that the stream can maintain its natural channel within the culvert. Bridges, bottomless arch culverts, and rectangular box culverts can often be used to accommodate stream channels. For design guidance refer to *"Design of Road Culverts for Fish Passage"* published by the *Washington State Department of Fish and Wildlife.*

3-7 OUTFALL DESIGN CRITERIA

3-7.01 GENERAL

1) All outfalls (at a minimum) shall be provided with rock protection. For outfalls with a velocity at the design flow greater than 10 fps, a gabion dissipater or engineered energy dissipater shall be required.

2) Mechanisms which reduce velocity prior to discharge from an outfall are encouraged.

3) Engineered energy dissipaters, including stilling basins, drop pools, hydraulic jump basins, baffled aprons, and bucket aprons, are required for outfalls with velocity at design flow greater than 20 fps.

4) Inlet control will usually dictate outfall pipe system capacity. The inlet conditions should be carefully examined, as well as the consequences should the inlet to the pipe system become plugged or capacity exceeded.

3-7.02 OUTFALL SYSTEMS TRAVERSING STEEP SLOPES

1) Outfall systems constructed of pipe segments which are banded and/or contain gaskets are not acceptable for traversing steep slopes. Leaks at the joints of the pipe will cause the system to fail.

2) Continuously fused, welded or restrained joint pipe systems, such as high density polyethylene pipe (HDPEP) or ductile iron pipe (restrained joints), with proper anchoring shall be used for outfall systems traversing steep slopes.

3) In general, outfall pipes systems shall be installed in trenches with standard bedding on slopes up to 20%. On slopes greater than 20%, outfall pipe systems shall be placed on the ground surface with proper pipe anchorage.

Table 3-2 Maximum Pipe Slopes and Velocities

MAXIMUM PIPE SLOPES AND VELOCITIES			
Pipe Material	**Pipe Slope above which Pipe Anchors Required and Minimum Anchor Spacing**	**Maximum Slope Allowed**	**Maximum Velocity at Full Flow**
PVC, CPE (1)	20% (1 anchor per 100 LF of pipe)	30% (3)	30 fps
Concrete or LCPE (1)	10% (1 anchor per 50 LF of pipe)	20% (3)	30 fps
Ductile Iron (2)	20% (1 anchor per pipe section)	None	None
SWPE (2)	20% (1 anchor per 100 LF or pipe, cross-slope installations only)	None	None

Notes:

(1) These materials are not allowed in landslide hazard areas.

(2) Butt-fused or flanged pipe joints are required; above ground installation is recommended on slopes greater than 40%.

(3) A maximum slope of 200% is allowed for these pipe materials with no joints (one section), with structures at each end, and with proper grouting.

3-8 DETENTION AND RETENTION FACILITIES

3-8.01 FACILITY LOCATION

Retention, detention and stormwater treatment facilities required for private land development shall not be placed in the public right-of-way. These facilities may be located in a private tract or easement, including those for a private road, subject to a determination that the private road will not likely be converted to a public road in the future.

3-8.02 FACILITY ACCESS

1) Adequate access shall be provided to operate and/or maintain all facilities and their controls, to provide for repair and improvement, and to perform maintenance during all times of the year. The City Engineer shall determine whether access is adequate.

2) Access shall be provided to:

   - All control structures, including weirs and emergency overflow structures.
   - All catch basins and vaults housing water quality treatment mechanisms.
   - All inlets and outlets of detention and retention systems.
   - All catch basins within detention and retention systems.
   - The bottom of earthen stormwater detention ponds, except those ponds designed to be maintained from the perimeter.

3) Vehicular access shall meet the following criteria:

   - The access road shall have a minimum width of 15 feet if a turnaround is provided; a 20 foot minimum width is required if a turnaround is not provided.
   - The access road shall meet H-20 loading requirements. At a minimum, the road shall have 4 inches of CSBC over 12 inches of compacted depth gravel borrow or pit run gravel. The road shall be paved with a minimum of 3 inches of ATB over the gravel layer if the grade exceeds 8%. The maximum allowable grade is 15%. Materials shall meet *WSDOT/APWA Standard Specifications 4-02 (Gravel Base)* and *5-04 (Asphalt Concrete Pavement*).
   - A hammerhead turnaround shall be provided if the access road:
     - is 75 feet or longer, or
     - connects to an arterial road right-of-way, or

- has a grade of 5% or greater, or
- has a horizontal curve radius of 100 feet or less.

- Hammerhead turnarounds shall have dimensions of 40 feet by 40 feet with a 15 foot inside radius.

3-8.03 OPEN STUCTURES

Open structures may include ponds, vaults, and water quality systems.

1) Facility Design

- Open facilities shall not be wider than 30 feet at the bottom of the pond, unless an access/maintenance road is constructed into the bottom of the facility.

- When facilities are not designed with a minimum of 0.5 feet of dead storage, the bottom shall have a minimum slope of 0.5% toward the outlet pipe.

- Open detention and retention systems shall have emergency overflow structures that convey the maximum design flow of the detention facility into the downstream drainage system without damage to any drainage facility.

2) Side Slopes

Interior (water-side) slopes for earthen detention, retention, infiltration, and water quality facilities shall have a maximum slope of 3 horizontal to 1 vertical. Exterior (non-water-side) slopes shall have a maximum slope of 2 horizontal to 1 vertical.

3) Berms

Berms with heights of 4 feet or less shall have a minimum top width of 6 feet. Berms more than 4 feet in height shall have a minimum top width of 15 feet and shall include a key section. All berms shall be placed in lifts not to exceed 1 foot in loose thickness. Each lift shall be compacted to at least 95% of the maximum dry density, as determined by ASTM Test Method D-1557-78 (Modified Proctor), before an additional fill is placed and compacted. In place density tests shall be performed at random locations within each lift of the fill to verify that this degree of compaction is being achieved.

4) Vertical Walls

Vertical walls shall be constructed with a minimum of 3000 psi structural reinforced concrete and shall be watertight. Porous materials, such as keystone, ecology blocks or rockeries shall not be used as an element of the wall below the waterline unless approved by the City Engineer.

5) Vegetation Cover

- Permanent vegetation shall be established on earthen detention, retention and water quality facilities. Water, shade and sun-tolerant grass species shall be used for the portions of slopes and berms exposed to water in the facilities.

- Trees shall not be planted on constructed perimeter berms designed for runoff impoundment. Trees may be planted at the top of facilities that are created solely by excavation (no fill or berms).

6) Fencing

- Fencing is required for safety and security purposes around all open detention or retention ponds, vaults, or water quality systems for which the maximum design water depth is greater than 3 feet or the inside slopes are steeper than 3 feet horizontal to 1 foot vertical.

- Fencing is not required if one (1) interior horizontal safety bench with a width of at least 10 feet is provided around the entire perimeter for each 3 three feet of water depth, and the interior side slopes are no steeper than 3 feet horizontal to 1 foot vertical. No benching or fencing is required where side slopes are 4 feet horizontal to 1 foot vertical or less.

- Fencing and gates shall be Type 1 or Type 3 chain link fence in accordance with *WSDOT/APWA Standard Specifications* and *WSDOT Standard Plan L-2*. Line posts for all fences shall be galvanized and set in concrete. Fences shall be powder coated or vinyl coated with no less than six (6) feet in height, from the ground to the top of the chain link. Wooden fences are not allowed as the security fence.

- The gap between the bottom of the chain link and the top of the ground shall not exceed two inches.

- An access opening with a minimum width of 16 feet shall be located at the access route entrance. Two gates of equal length shall be provided for the access opening. Gates shall be designed and constructed in accordance with *WSDOT/APWA Standard Specifications* and *Standard Plan L-3*. Gates shall include a combination lock.

3-8.04 VAULT DETENTION

1) Vaults for private land development projects shall not be located in the public right-of-way. However, vaults may be located in a private tract or easement, including those for a private road, subject to a determination that the private road will not likely be converted to a public road in the future.

2) Detention/retention vaults shall be located no closer than 50 feet from the top of a steep slope, as defined by AMC 20.88.

3) Structural plans for all vaults shall be prepared and stamped by a Professional Structural Engineer licensed in the State of Washington. The drawings shall include steel placement blockouts for inlet and outlet pipes, corner reinforcement, top attachment, water stops, construction joints, and design mix specifications for the concrete. When the vault top is to have a soil cover, it shall be designed for saturated soil loading with a minimum cover of 2 feet. The design shall be adequate for live loads, dead loads, and seismic loads in accordance with the *International Building Code*. Vaults shall be watertight and constructed with 3000 psi minimum compressive strength reinforced concrete.

4) Closed vaults shall be designed for H25 loading when located in the right-of-way or in areas where the lids may be subject to vehicle loads, such as commercial developments. Vaults in other areas may be designed for H20 loading. All design loads shall include an impact allowance in accordance with the *AASHTO Standard Specifications for Highway Bridges*.

5) The minimum internal height in a closed vault shall be 7 feet, the minimum internal width shall be 4 feet, and the maximum depth from ground elevation to the vault bottom shall be 20 feet.

6) The walls of all vaults shall have horizontal and vertical reinforcement on each face. Reinforcement shall be designed for both the hydrostatic pressure of a tank full of water and the earth pressure of the planned backfill plus any surcharge. The design of corners of vaults shall take into consideration the restraint provided by the adjoining walls and/or the lids.

7) Maintenance access and ventilation shall meet city, State and National Standards. Closed vault ventilation shall be provided by a venting manhole cover or catch basin grate.

8) Closed vaults used for detention, retention, or treatment shall have at least one access for every 50 feet of length, with a minimum of three access points. A ladder shall be provided to the bottom of each cell or compartment. Access points shall be located over the inlet/outlet and the sediment trap. Access shall consist of a round, locking ring and cover. The ladder shall be directly under the ring and cover. Access design shall provide sufficient clearance between walls and appurtenances to allow access for personnel and required safety and maintenance equipment.

9) Control structures shall be located outside of the vault in an appropriately sized manhole.

10) A catch basin or an alternative sediment removal best management practice (BMP) with sufficient capacity shall be constructed upstream of the vault for sediment removal. The volume of sediment storage required shall be determined by the Design Engineer of record. Vehicular access designed for H25 loading shall be provided for the sediment removal area. Vaults shall also contain a forebay for additional sediment capture. Access directly over the forebay shall be provided for maintenance purposes.

11) Enclosed detention structures, such as vaults, tanks, and pipes, shall not be considered sufficient for water quality treatment. While they may be designed to provide sediment removal, these systems must be used in conjunction with a vegetated system such as biofiltration swales or a water quality pond, or some other system proven to be effective at removing metals, organic pollutants, and if necessary, nutrients.

12) Water quality treatment systems are preferred to be installed downstream from vault detention systems. However, if topography makes a downstream location unfeasible, then a water quality system may be installed upstream from the detention system, provided that a sump or means of initial sediment removal is installed and that peak flow through the water quality system is controlled to not exceed the water quality design flow rate. Water quality treatment may be biofiltration or other approved treatment method. A "wet vault", or other system where settling is the only pollutant removal system, is not acceptable as the sole water quality treatment for runoff.

3-8.05 PIPE DETENTION

1) Pipes used for detention, retention, or treatment systems shall have at least one access point for every 100 feet of length. Each end of the pipe shall be connected to a Type 2 catch basin with a culvert section having a maximum length of 2 feet and a minimum diameter of 3 feet. Access points shall be located over the flow control device and the inlet pipe. Access shall consist of a round, locking ring and cover.

2) An air vent connection of appropriate size shall be provided at the top of the high end of the pipe. Maintenance access and ventilation shall meet State and National Standards.

3) Parallel pipes used for detention, retention, infiltration, or treatment shall meet the minimum clearance requirement of 2 feet unless approved by the City Engineer, with appropriate provisions for controlling the density of fill between the pipes.

4) Water quality treatment systems are preferred to be installed downstream from pipe detention systems. However, if topography makes a downstream location unfeasible, then a water quality system may be installed upstream from the detention system, provided that a sump or means of initial sediment removal is installed and that peak flow through the water quality system is controlled to not exceed the water quality design flow rate. Water quality treatment may be biofiltration or other approved method.

3-8.06 EMERGENCY OVERFLOW STRUCTURES

1) Enclosed vaults and open detention, retention, and infiltration systems shall have emergency overflow structures that convey the maximum undetained design flow of the detention facility into the downstream drainage system without damage to any drainage facility. Overflow structures may be open channel spillways or closed conduit systems, but shall not be connected to or through the control structure. The emergency flow outfall shall bypass any biofiltration system.

2) If the structure is an open channel, it shall be designed as a broad crested weir, to pass the 100-year, 24-hour undetained post-development event. It shall be armored with quarry spalls that conform to *WSDOT/APWA Standard Specifications*, provided that larger material shall be used if necessary to prevent erosion from the maximum design flow. The quarry spall layer shall be at least one (1) foot thick and individual rocks shall not protrude more than three inches from that surface.

3) All detention ponds and vaults shall have an emergency overflow system (spillway or closed conduit) that supplements the design overflow. The emergency overflow elevation shall be 0.5 feet above the maximum design water surface elevation. The pond freeboard shall be a minimum of one (1) foot above the undetained 100-year flow through the emergency overflow. The preferred method to establish the spillway invert elevation in an open channel is a concrete curb or sill.

3-8.07 SEDIMENT TRAPS

1) There shall be a separate sediment trap installed at the inlet of all stormwater detention and retention systems. The trap shall be designed such that the entire area is accessible by maintenance equipment. If the width across the top of the sediment trap is greater than 30 feet, an access road to the bottom of the sediment trap is required.

2) A control structure shall not be considered to perform the same function as a sediment trap.

3-8.08 WEIRS

1) All weirs shall have a debris barrier installed directly upstream of the weir.

2) All weir wall structures shall be reinforced concrete on a reinforced concrete pad poured in place for 5 feet upstream and downstream of the weir wall. The concrete pad shall extend 1 foot in width to each side of the outside edge of the weir.

3) If a chain link fence is constructed directly over or adjacent to the weir structure, the chain link fence shall extend to within 2 inches of the top of the weir, to prevent unauthorized access to the facility. A bottom rail meeting *WSDOT/APWA Standards Specifications* shall be installed, extending a minimum of 5 feet horizontally from each

edge of the weir.

4) All weirs shall be designed as sharp crested weirs using end contraction correction factors or other formulas approved by the City Engineer.

5) Metal weir plates shall be designed to be field adjusted, bolted, or otherwise fastened to the foundation, not embedded in concrete. Weir plate fasteners that allow field adjustment shall be used.

3-8.09 VORTEX FLOW REGULATORS

1) The vortex flow regulator control structure shall have a sediment trap and a spill-control device (oil-water separator, or equivalent as shown in Standard Detail SD-120) installed.

2) The vortex flow regulator shall be enclosed within a standard Type 2 catch basin or manhole for adequate access and protection from vandalism. Maintenance access shall be provided into the structure.

3) The vortex flow regulator shall be designed and constructed so that it is completely removable from the structure.

4) The vortex flow regulator system shall include a shear gate and an overflow, or some other method approved by the City Engineer that allows quick draining and cleaning of the detention facility.

3-9 INFILTRATION SYSTEMS

3-9.01 GENERAL

1) A proposal to use a drainage infiltration system shall include a system design, feasibility analysis and discussion. The design shall be based on tests performed on the proposed infiltration site, infiltration criteria, site limitations, and requirements for the selected best management practice (BMP) from the *DOE Stormwater Management Manual*.

2) Large infiltration systems receive runoff from 5,000 square feet or more of impervious area.

- The design report for a large infiltration system shall be prepared by a licensed Geotechnical Engineer, Engineering Geologist or Hydrogeologist. The report shall state whether the site is suitable for the proposed infiltration facility and recommend a design infiltration rate.

- At least one soil log, boring, or test pit shall be provided for each 5,000 square feet of infiltration pond bottom area (plan view), with a minimum of two soil logs per infiltration facility.

- For trenches, at least one soil log per 50 feet of trench length shall be provided, with a minimum of two per trench.

- Each soil log shall extend a minimum of 6 feet below the bottom of the proposed facility, and shall describe the SCS/NRCS series of the soil, the apparent textural class of the soil horizon(s) through each zone.

- The location of the soil logs shall be noted on the plans and in the report.

3) Small infiltration systems receive runoff from less than 5,000 square feet of impervious area.

- Infiltration trenches for roof drains may be designed and constructed per Standard Detail SD-140.

- The elevation must be reported relative to the NAVD88 vertical datum.

- Soil tests for small infiltration systems may be conducted by a licensed septic designer.

3-9.02 SOIL SAMPLING AND ANALYSIS

1) The soil log shall note the estimated or measured high groundwater level. The location of the seasonal high groundwater table can be determined by field observation of static water elevation in borings, changes in soil moisture content, and/or changes in soil color such as mottling.

2) The location of impermeable soil layers or dissimilar soil layers shall be noted.

3) Soil samples shall be taken in each distinct layer and to a depth of 3 feet below the proposed bottom of the infiltration facility. The soil's texture class may be established using the USDA Textural Triangle and the percentages of silt, clay, and sand determined from analysis of the soil samples. Laboratory analysis of soil samples is encouraged.

4) Each design report shall contain a clear statement of the depth to the maximum seasonal high water table. If any doubt exists about the maximum seasonal high water table measurements, monitoring wells shall be dug and monitored during a period when the water table elevation is expected to be at a maximum; that is, over a winter. Monitoring of the water table over a winter season shall include an analysis of rainfall for

comparison to normal amounts and conditions.

5) A groundwater mounding analysis shall be included with all large infiltration system designs when the depth to the seasonal high water table or low permeability stratum is less than 15 feet and the runoff collection area is more than 1 acre.

3-9.03 DESIGN

1) The use of infiltration systems in fill soils is not allowed. Soils shall be natural, undisturbed, and permeable in nature.

2) Soils are suitable for infiltration if they meet all of the following requirements:

- The soil infiltration rate is at least 0.5 inch per hour or 2 hours per inch;
- The soil has less than 30 percent clay content; and
- The soil has less than 40 percent silt and clay content.

3) For infiltration systems to provide water quality treatment, the runoff must infiltrate through at least 18 inches of soil that has a minimum cation exchange capacity of five (5) milliequivalents per 100 grams of dry soil. The soil's infiltration rate and cation exchange capacity shall be determined using the values given in Table III-3.1 of the *1992 DOE Stormwater Management Manual*. The texture class shall be determined using the USDA Textural Triangle. For large infiltration systems, the soil's infiltration rate and cation exchange capacity shall be determined using USEPA Method 9081.

4) The bottom of the infiltration facility shall be a minimum of 3 feet above the maximum seasonal high water table, bedrock, hardpan or an impermeable layer. This depth requirement may be reduced to a minimum of 2 feet above the maximum seasonal high water table or bedrock/hardpan/impermeable layer for single family roof infiltration systems where the impermeable area is less than 5,000 square feet.

5) All infiltration system locations are subject to the regulations of the Snohomish County Health District. The following setback requirements shall be met unless a licensed Geotechnical Engineer, Hydrologist, or other appropriate expert provides sufficient information to justify a setback reduction:

- A minimum of 100 feet from wells.
- A minimum of 30 feet from septic tanks or drainfields.
- A minimum of 10 feet upslope from any structure, property line, and wetland or stream Native Growth Protection Area (NGPA).

- A minimum of 30 feet down slope or 100 feet up slope from any structure and at least 20 feet from an NGPA (large infiltration systems only).

- A minimum of 50 feet from any geologically hazardous area. Any design requirements or concerns related to steep slopes or other sensitive area impacts identified by a licensed Engineer shall be addressed in the soil study.

- Sufficient separation shall be provided between adjacent infiltration systems so that the respective lines of soil saturation do not intersect. Lines of saturation shall be assumed to slope away from the design maximum water elevation at 1.5 horizontal to 1 vertical.

6) The design infiltration rate shall be determined by infiltration testing, or analysis of soil logs, or a combination of testing and analysis.

   - When infiltration rate tests are used to provide an estimate of the saturated soil hydraulic conductivity, the maximum infiltration rates determined through these tests shall not be faster than those shown in the table in *DOE Stormwater Management Manual* for the given soil textural class.

   - The design infiltration rate shall not be higher than the measured infiltration rate. The appropriate factor of safety (4 minimum) shall be applied. Long term clogging with fines shall be reflected in the design infiltration rate.

   - When a project is located near the boundary between 1 or more soil units, the unit yielding the most conservative infiltration rate shall be used.

   - The design infiltration rate analysis shall address the influence of geometric hydraulic constraints, groundwater mounding, shallow water table and/or any impervious layer(s).

7) Slope restrictions depend on the infiltration BMP selected. Infiltration facilities are generally feasible on slopes up to 15%.

8) The following drainage area limitations shall apply for infiltration BMPs:

   - Infiltration basins - 5 acres maximum.

   - Roof runoff infiltration/dispersion systems - 5000 square feet of impervious area maximum.

9) The use of infiltration systems for runoff from single family residential buildings with less than 5000 square feet of roof area is encouraged. Large lots are encouraged to use a combination infiltration/dispersion system to handle the two (2) year storm with excess

runoff dispersion for larger storms, provided that no downstream structures exist and wetlands or buffers are available to receive the runoff.

10) Infiltration BMPs are sized using standard routing and modeling techniques. Stage-storage and stage-discharge relationships are developed through an iterative process, the final infiltration facility size and geometry is determined by routing the appropriate design storm(s) through the facility. Darcy's law of ground water movement shall be used to determine the flow rate and stage discharge table.

Darcy's Law: Q = (f)(i)(As)

Where:
Q = flow rate at which runoff is infiltrated
f = soil infiltration rate (including minimum safety factor of 4) *
i = hydraulic gradient (set equal to one)
As = surface area available for infiltration (not cross-sectional area)
* *The infiltration rate is determined from the soil texture class or soil test.*

3-9.04 CONSTRUCTION

1) Construction plans shall specify the construction sequence for the infiltration BMP. Compaction of soil and later redevelopment is not allowed as the design is based on natural soil in the original location. Vehicles shall not be driven over the infiltration area during construction.

2) When constructing infiltration basins, the initial basin excavation shall be carried to within one (1) foot of the final elevation of the basin floor. Final excavation to the finished grade shall not be initiated until all disturbed areas in the watershed have been stabilized or protected. After the final grading is completed, the basin floor shall be deeply tilled using rotary tillers or disc harrows to provide a well aerated, highly porous surface texture.

3) Specifications for basin construction shall state the earliest point in the construction process when storm drainage may be directed to the basin. Details for bypassing the facility until it is operational shall be provided. Infiltration BMPs shall not be put into use until the drainage areas that contribute runoff to the facility have been adequately stabilized. Infiltration systems must be protected from sediment deposition at all times, especially during the plat build out phase.

3-9.05 MAINTENANCE

A plan for maintenance and/or replacement of the infiltration BMP is required. For an infiltration trench BMP, inspection and/or monitoring reports shall be provided.

3-10 FLOW DISPERSAL SYSTEMS

The primary purpose of a level spreader trench is to diffuse concentrated runoff and release it onto large areas stabilized by existing vegetation. Level spreaders may be used to disperse the outflow from detention facilities when a downstream conveyance system is not present.

3-10.01 LEVEL SPREADER TRENCHES

1) Level spreader trenches shall be constructed a minimum of 20 feet upstream from any adjoining downstream property.

2) Level spreader trenches shall be constructed of a grass swale and 4 inch drain rock or a level steel plate embedded in reinforced concrete. No wood structures shall be allowed.

3) A minimum of 10 feet of drain rock shall be laid downstream of the level spreader trench.

4) Level spreader trenches shall only be used on slopes 5% or less.

5) Downstream easements are required when the level spreader is closer than 20 feet to the downstream property line and whenever sheetflow patterns originally existed.

3-10.02 BUBBLE–UP SPREADERS

For runoff from roof areas larger than 700 square feet, a bubble-up spreader may be used.

3-11 WATER QUALITY SYSTEMS

1) Water quality systems are discussed in detail in the *DOE Stormwater Management Manual*, Volumes I-IV.

2) Biofiltration facilities to provide water quality treatment include biofiltration swales and vegetated filter strips. Biofiltration swales are specially designed vegetated channels for treating concentrated flow, while filter strips are vegetated areas for treating unconcentrated sheet flow.

3) Biofiltration facilities that provide stormwater treatment for private development are required to be placed in separate tracts, and shall not be located in the public right-of-way. While these channels may provide pollutant removal, they are not a substitute for required stormwater treatment systems such as biofilters.

4) Water quality treatment systems shall not be part of any conveyance system where the peak flow is uncontrolled.

5) Systems requiring periodic replacement of filter media may be used in drainage systems located outside the public right-of-way. Use of these systems within the public right-of-way is allowed if approval is granted by the City Engineer.

3-11.01 DESIGN

Design shall be based on hydraulic residence time, calculated by using the Manning Formula method. If not all of the stormwater treated in a biofilter enters at the same location, the design hydraulic residence time shall be the flow weighted average hydraulic residence time.

1) Biofilters shall be designed to receive flows no greater than the design flow rate. Flows exceeding the design flow rate shall bypass the biofilter. In cases where the City Engineer determines that bypass is not feasible, biofilters shall be designed and constructed in accordance with all standards and code requirements for both biofilters and conveyance systems. Additional exceptional design parameters may be required.

2) If flow is introduced to biofilters through curb cuts, the cuts shall be a minimum of 12 inches wide.

3-11.02 CONSTRUCTION

1) Biofilters shall be sodded and over-seeded. Examples of vegetation mixes are provided in the *DOE Stormwater Management Manual* of Western Washington. Vegetation shall be permanently established in biofilters before stormwater runoff is allowed to flow through them.

   - Biofilters with grades greater than 2% shall be over-seeded with water tolerant grasses.

   - Biofiltration swales with slopes of 2% and less shall be over-seeded with both water-tolerant grasses and emergent wetland vegetation.

2) Level spreaders shall be installed at a minimum of every fifty feet in biofiltration swales. If the swale is terraced, additional spreaders are required at the top and base of each terrace. If the terrace exceeds a vertical drop of 0.5 foot or a 1:1 grade drop of 1.0 foot, a concrete sump box is required at the base with a level spreader at the downstream lip of the box. Otherwise, a 4 foot long strip of 4- to 8-inch rock shall be placed immediately below the terrace.

3) Swales shall be constructed as follows:

   - Overexcavate the swale 8 to 12 inches and install 4 to 8 inches of compacted, amended topsoil and 4 inches of turf sod on the topsoil.

- Topsoil and turf shall extend at least one (1) foot above the design water surface and shall cover the entire bottom of the swale.

- The top of sod shall be two (2) inches below the invert of the inlet and outlet pipes.

- No wood is allowed.

3-12 DRAINAGE EASEMENTS

1) Public drainage easements shall be a minimum of 10 feet wide for maintenance and access of pipes located outside of the public right-of-way which convey runoff from public streets or other facilities. See Standard Detail SD-130.

2) Where possible, pipes shall be located in the center of the drainage easement, but in no case shall a pipe be closer than five feet to a property line.

3) Where possible, drainage easements shall be contained on one lot, and not bisected by a lot line.

4) Shared private pipes must be located within private drainage easements.

5) Easements for downspout roof drains, yard drains, and footing drains are not required unless these systems are shared by more than one property owner.

3-13 OPERATION AND MAINTENANCE

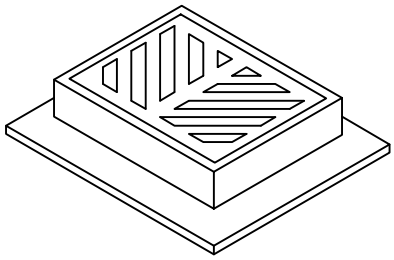
All stormwater facilities shall be maintained in accordance with the adopted *DOE Stormwater Manual*, the O&M manual in the drainage report prepared by the Design Engineer during the project review process, the City of Arlington Stormwater Utility policy approved by the City Council, the City Stormwater Comprehensive Plan, and the provisions provided herein.

Projects within the City of Arlington are eligible for a Stormwater Utility Credit for stormwater service customers who construct and maintain systems according to the adopted *DOE Stormwater Manual*. This credit is an ongoing reduction in the stormwater utility fee. The Stormwater Utility is outlined in Ordinances No. 1395 and 1396.

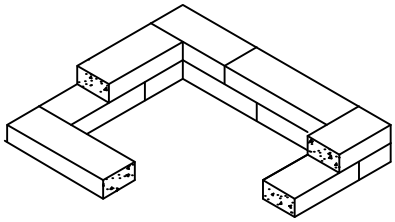
3-14 PRIVATE SYSTEMS

It shall be the responsibility of the property owner to maintain, repair and restore, at the owner's expense, all private stormwater and drainage systems located on the owner's property. Maintenance shall be performed in accordance with maintenance schedule in the drainage report prepared by the Design Engineer during the plan review process for constructing the facilities. The City shall be granted the right to inspect and conduct emergency maintenance as deemed necessary by the Public Works Director. The City will be reimbursed by the private owner for any emergency maintenance costs incurred.

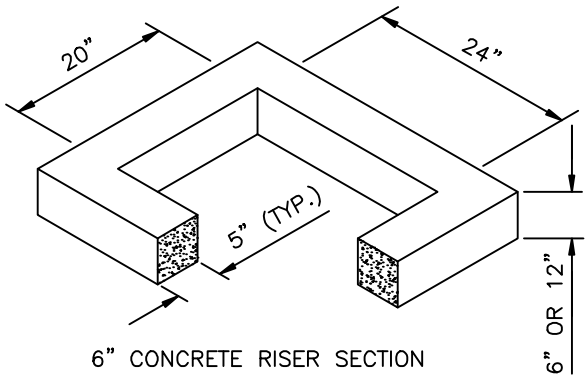
Disposal of waste from maintenance activities shall be conducted in accordance with the minimum Functional Standards for Solid Waste Handling, Chapter 173-304 WAC, guidelines by the Washington State Department of Ecology for disposal of waste materials from stormwater maintenance activities, and where appropriate, the *Dangerous Waste Regulations*, Chapter 173-303 WAC.



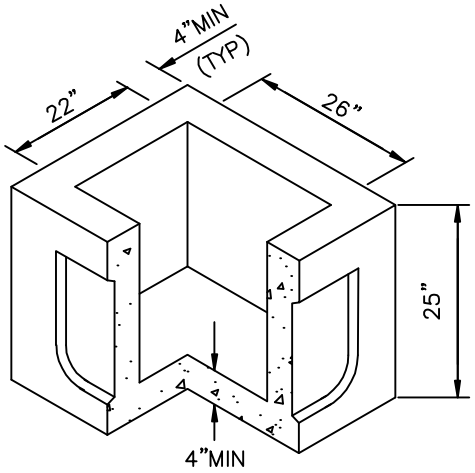
FRAME AND GRATE, SEE APPLICABLE STANDARD DETAILS



2"X4"X8" SOLID BRICK USED FOR FINAL ADJUSTMENT TO GRADE, 6" HIGH MAX.



6" CONCRETE RISER SECTION

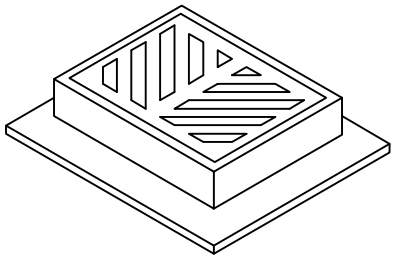


PRE-CAST BASE SECTION
(MEASUREMENT AT THE TOP OF THE BASE)

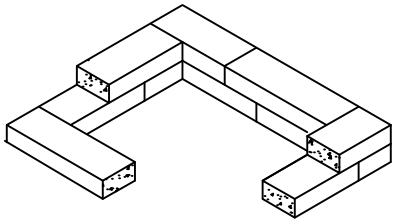
NOTES:

1. CONCRETE INLET TO BE CONSTRUCTED IN ACCORDANCE WITH ASTM C478 & C890 UNLESS OTHERWISE SHOWN ON THE PLANS OR NOTED IN THE STANDARD SPECIFICATIONS. ALL CONCRETE SHALL BE CLASS 4000.
2. REINFORCING SHALL BE EQUIVALENT TO WELDED WIRE FABRIC (WWF) HAVING A MINIMUM AREA OF 0.12 SQUARE INCH PER FOOT. WWF SHALL COMPLY TO ASTM A497. WWF SHALL NOT BE PLACED IN KNOCKOUTS.
3. THE BOTTOM OF THE PRE-CAST BASE SECTION MAY BE ROUNDED.
4. PRE-CAST BASES SHALL BE FURNISHED WITH CUTOUTS OR KNOCKOUTS. KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" MIN. ALL PIPE SHALL BE INSTALLED IN FACTORY PROVIDED KNOCKOUTS. UNUSED KNOCKOUTS NEED NOT BE GROUTED IF WALL IS LEFT INTACT.
5. KNOCKOUT OR CUTOUT HOLE SIZE IS EQUAL TO PIPE OUTSIDE DIAMETER PLUS CONCRETE INLET WALL THICKNESS. KNOCKOUTS MAY BE ROUND OR "D" SHAPED AND MAY BE ON ALL 4 SIDES WITH MAXIMUM DIAMETER OF 17".
6. THE MAXIMUM DEPTH FROM THE FINISHED GRADE TO THE PIPE INVERT IS 5'-0".
7. THE TAPER ON THE SIDES OF THE PRE-CAST BASE SECTION AND RISER SECTION SHALL NOT EXCEED 1/2" PER FOOT.
8. FRAME AND GRATE SHALL BE IN ACCORDANCE WITH WSDOT/APWA SPECIFICATIONS. MATING SURFACES SHALL BE FINISHED TO ASSURE NON-ROCKING FIT WITH ANY COVER POSITION.
9. FRAME AND GRATE MAY BE INSTALLED WITH FLANGE DOWN OR CAST INTO RISER.

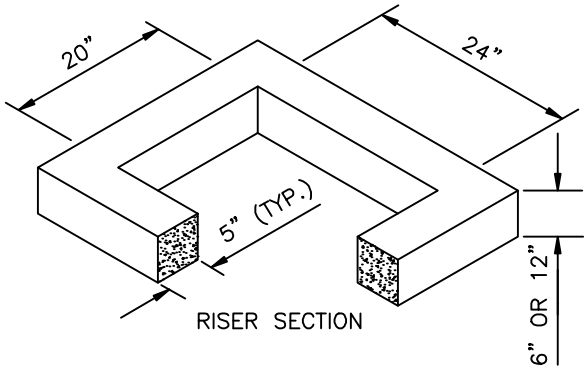
CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL	STANDARD DETAIL NUMBER
	DATE	07/31/2008		
	REF STAN SPEC		CONCRETE INLET	SD-010



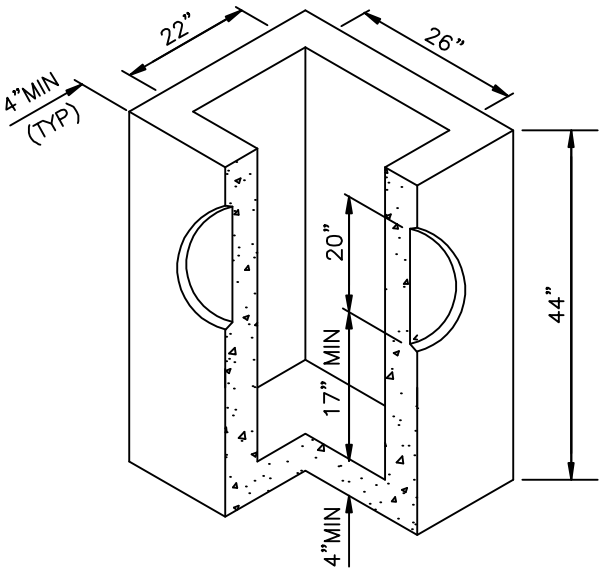
FRAME AND GRATE (OR SOLID COVER), SEE APPLICABLE STANDARD DETAILS



2"X4"X8" SOLID BRICK USED FOR FINAL ADJUSTMENT TO GRADE, 6" HIGH MAX.



RISER SECTION

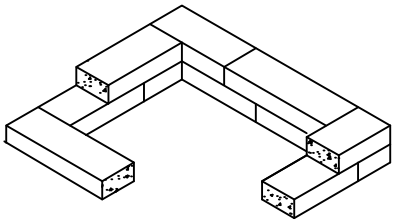


PRE-CAST BASE SECTION
(MEASUREMENT AT THE TOP OF THE BASE)

NOTES:

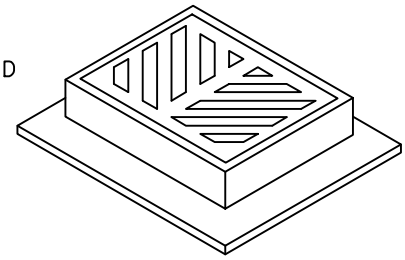
1. CONCRETE INLET TO BE CONSTRUCTED IN ACCORDANCE WITH ASTM C478 & C890 UNLESS OTHERWISE SHOWN ON THE PLANS OR NOTED IN THE STANDARD SPECIFICATIONS. ALL CONCRETE SHALL BE CLASS 4000.
2. REINFORCING SHALL BE EQUIVALENT TO WELDED WIRE FABRIC (WWF) HAVING A MINIMUM AREA OF 0.12 SQUARE INCH PER FOOT. WWF SHALL COMPLY TO ASTM A497. WWF SHALL NOT BE PLACED IN KNOCKOUTS.
3. THE BOTTOM OF THE PRE-CAST BASE SECTION MAY BE ROUNDED.
4. PRE-CAST BASES SHALL BE FURNISHED WITH CUTOUTS OR KNOCKOUTS. KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" MIN. ALL PIPE SHALL BE INSTALLED IN FACTORY PROVIDED KNOCKOUTS. UNUSED KNOCKOUTS NEED NOT BE GROUTED IF WALL IS LEFT INTACT.
5. KNOCKOUT OR CUTOUT HOLE SIZE IS EQUAL TO PIPE OUTSIDE DIAMETER PLUS CATCH BASIN WALL THICKNESS. KNOCKOUTS MAY BE ROUND OR "D" SHAPED AND MAY BE ON ALL 4 SIDES WITH MAXIMUM DIAMETER OF 20".
6. THE MAXIMUM DEPTH FROM THE FINISHED GRADE TO THE PIPE INVERT IS 5'-0".
7. THE TAPER ON THE SIDES OF THE PRE-CAST BASE SECTION AND RISER SECTION SHALL NOT EXCEED 1/2" PER FOOT.
8. FRAME AND GRATE SHALL BE IN ACCORDANCE WITH WSDOT/APWA SPECIFICATIONS. MATING SURFACES SHALL BE FINISHED TO ASSURE NON-ROCKING FIT WITH ANY COVER POSITION.
9. FRAME AND GRATE MAY BE INSTALLED WITH FLANGE DOWN OR CAST INTO RISER.
10. EDGE OF RISER OR BRICK SHALL NOT BE MORE THAN 2" FROM VERTICAL EDGE OF CATCH BASIN WALL.

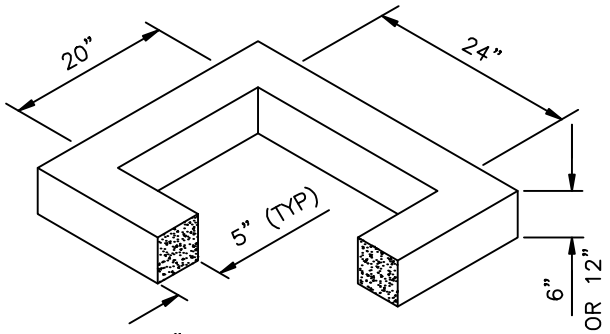
CITY OF ARLINGTON	APPROVED BY: L. OLIVE DATE: 07/31/2008 REF STAN SPEC:	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL CATCH BASIN TYPE 1	STANDARD DETAIL NUMBER SD-020



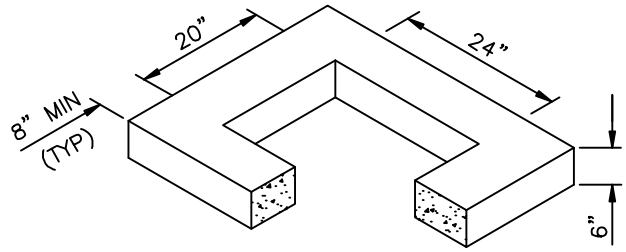
2"X4"X8" SOLID BRICK USED FOR FINAL ADJUSTMENT TO GRADE, 6" HIGH MAX

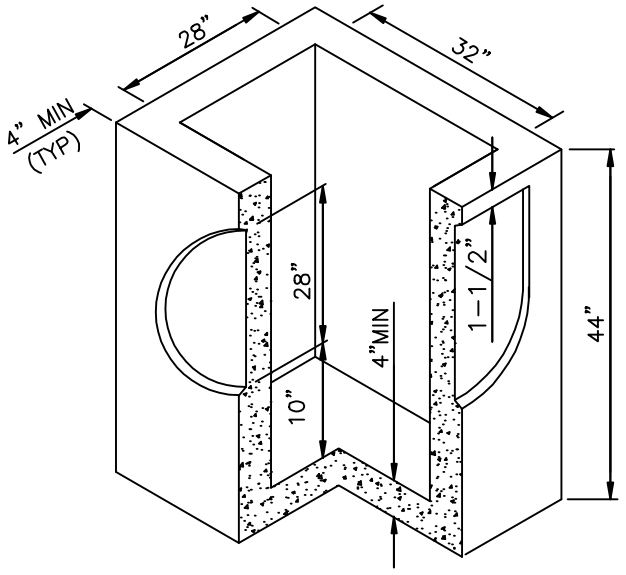
FRAME AND GRATE (OR SOLID COVER), SEE APPLICABLE STANDARD DETAILS





6" CONCRETE RISER SECTION





PRE-CAST BASE SECTION
(MEASUREMENT AT THE TOP OF THE BASE)

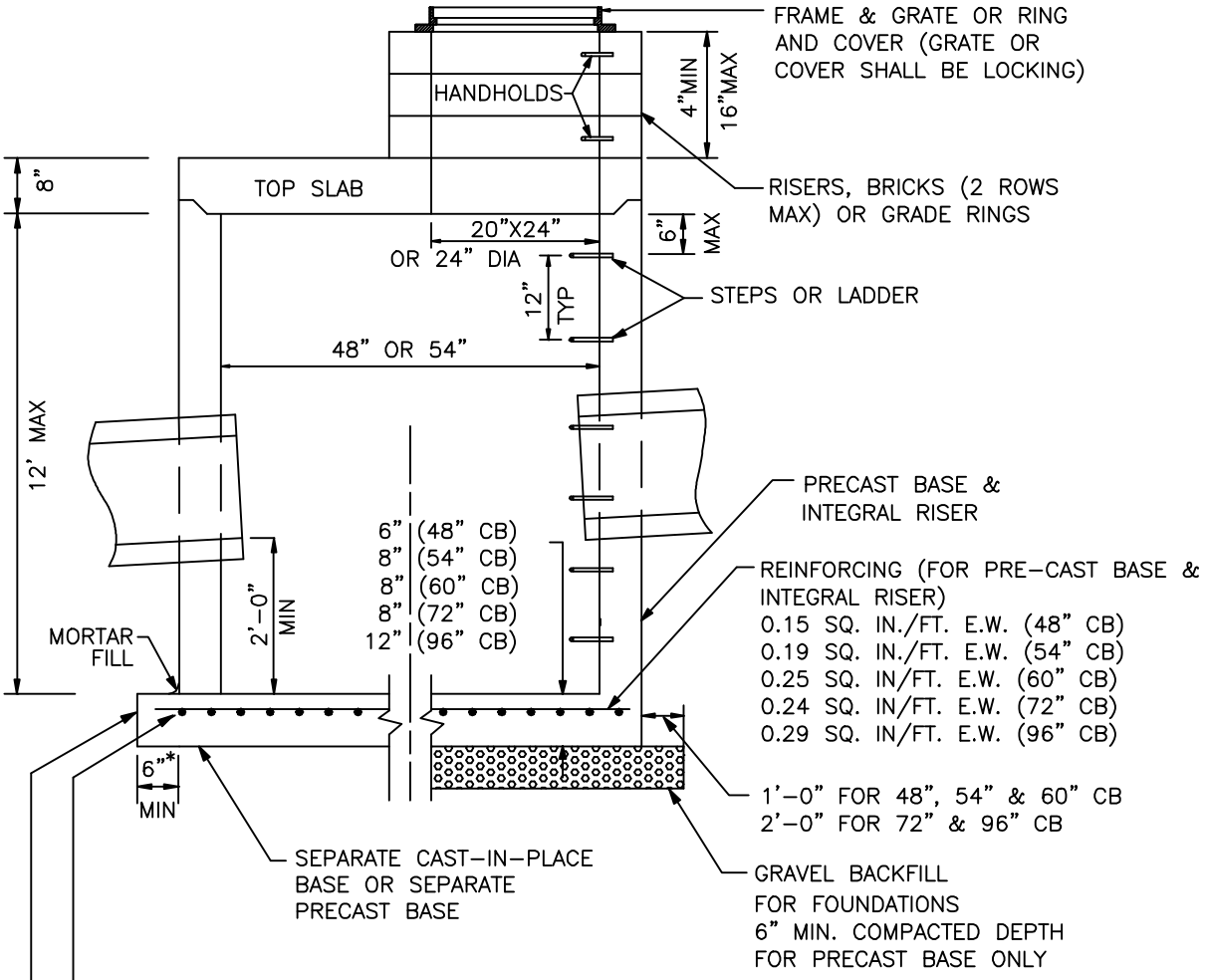
NOTES:

1. CONCRETE INLET TO BE CONSTRUCTED IN ACCORDANCE WITH ASTM C478 & C890 UNLESS OTHERWISE SHOWN ON THE PLANS OR NOTED IN THE STANDARD SPECIFICATIONS. ALL CONCRETE SHALL BE CLASS 4000.
2. REINFORCING SHALL BE EQUIVALENT TO WELDED WIRE FABRIC (WWF) HAVING A MINIMUM AREA OF 0.12 SQUARE INCH PER FOOT. WWF SHALL COMPLY TO ASTM A497. WWF SHALL NOT BE PLACED IN KNOCKOUTS.
3. THE BOTTOM OF THE PRE-CAST BASE SECTION MAY BE ROUNDED.
4. PRE-CAST BASES SHALL BE FURNISHED WITH CUTOUTS OR KNOCKOUTS. KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" MIN. ALL PIPE SHALL BE INSTALLED IN FACTORY PROVIDED KNOCKOUTS. UNUSED KNOCKOUTS NEED NOT BE GROUTED IF WALL IS LEFT INTACT.
5. KNOCKOUT OR CUTOUT HOLE SIZE IS EQUAL TO PIPE OUTSIDE DIAMETER PLUS CATCH BASIN WALL THICKNESS. KNOCKOUTS MAY BE ROUND OR "D" SHAPED AND MAY BE ON ALL 4 SIDES WITH MAXIMUM DIAMETER OF 28".
6. THE MAXIMUM DEPTH FROM THE FINISHED GRADE TO THE PIPE INVERT IS 5'-0".
7. THE TAPER ON THE SIDES OF THE PRE-CAST BASE SECTION AND RISER SECTION SHALL NOT EXCEED 1/2" PER FOOT.
8. FRAME AND GRATE SHALL BE IN ACCORDANCE WITH WSDOT/APWA SPECIFICATONS. MATING SURFACES SHALL BE FINISHED TO ASSURE NON-ROCKING FIT WITH ANY COVER POSITION.
9. FRAME AND GRATE MAY BE INSTALLED WITH FLANGE DOWN OR CAST INTO RISER.
10. EDGE OF REDUCING SECTION OR BRICK SHALL NOT BE MORE THAN 2" FROM VERTICAL EDGE OF CATCH BASIN WALL.

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL
	DATE	07/31/2008	
	REF STAN SPEC		CATCH BASIN TYPE 1L

STANDARD DETAIL NUMBER

SD-030

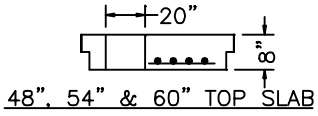


PRECAST BASE JOINT

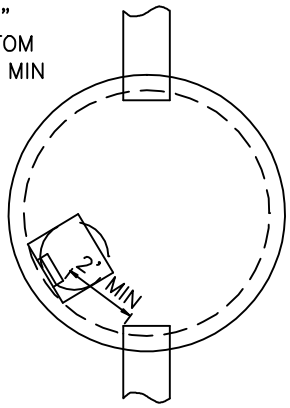
NOTES:

1. HANDHOLDS IN RISER OR ADJUSTMENT SECTION SHALL HAVE A 3" MINIMUM CLEANANCE. STEPS IN CATCH BASIN SHALL HAVE 6" MINIMUM CLEANANCE. NO STEPS ARE REQUIRED WHEN "B" IS 4' OR LESS. HANDHOLDS SHALL BE PLACED IN ALTERNATING GRADE RINGS OR LEVELING BRICK COURSE WITH A MINIMUM OF ONE HANDHOLD BETWEEN THE LAST STEP AND TOP OF THE FINISHED GRADE.
2. MINIMUM SOIL BEARING STRENGTH SHALL EQUAL 3,300 POUNDS PER SQUARE FOOT.
3. MORTAR SHALL BE PLACED BETWEEN EACH LEVEL OF ADJUSTING RINGS. TOP OF TOP SLAB, AND BOTTOM OF IRON RING.
4. SEE THE STANDARD SPECIFICATIONS FOR MORE REQUIREMENTS.

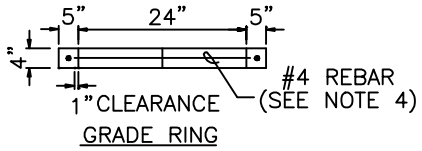
CITY OF ARLINGTON	APPROVED BY: L. OLIVE DATE: 07/31/2008 REF STAN SPEC:	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL CATCH BASIN TYPE 2 48", 54", 60", 72" & 96"	STANDARD DETAIL NUMBER SD-040



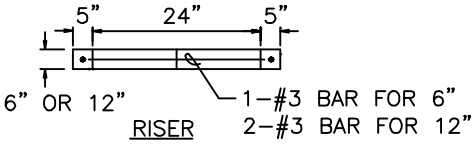
48", 54" & 60" TOP SLAB



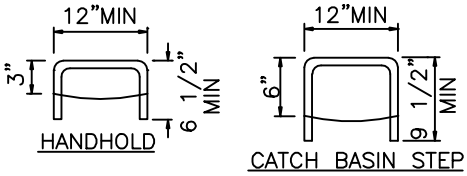
TYPICAL ORIENTATION
FOR ACCESS AND STEPS

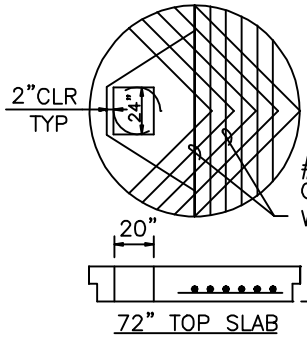


GRADE RING

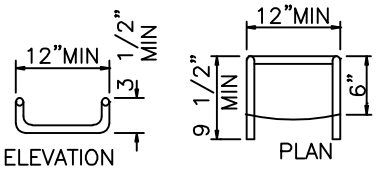


RISER



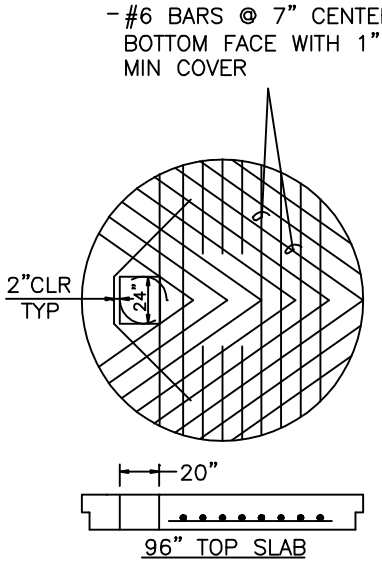


72" TOP SLAB



DROP RUNG CATCH BASIN STEP

* ALL STEPS COPLOYMER PROPYLENE



96" TOP SLAB

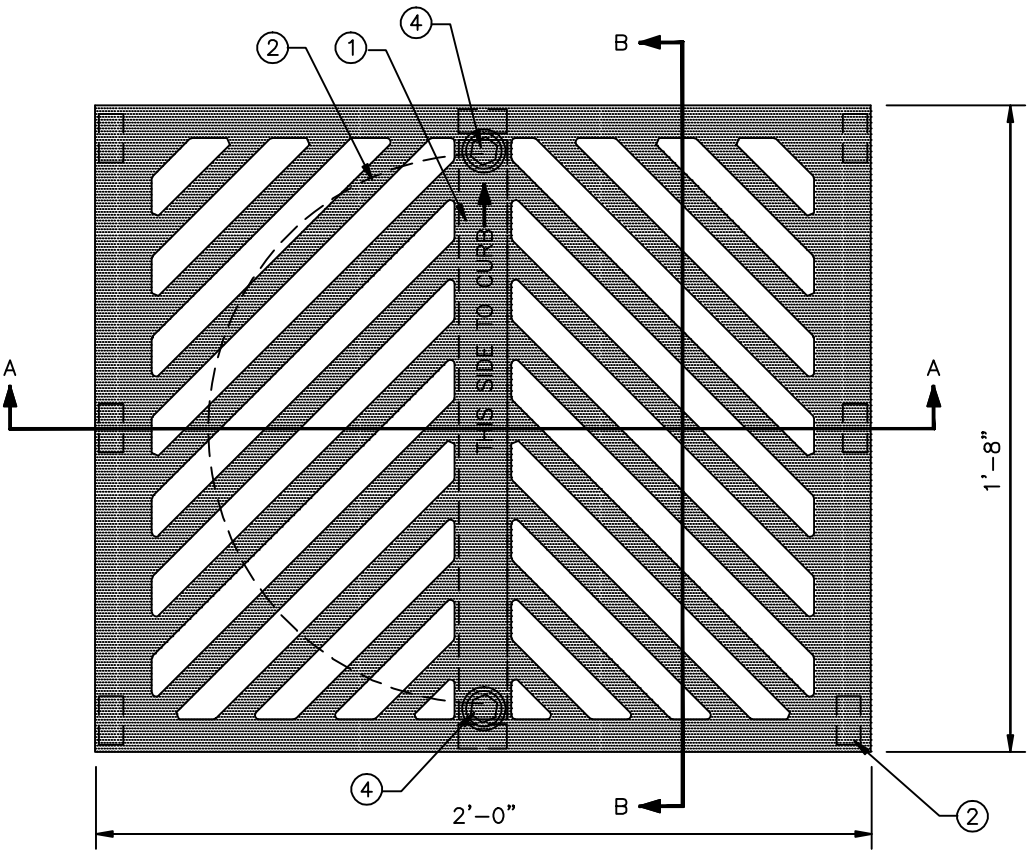
NOTES:

1. PROPRIETARY CATCH BASIN HANDHOLDS AND STEPS ARE ACCEPTABLE, PROVIDED THAT THEY CONFORM TO SEC. R, ASTM C478, AASHTO M-199 AND MEET ALL WISHA REQUIREMENTS.
2. CATCH BASIN STEP/HANDHOLD LEGS SHALL BE PARALLEL OR APPROXIMATELY RADIAL AT THE OPTION OF THE MANUFACTURER, EXCEPT THAT ALL STEPS IN ANY CATCH BASIN SHALL BE SIMILAR. PENETRATION OF OUTER WALL BY A LEG IS PROHIBITED.
3. HANDHOLDS AND STEPS SHALL HAVE "DROP" RUNGS AS SHOWN ON DETAIL OR PROTUBERANCES TO PREVENT SIDEWAYS SLIP.
4. SLAB OPENING MAY BE 24" X 20" OR 24" DIAM.
5. AS AN ACCEPTABLE ALTERNATIVE TO REBAR, WELDED WIRE FABRIC HAVING A MIN. AREA OF 0.12 SQUARE INCH PER FOOT MAY BE USED. WELDED WIRE FABRIC SHALL COMPLY TO ASTM A497.
6. LADDERS OR STEPS SHALL EXTEND TO WITHIN 16" OF BOTTOM OF CATCH BASIN. IF LADDERS ARE USED THEY SHALL BE STEEL REINFORCED COPOLYMER POLYPROPYLENE PLASTIC PER STD. DETAIL SS-040
7. HANGING LADDERS SHALL BE PERMANENTLY FASTENED AT TOP BY HANGING ON STEP OR BY BOLTING OR EMBEDDING IN CONCRETE. EACH SHALL BE EMBEDDED AT BOTTOM IN BASE.
8. ADDITIONAL SAFETY FEATURES MAY BE REQUIRED IN VERY DEEP OR UNUSUAL STRUCTURES.

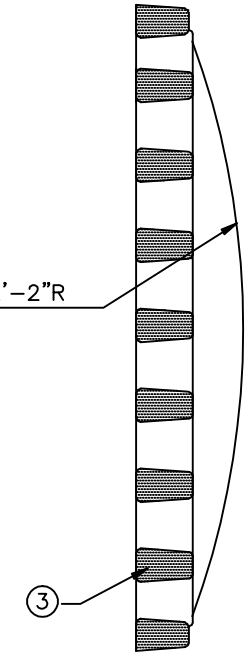
CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL
	DATE	07/31/2008	
	REF STAN SPEC		CATCH BASIN LADDER, STEP, AND TOP SLAB DETAILS

STANDARD DETAIL NUMBER

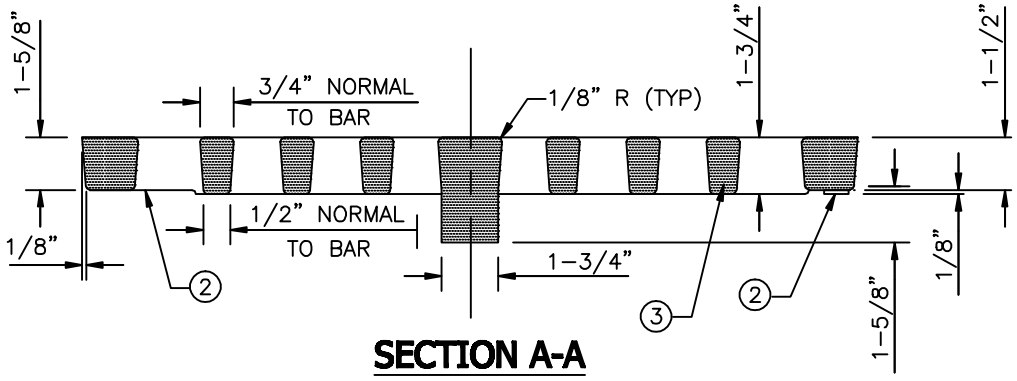
SD-050



PLAN



SECTION B-B



SECTION A-A

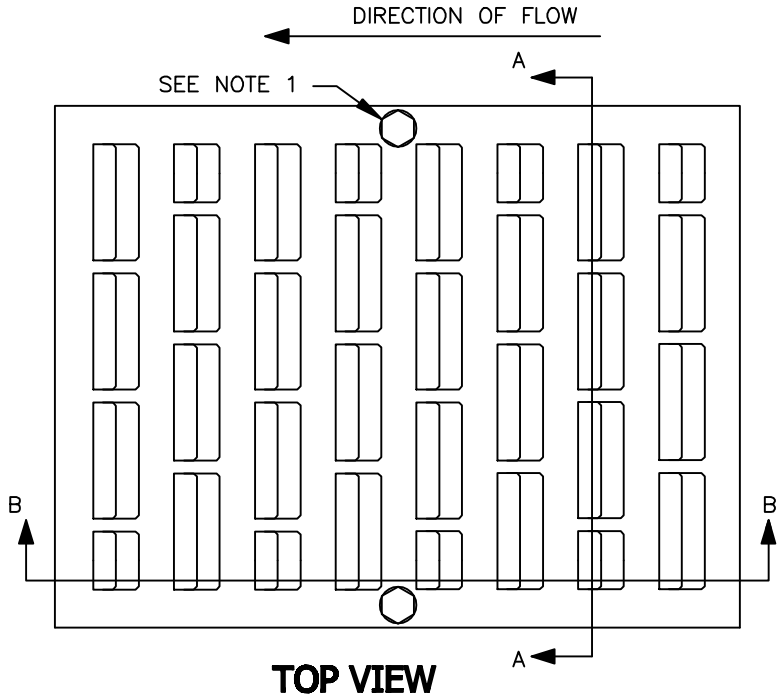
NOTES:

1. FOUNDRY NAME, THIS SIDE TO CURB W/ARROW AND (DI) FOR DUCTILE IRON SHALL BE EMBOSSED ON TOP OF GRATE WITH 1/16" RECESSED LETTERS.
2. SEATING OF GRATE SHALL BE ACCOMPLISHED BY ONE OF THE FOLLOWING: A. 8 INTEGRALLY CAST PADS (1-1/2"x3/4"x1/8"). B. MACHINE BOTTOM SURFACE OUTSIDE A 17" DIA.
3. MATERIAL USED SHALL BE DUCTILE IRON PER ASTM-A536, GRADE 80-55-06. ALL CASTINGS SHALL HAVE A BITUMINOUS COATING.
4. LOCKING GRATE CASTED HOLES SHALL BE CASTED TO ALLOW FOR TWO 5/8" DIA STAINLESS STEEL SOCKET HEAD CAP SCREWS SO THAT NO PART OF HEAD PROTRUDES ABOVE TOP OF CASTING.
5. GRATE TO BE USED WITH FRAME SHOWN IN STANDARD DETAIL SD-090.

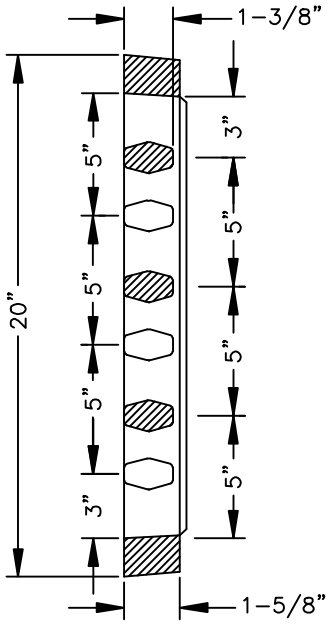
CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL
	DATE	07/31/2008	
	REF STAN SPEC		STANDARD GRATE CATCH BASIN INLET

STANDARD DETAIL NUMBER

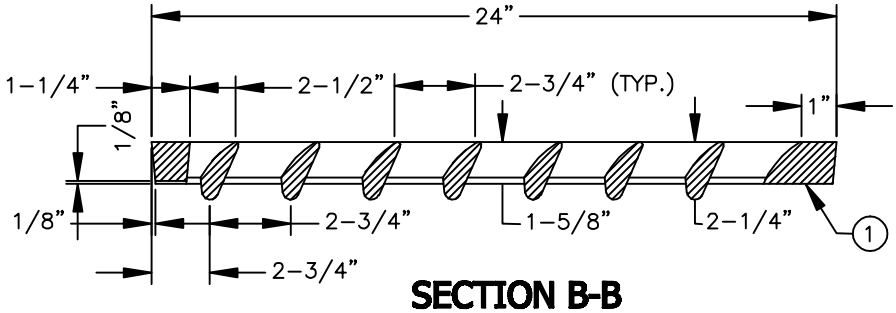
SD-060



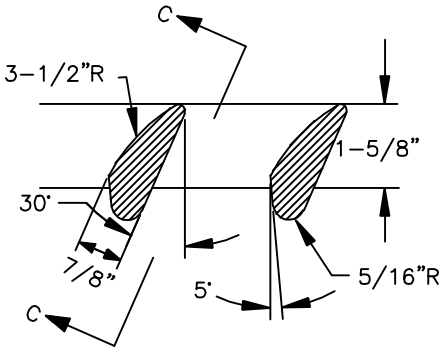
TOP VIEW



SECTION A-A



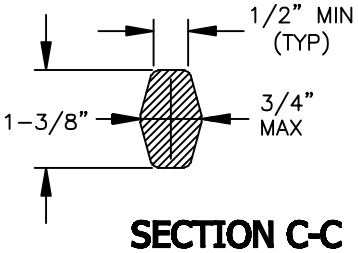
SECTION B-B



VANE DETAIL

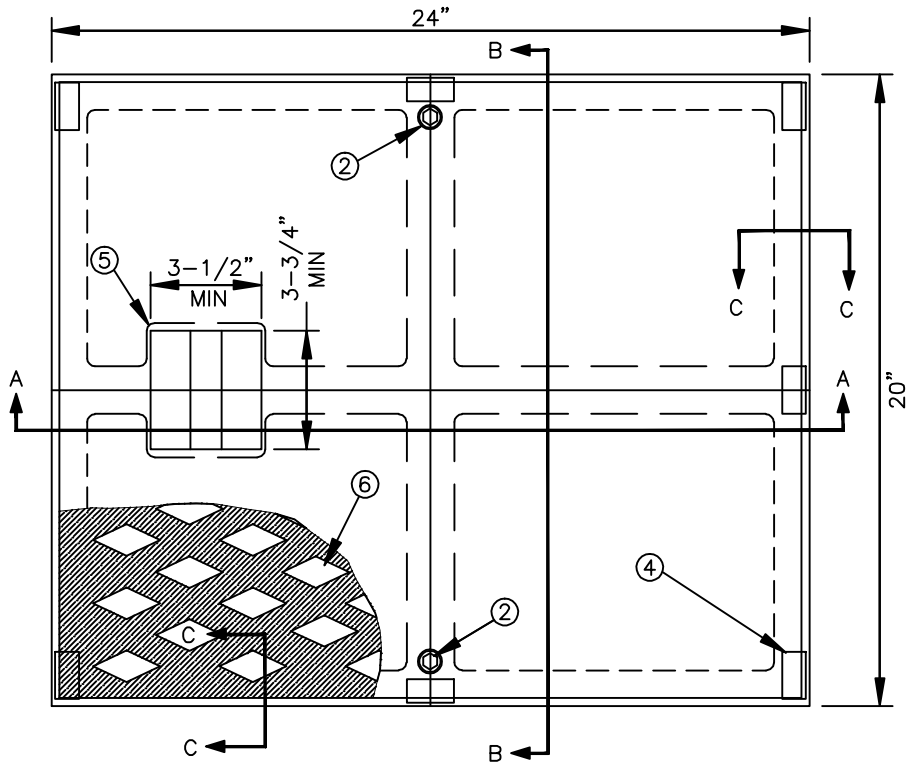
NOTES:

1. USE WITH TWO LOCKING BOLTS 5/8" DIA STAINLESS STEEL TYPE 304 SOCKET HEAD (ALLEN HEAD) BOLTS, 2" LONG. SELF-LOCK VANED GRATE IS NOT ACCEPTED.
2. MATERIAL SHALL BE DUCTILE IRON ASTM A536, GRADE 80-55-06, WITH BITUMINOUS COATING.
3. WELDING IS NOT PERMITTED. EDGES SHALL HAVE 0.125" RADIUS, 0.125" CHAMFER OR COMPLETE DEBURRING.
4. USE A BI-DIRECTIONAL VANED GRATE IN SAG VERTICAL CURVES.

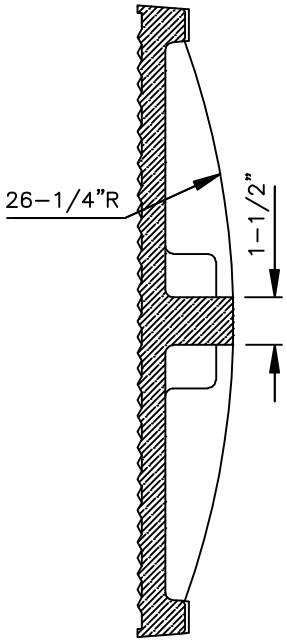


SECTION C-C

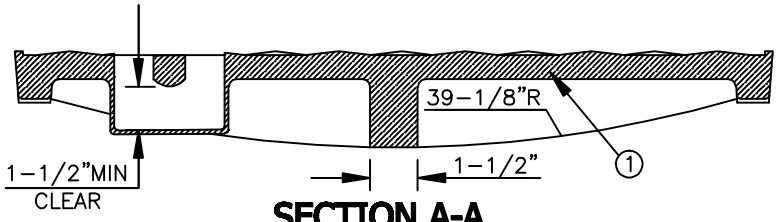
CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL
	DATE	07/31/2008	
	REF STAN SPEC		VANED GRATE
			STANDARD DETAIL NUMBER SD-070



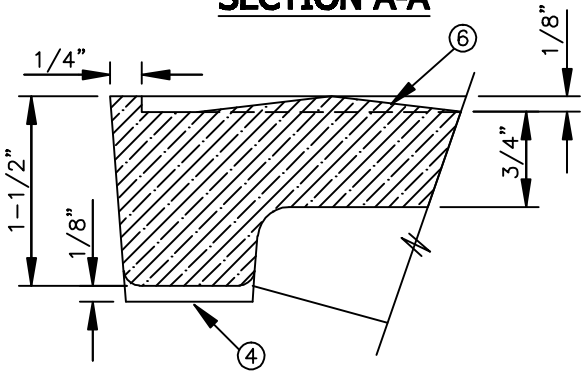
TOP VIEW



SECTION B-B



SECTION A-A

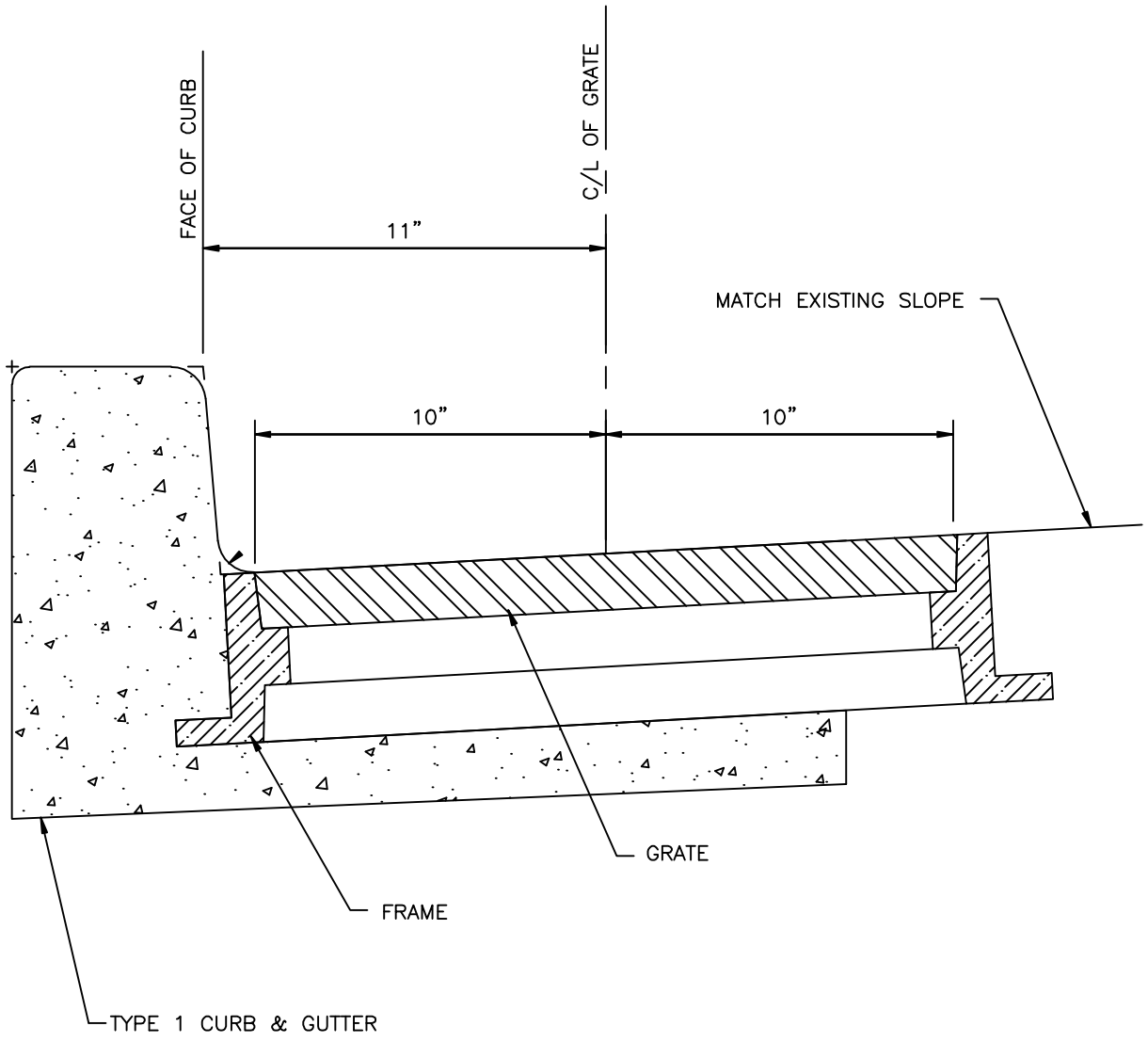


SECTION C-C

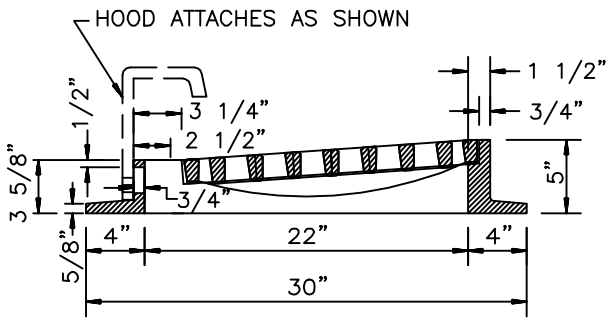
NOTE:

1. MATERIAL USED SHALL BE DUCTILE IRON PER ASTM-A536, GRADE 80-55-06, WITH BITUMINOUS COATING.
2. LOCKING HOLES TO BE PROVIDED IN CASTING TO ALLOW FOR TWO 5/8" DIA STAINLESS STEEL, SOCKET HEAD CAP SCREWS. NO PART OF SCREW WILL PROTRUDE ABOVE GRATE.
3. GRATE TO BE USED WITH FRAME SHOWN IN STD DETAIL SD-090.
4. GRATE SEATING: 8 INTEGRALLY CAST PADS.
5. CAST POCKET LIFT HANDLE.
6. NON-SKID DIAMOND PATTERN APPROX 2-1/2"x1"x1/8" HIGH

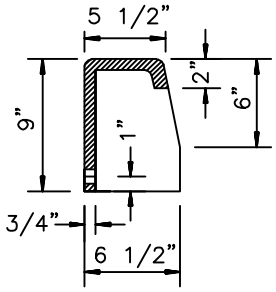
CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL
	DATE	07/31/2008	
	REF STAN SPEC		SOLID COVER
			STANDARD DETAIL NUMBER SD-080



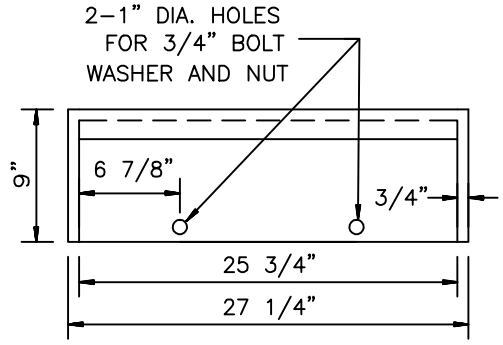
CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL	STANDARD DETAIL NUMBER
	DATE	07/31/2008		
	REF STAN SPEC		TYPICAL FRAME AND GRATE INSTALLATION	SD-090



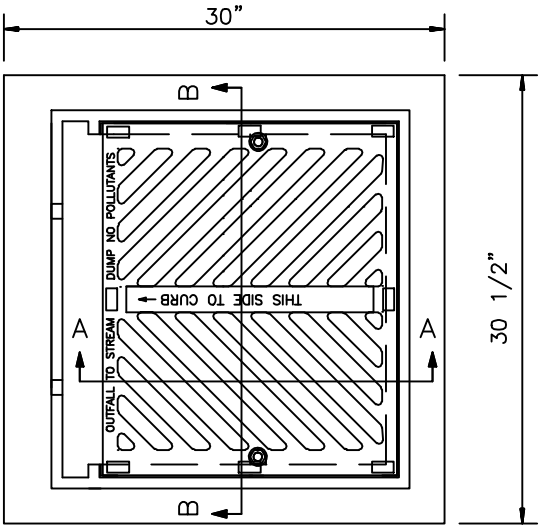
SECTION A-A



HOOD DETAIL - SECTION

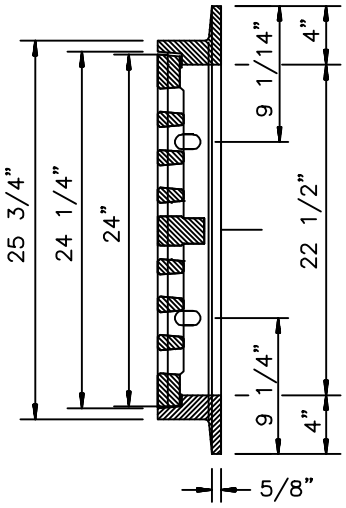


HOOD DETAIL - FRONT



NOTES:

1. GRATE SHALL EITHER BE STANDARD GRATE OR VANED GRATE.
2. GRATE SHALL BE LOCKED DOWN WITH (2) 5/8" STAINLESS STEEL SOCKET HEAD CAP SCREWS.
3. LEVELING PADS 1 1/2"X 3/4"X 1/8" SHALL BE USED.
4. FRAME SHALL BE CAST IRON ASTM A48 CL. 30.
5. INSTALL 3/16" NON–SKID DIAMOND PATTERN ON TOP SURFACE OF HOOD.
6. BOLT, WASHER, AND NUT SHALL BE GALVANIZED OR CORROSION RESISTANT.
7. FOR INSTALLATION ON ARTERIALS. FOR NON–ARTERIALS, ALTERNATE THROUGH CURB INLET FRAMES FOR 18" X 24" GRATES MAY BE INSTALLED.

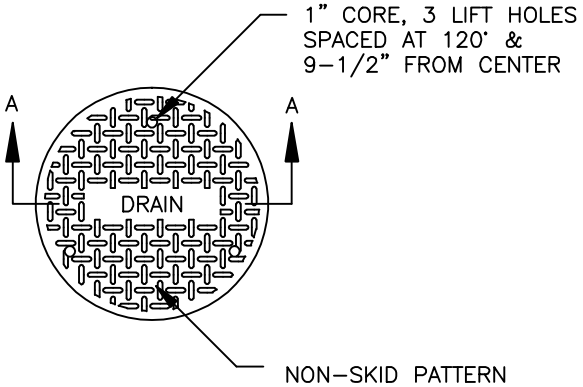


SECTION B-B

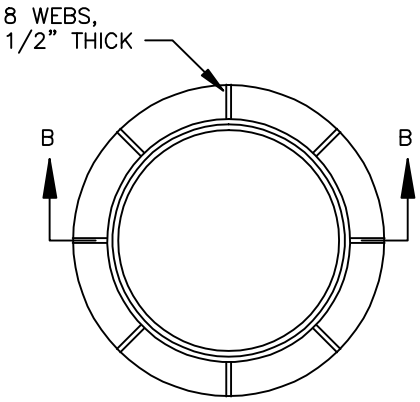
CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL
	DATE	07/31/2008	
	REF STAN SPEC		THROUGH CURB INLET FRAME

STANDARD DETAIL NUMBER

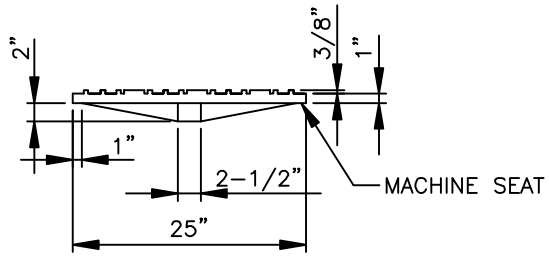
SD–100



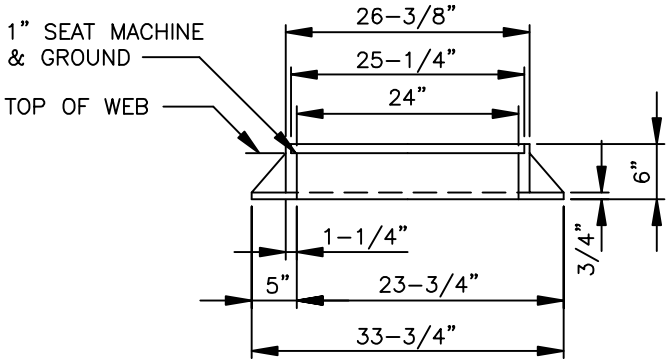
PLAN



FRAME PLAN



SECTION A-A



SECTION B-B

COVER NOTES:

1. USE WITH THREE LOCKING BOLTS 5/8"DIA STAINLESS STEEL TYPE 304 SOCKET HEAD (ALLEN HEAD) BOLTS, 2" LONG. DRILL HOLES SPACED 120° TO MATCH HOLES IN RING.
2. COVER MATERIAL IS DUCTILE IRON ASTM A536 GRADE 80-55-06.
3. APPROXIMATE WEIGHT OF COVER IS 150 LBS.
4. TRAFFIC RATING: H-20.

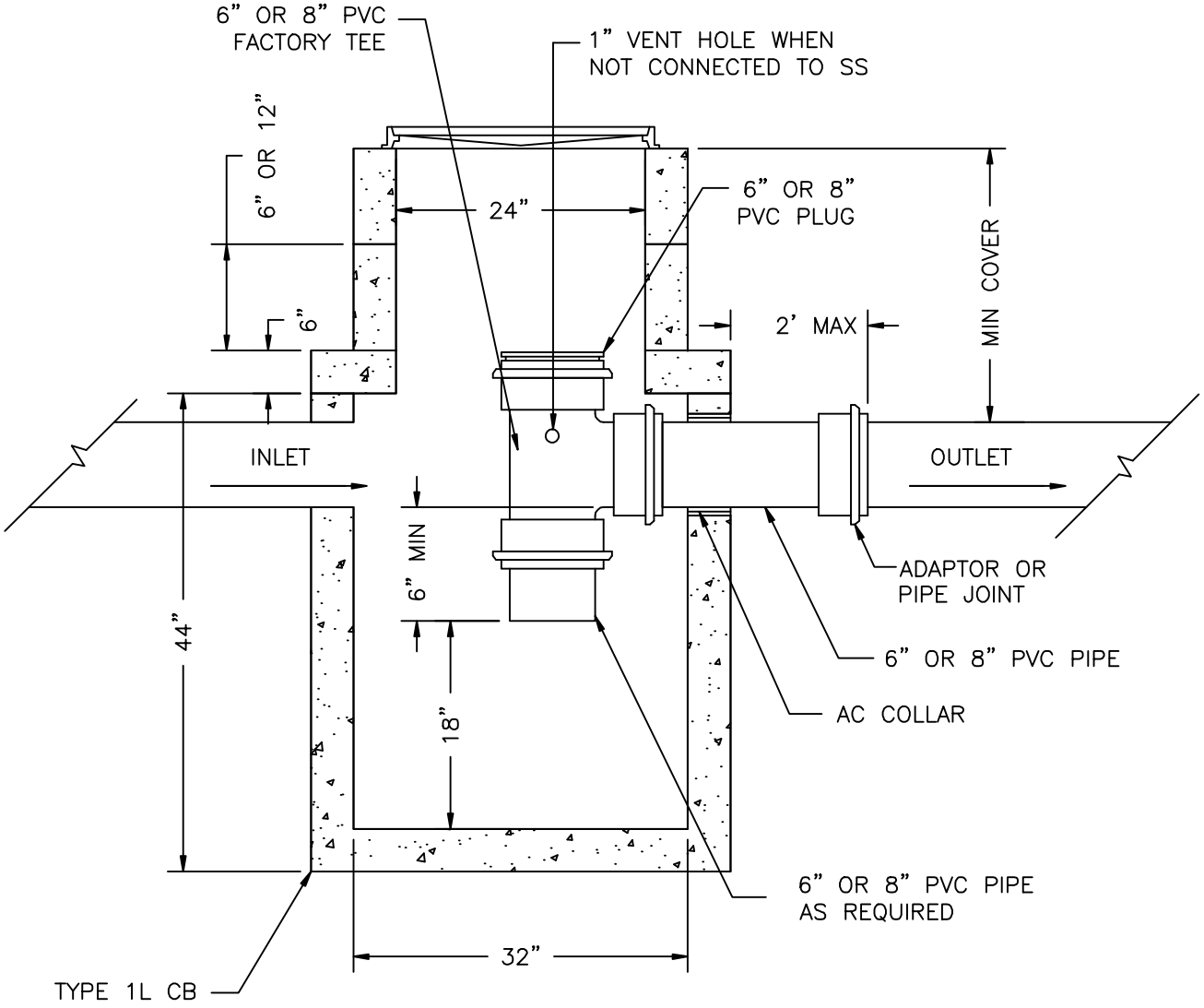
RING NOTES:

1. DRILL THREE 5/8" HOLES THROUGH RING SPACED AT 120°.
2. RING MATERIAL IS GREY IRON, ASTM A-48 CLASS 30.
3. APPROXIMATE WEIGHT OF RING IS 215 LBS.
4. TRAFFIC RATING: H-20.

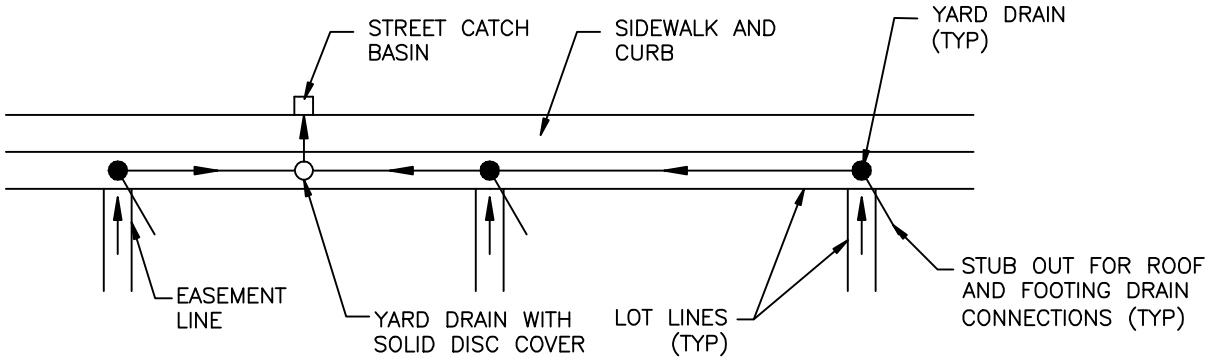
CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL
	DATE	07/31/2008	
	REF STAN SPEC		24" BOLT-LOCKING MANHOLE RING & COVER

STANDARD DETAIL NUMBER

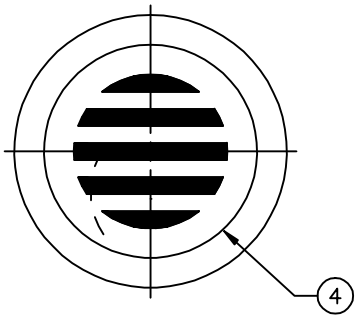
SD-110



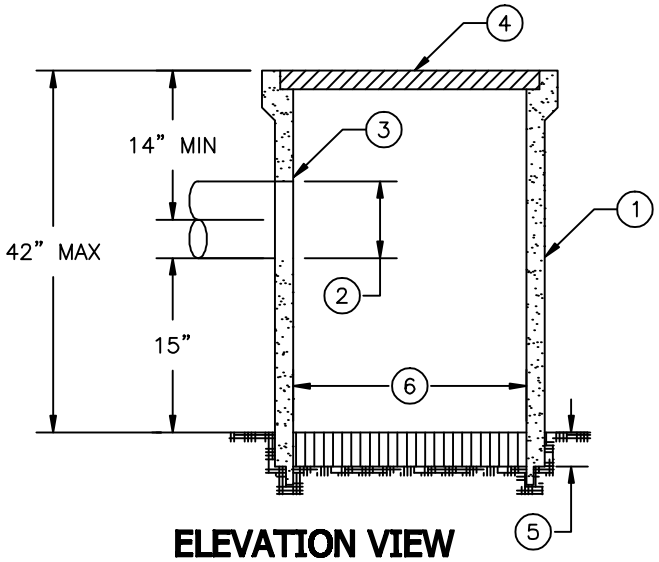
CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL	STANDARD DETAIL NUMBER
	DATE	07/31/2008		
	REF STAN SPEC		STANDARD OIL/WATER SEPARATOR	SD-120



TYPICAL LOT PLACEMENT



PLAN VIEW

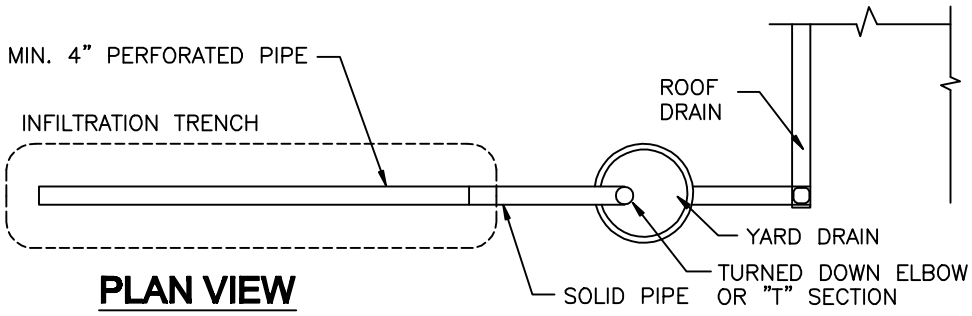


ELEVATION VIEW

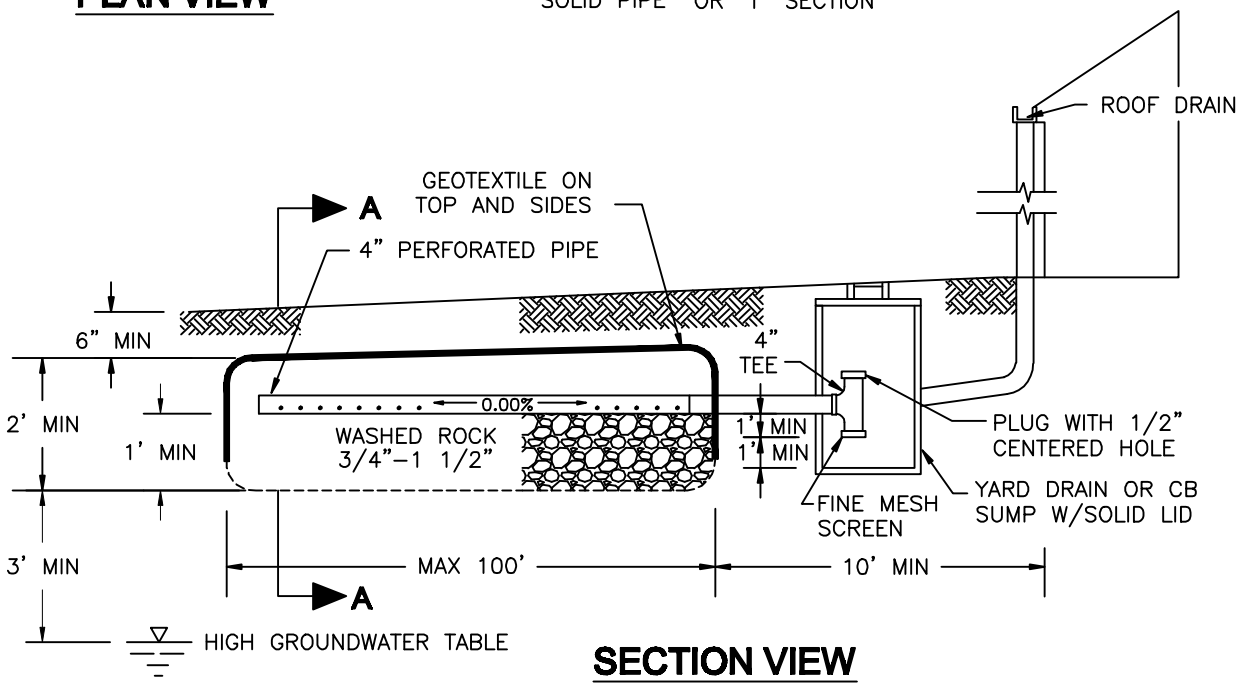
NOTES:

1. YARD DRAINS TO BE CONSTRUCTED FROM CONCRETE PIPE IN ACCORDANCE WITH ASTM C14 UNLESS OTHERWISE SHOWN ON THE PLANS OR NOTED IN THE SPECIFICATIONS.
2. CUTOUT HOLE SIZE IS EQUAL TO OUTLET PIPE OUTSIDE DIAMETER PLUS YARD DRAIN WALL THICKNESS
3. CONNECTION TO OUTLET PIPE TO BE MORTARED AND MADE FLUSH WITH INSIDE OF THE YARD DRAIN WALL.
4. CAST IRON BELL GRATE. FITS INTO BELL RECESS AND EXTENDS FLUSH WITH FACE OF BELL. THE GRATE SHALL HAVE SLOTS (HOLES) THAT CONSTITUTE 50 PERCENT OPEN AREA FOR DRAINAGE. INLET BELL SURFACE SHALL BE FINISHED TO ASSURE NON-ROCKING FIT WITH ANY COVER POSITION.
5. WASHED DRAIN ROCK 6" MIN. THICK.
6. VARIES 12" OR 18" PER PLANS.

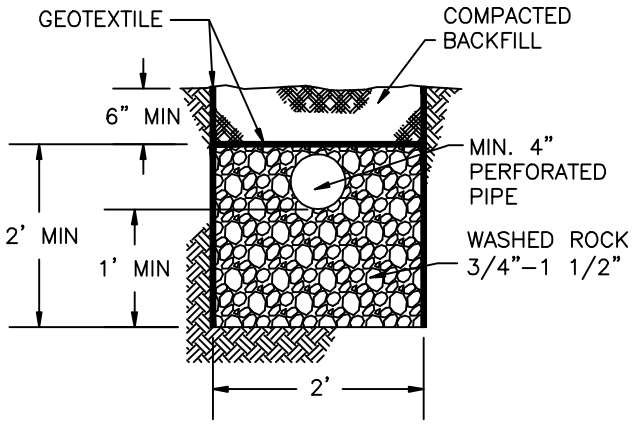
CITY OF ARLINGTON	APPROVED BY: L. OLIVE DATE: 07/31/2008 REF STAN SPEC:	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL YARD DRAIN CONNECTIONS	STANDARD DETAIL NUMBER SD-130



PLAN VIEW



SECTION VIEW



SECTION A-A

NOTES:

1. TRENCHES SHALL BE A MINIMUM OF 10' FROM BUILDING, PROPERTY LINES, AND EASEMENTS.
2. THE FOLLOWING MINIMUM LENGTH (LINEAR FEET) PER 1,000 SQUARE FEET OF ROOF AREA BASED ON SOIL TYPE MAY BE USED FOR SIZING DOWNSPOUT INFILTRATION TRENCHES.

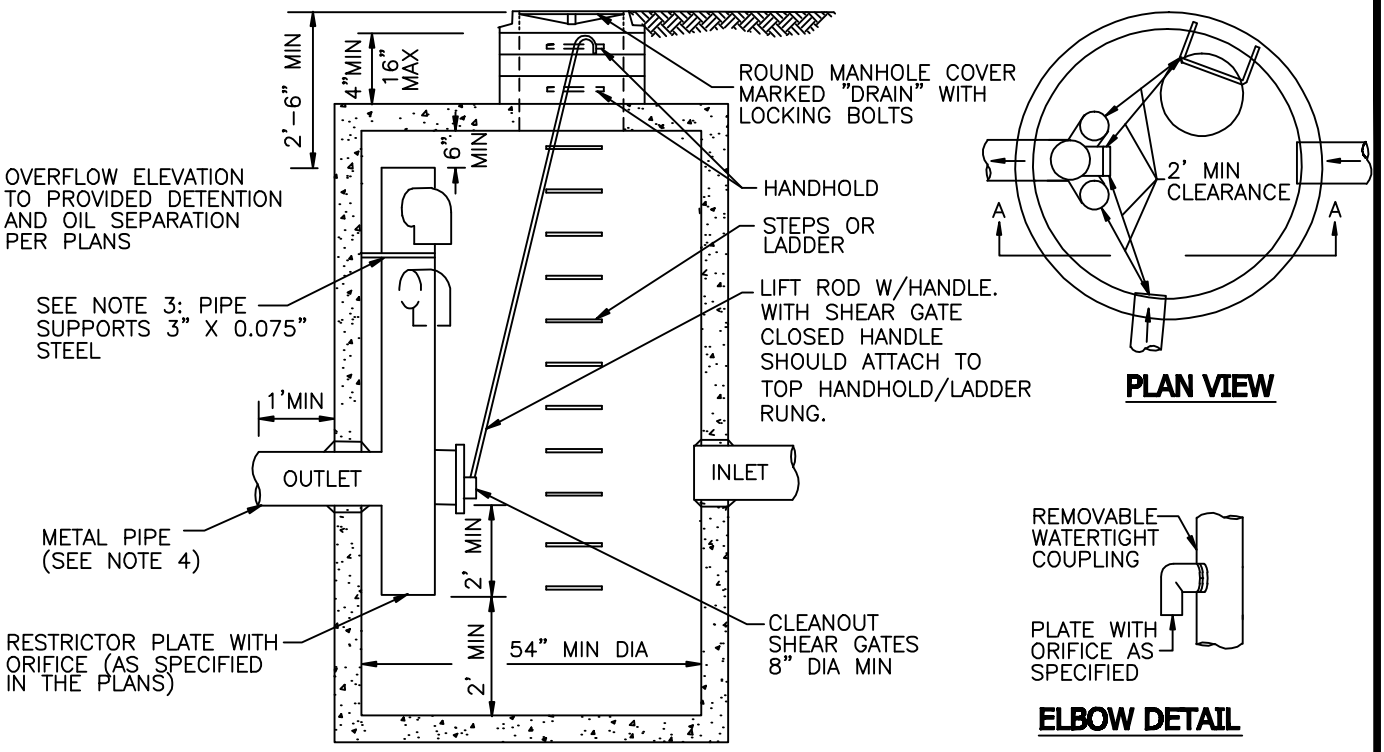
COURSE SAND & COBBLES	20 LF
MEDIUM SAND	30 LF
FINE SAND, LOAMY SAND	75 LF
SANDY LOAM	125 LF
LOAM	190 LF

3. MINIMUM SPACING BETWEEN ADJACENT TRENCH WALLS MUST BE 6 FEET.
4. INFILTRATION TRENCHES SHALL NOT BE BUILT ON SLOPES GREATER THAN 25 PERCENT.
5. SLOPES GREATER THAN 25 PERCENT HAVE A MINIMUM SETBACK OF 50' FOR INFILTRATION TRENCHES.

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL
	DATE	07/31/2008	
	REF STAN SPEC		RESIDENTIAL ROOF DRAIN INFILTRATION TRENCH

STANDARD DETAIL NUMBER

SD–140



SECTION A-A

NOTES:

1. EXCEPT AS SHOWN OR NOTED, UNITS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE REQUIREMENTS FOR CATCHBASIN TYPE 2 54" MINIMUM DIAMETER.

2. THE RESTRICTOR/SEPARATOR AND PIPE SUPPORTS SHALL BE OF THE SAME MATERIAL AND SHALL BE FABRICATED FROM 0.060" ALUMINUM OR 0.064" ALUMINIZED STEEL OR 0.064" GALVANIZED STEEL PIPE IN ACCORDANCE WITH AASHTO M 36, M 196, M197 AND M274. GALVANIZED STEEL SHALL HAVE TREATMENT 1.

3. OUTLET SHALL BE CONNECTED TO CULVERT OR SEWER PIPE WITH A STANDARD COUPLING BAND FOR CORRUGATED METAL PIPE OR GROUTED INTO THE BELL OF CONCRETE PIPE.

4. THE VERTICAL RISER STEM OF THE RESTRICTOR/SEPARATOR SHALL BE THE SAME DIAMETER AS THE HORIZONTAL OUTLET PIPE WITH A 8" MINIMUM SIZE.

5. FRAME AND LADDER OR STEPS TO BE OFFSET SO THAT (1) CLEANOUT GATE IS VISIBLE FROM TOP. (2) CLIMB-DOWN SPACE IS CLEAR OF RISER AND CLEANOUT GATE. (3) FRAME IS CLEAR OF CURB (IF ANY EXIST).

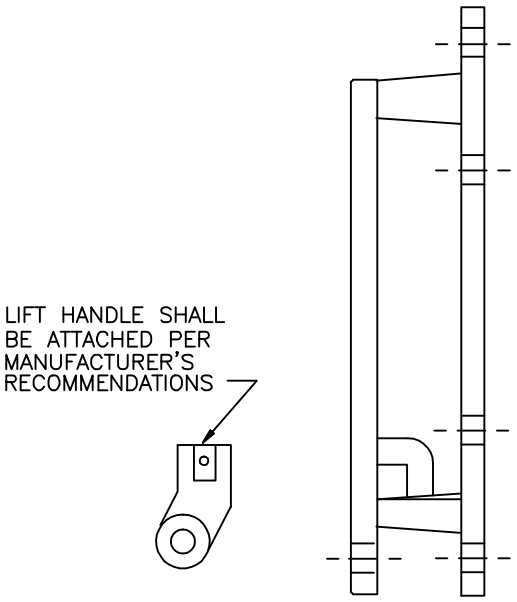
6. MULTI-ORIFICE ELBOWS MAY BE LOCATED AS SHOWN ON ONE SIDE OF RISER TO ASSURE LADDER CLEARANCE. SIZE OF ELBOWS TO BE DETERMINED BY THE ENGINEER.

7. CLEANOUT GATE/SHEAR GATE :
ALUMINUM ALLOY PER ASTM B26-ZG32A OR CAST IRON ASTM A48 CLASS 30B AS REQUIRED.
LIFT HANDLE EITHER SOLID OR TUBING WITH ADJUSTABLE HOOK AS REQUIRED.
NEOPRENE RUBBER GASKETS REQUIRED BETWEEN FLANGES.

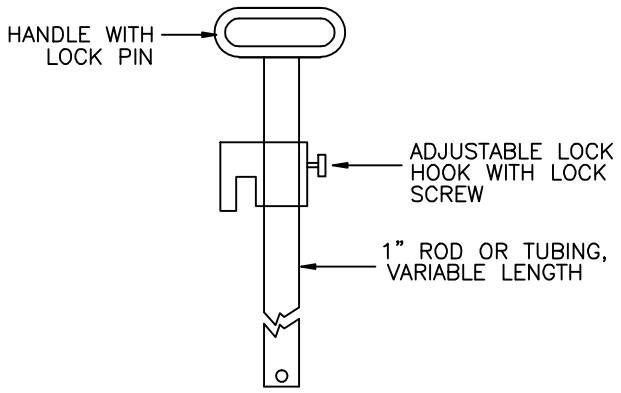
CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL
	DATE	07/31/2008	
	REF STAN SPEC		TYPICAL FLOW RESTRICTOR INSTALLATION

STANDARD DETAIL NUMBER

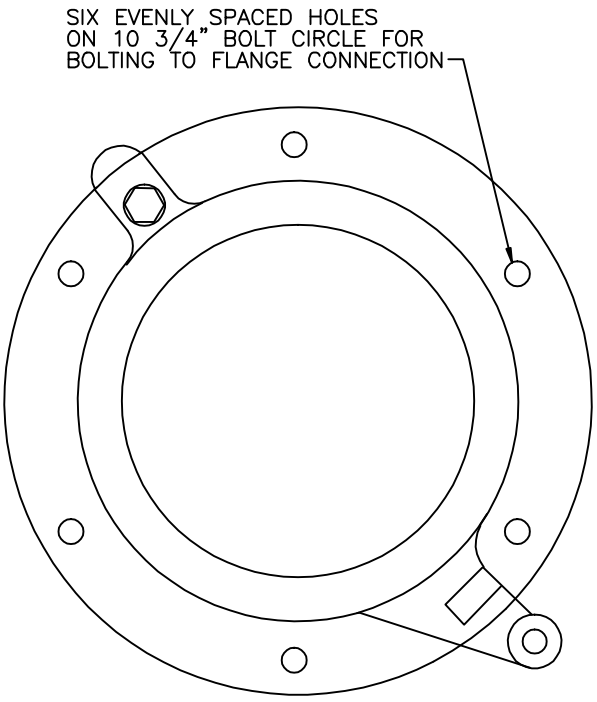
SD-150



SIDE



LIFT HANDLE



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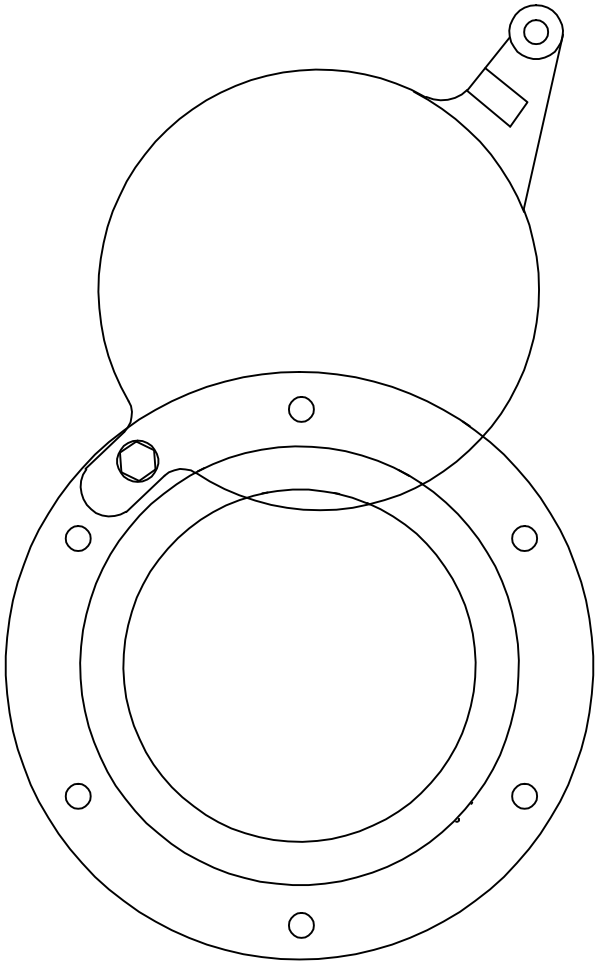


MAXIMUM OPENING OF GATE

NOTES:

ALTERNATES ARE ACCEPTABLE PROVIDED MATERIAL SPECIFICATIONS ARE MET AND FLANGE BOLT PATTERN MATCHES.

CITY OF ARLINGTON	APPROVED BY: L. OLIVE DATE: 07/31/2008 REF STAN SPEC:	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL SHEAR GATE ASSEMBLY	STANDARD DETAIL NUMBER SD-160

CHAPTER 4

WATER

TABLE OF CONTENTS

4-1 DESIGN STANDARDS

4-1.01 GENERAL

No extension or modification to the City's water system shall be made without approved construction plans with the signature of the City Engineer, prepared in accordance with these Standards, *AMC*, and the *City's Water Comprehensive Plan*. All construction of system extensions shall conform to these Standards, applicable *American Water Works Association (AWWA) Specifications* and the *WSDOT/APWA Standard Specifications*.

These Standards do not include design of the City's general facilities such as wells; pump stations, storage tanks, or treatment plant. The general facilities require special design and will be reviewed and approved by the City on a case-by-case basis.

4-1.02 HYDRAULIC REQUIREMENTS

All water mains shall be sized following a hydraulic analysis based on flow demands and pressure requirements. The system shall be designed to maintain a minimum pressure of 20 psi at ground level along the entire distribution system under all conditions of flow. The desired working pressure in the distribution system should be approximately 50 to 80 psi, not less than 40 psi, and not greater than 125 psi. Individual pressure reducing valves (PRV) are required when the static pressure at the ground level exceeds 80 psi. Flow velocities in water mains shall not exceed 10 feet per second during the highest demand and fire flow.

Fire flow requirements shall be determined by the City Fire Chief. The available fire flow will be determined by the City's engineering staff using the water system hydraulic model.

4-1.03 WATER MAIN EXTENSION

Residential

It is the policy of the City that anyone who desires water services for more than one (1) single family residence, including single family and multi-family structures, must extend the City's water system to, and past, at least one full side of the property. In addition, the water mains must be installed through all internal streets; loop to all adjacent mains which will, in the City Engineer's opinion, extend past or through the property in the future; and stub to the property line where it is likely that they will be needed to connect to future mains. Depending on the property size, shape and the Water System Plan, the City may require mains to be constructed on more than one, and up to all, full sides of the property.

Non-Residential Properties

It is the policy of the City that anyone who desires water services to non-residential (commercial, industrial or public) property must extend the City's water system to, and past, the entire perimeter of the property and/or stub or connect to present and future mains.

The City also reserves the right to require that extra service lines be installed, at their discretion, to be used for sampling stations.

If a development is located in 2 or more pressure zones, the Developer may be required to install pressure reducing stations, isolation valves, check valves, and/or booster pump stations if required by the City Engineer.

Dead-end mains shall be minimized by making appropriate looping and tie-ins whenever practical in order to provide increased reliability of service and reduce head loss.

If the Developer's project directly benefits other property owners, the Developer may enter into a reimbursement agreement with the City per AMC 12.24.

4-1.04 WATER MAIN LOCATION

It is preferred that water mains and appurtenances are within the right-of-way of public streets and roads. Water mains may be installed within City easements across private properties. Water mains within public right-of-way shall be located on north and east sides of the centerlines. Water mains shall be in the shoulder of the roadway for rural roads, and approximately 6 feet from the street centerline for urban streets. See Standard Detail R-060. Exceptions to this requirement may be made in order to minimize the cutting and replacing of pavement, to avoid conflicts with other underground facilities, to permit sanitary sewers to be installed on the "low side" of streets, or for other approved reasons. As nearly as practical, mains shall be installed on a particular street with the distance from the property line and/or centerline varied as little as possible. Water mains shall not be located under or behind parking lanes, curbs, gutters, or sidewalks. Valve boxes shall be located outside the normal wheel track whenever possible.

If there is an easement across a paved area on private property the water main shall be installed in the driving lanes (not under parking stalls).

Water mains may be laid along road/street curves using pipe joint deflection whenever possible. Pipe joint deflections shall not exceed one-half of pipe manufacturer's recommended maximum deflections. Bends may be required to maintain proper water main alignment within the public right-of-way or easements.

4-1.05 HORIZONTAL SEPARATION

Water mains shall be laid at least 10 feet horizontally from any existing or proposed sanitary sewer, septic tank and/or absorption field. The distance shall be measured edge to edge. In cases where it is not practical to maintain a 10 foot separation, the City may allow deviation on a case-by-case basis using DOE criteria. Such deviation may allow installation of the water main closer to a sanitary sewer, provided that the water main is laid in a separate trench or on undisturbed earth shelf located on one side of the sanitary sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer. Water service connections and side sewers shall have minimum horizontal clearance of 10 feet unless otherwise approved by the City Engineer.

Minimum horizontal clearances from water mains:

Cable	5’
Gas	5’
Power	5’
Storm drain	5’
Telephone, Fiber optic	5’
Sanitary Sewer	10’

4-1.06 VERTICAL SEPARATION

Wherever practical, water mains shall cross other utilities at right angles. If this is not possible, the crossing angle shall be maintained between 45 and 90 degrees. Water mains crossing sanitary sewers shall be laid to provide a minimum vertical clearance of 18 inches between the outside of the water main and the outside of the sewer. The City prefers that the water main be above the sewer main. Where a water main crosses a sanitary sewer, one full length of water pipe shall be used with the pipe centered over the sewer for maximum joint separation. When the above conditions cannot be met, the City has the right to approve a variance, but shall require that the sewer be constructed of ductile iron pipe and be pressure tested before being activated, and/or be encased as the City deems necessary. DOE criteria will also apply.

Minimum vertical clearances from water mains:

Cable	1’
Gas	1’
Power	1’
Storm drain	0.5’
Telephone, Fiber optic	1’
Sanitary Sewer	1.5’

In cases where it is not practical to maintain this minimum separation between the water main and storm drain, the vertical clearance may be less than 6 inches and Ethafoam pads are required.

4-1.07 SETBACK DISTANCE FROM BUILDINGS

Water mains shall be located a minimum of 5 feet from covered parking, 10 feet minimum from building and retaining walls. A 20 foot wide minimum easement shall be provided for a water main between buildings.

4-1.08 WATER MAIN SIZING

Transmission mains, commercial developments, and specific areas outlined in the City's Water System Plan require 12 inch or larger water mains or as directed by the City Engineer.

The City generally does not use 10 inch pipe as water distribution mains. When serving fire hydrants and for local distribution mains in residential areas, 8 inch or larger pipe is required.

The City does not use 6 inch pipe as part of the distribution system except as fire hydrant runs (not longer than 50 feet). With the City Engineer's approval, 4 inch pipe may be used to serve water to a tract or the end of a cul-de-sac after the last fire hydrant and when no future extension is required. The length of the 4 inch water main shall not exceed 200 feet.

4-1.09 PIPE MATERIAL

Generally, water mains shall be cement mortar lined ductile iron pipe (DIP) Class 52 unless otherwise approved by the City Engineer.

4-1.10 PIPE FITTINGS

Pipe shall be furnished with mechanical joints or rubber gasket push-on joints (Tyton joint only) unless flanged joints or restrained joints are required. Horizontal or vertical bends shall be used when joint deflection would exceed one-half of the pipe manufacturer's recommended maximum deflection. Meg-A-Lugs are required on all fittings.

4-1.11 STEEL CASING

Ductile iron pipe shall be encased in a steel casing when crossing under a rockery or wall so that removal or replacement of the water main will not disturb the structures. Casings are required when crossing (1) under rockeries over 5 feet high; (2) under retaining wall footings over 5 feet wide; and (3) under reinforced earth retaining walls (both wall and reinforcing material). Casings shall extend a minimum of 5 feet past each edge of the structure, or a distance equal to the depth of pipe, whichever is greater. Minimum vertical clearance between the bottom of the wall or footing and top of the pipe or casing shall be 2 feet. The pipe trench at the casing shall be

backfilled with gravel backfill material when the vertical clearance is less than 3 feet.

Ductile iron pipe shall be encased in a steel casing when crossing under a railroad or State/County highway. Casings shall extend at least 6 feet past the edges of the right-of-way.

The casing pipe and carrier pipe shall be installed in accordance with the applicable Federal, State and local regulations. In the case of railroad crossings, the project shall also comply with regulations established by the railroad company.

The carrier pipe shall be supported by casing spacers. Casing spacers shall be placed under the carrier pipe to ensure approximate centering within the casing pipe and to prevent damage during installation. See City of Arlington Standard Detail W-230.

Steel casings may also be required when water mains cross creeks or wetlands.

4-1.12 COVER DEPTH

A cover depth of 3 feet (36 inches) above the top of water mains shall be maintained if possible. The cover depth shall not be less than 3 feet (36 inches) or more than 5 feet (60 inches) without the approval of the City Engineer.

If the water main is within the State or County right-of-way, the cover depths shall meet the requirements of the State or County.

4-1.13 SLOPES

Where the longitudinal slopes are 20% or greater, pipe joints shall be restrained. Anchor blocks shall be used in conjunction with joint restraint where slopes are 20% or greater. Timber baffle/hill holders shall be required on unpaved slopes that exceed 20%, maximum spacing shall be 20’ foot on center and minimum of 1 holder for each pipe length.

4-1.14 POLYETHYLENE ENCASEMENT

If required by the City, ductile iron pipe and fittings shall be protected by 8-mil polyethylene encasement in areas of severely corrosive soils in accordance with AWWA/ANSI C105/A21.5.

4-1.15 CONCRETE BLOCKING

When using horizontal and vertical concrete blocking, show locations and type of blocking on the plans. City Standard Details W-160 through W-175. Concrete blocking is required on all fittings including restrained joint fittings.

An 8 inch pipe at a vertical bend shall be restrained a minimum of 36 feet (2 joints) from each side of a bend. A 12 inch or larger pipe at a vertical bend shall be restrained a minimum of 54

feet (3 joints) from each side of a bend. No change in horizontal direction or diameter shall occur within 36 feet of the vertical bend. Special blocking or joint restraint designs may be necessary for poor soil, conflicting utility, etc.

4-1.16 ASBESTOS CONCRETE PIPE CROSSING

When a proposed water main crosses existing asbestos concrete (A.C.) pipe, the City shall require removal and replacement of the A.C. pipe with ductile iron pipe at the Developer's expense. The A.C. pipe to be removed shall be disposed of in accordance with the Puget Sound Air Pollution Control Agency (PSAPCA) requirements. A permit from PSAPCA to perform the A.C. pipe removal is required prior to construction drawing approval. DIP crossings shall be connected to the existing A.C. main with Romac extended range transition couplings.

4-1.17 VALVES

Sufficient valves shall be provided on water mains so that interrupted service and sanitary hazards will be minimized during repairs. Valves shall be located at no more than 300 foot intervals in commercial, industrial and multi-family areas and at no more than one block or 400 foot intervals in other areas. At water main intersections, valves shall be placed on 4 legs at each cross, and 3 legs at each tee (unless tapping an existing water main). The valves shall be spaced so that no more than one fire hydrant is removed from service with any separate main shut down.

An auxiliary valve shall be installed on each hydrant run at the tee. Provide a valve at each end of an easement. Additional valves may be required for area isolation and unidirectional flushing. Valves on water mains shall, where practical, be located within paved area of the street. A valve box or chamber shall be provided for every valve.

Generally valve sizes shall be the same as the water main. All valves 12 inch and smaller shall be resilient seated gate valves and all valves larger than 12 inch shall be butterfly type if approved by the City. When butterfly valves are installed, the operation nuts shall be on the north or east sides of the water mains. If a valve is installed in gravel or unpaved area, a concrete pad shall be set around each valve box at finished grade. See City Standard Detail W-190.

4-1.18 FIRE HYDRANTS

Fire hydrants shall be installed for buildings where water is served by the City. The final number of hydrants and their locations shall be approved by the City Fire Chief.

The maximum spacing of fire hydrants serving single-family dwellings or duplex dwellings on individual lots shall be 600 feet and not more than 300 feet from the front property line of the main body of a lot. Required distances shall be measured along the normal fire department hose laying route.

Fire hydrants serving multi-family and commercial lots shall be located not more than 300 feet on center and shall be located so that at least one hydrant is located within 150 feet of all structures or uses. Fire hydrants shall not be closer than 50 feet from multi-family or commercial buildings. On arterial streets without residential access, maximum hydrant spacing shall be 600 feet.

Any hydrant run exceeding fifty (50) feet in length shall be 8 inches in diameter unless it is approved by the City Engineer. The joints of hydrant runs shall be restrained. No domestic or fire sprinkler service shall be tapped on any hydrant run. Fire hydrants shall be installed at the ends of each dead end line more than 300 feet in length. Said fire hydrants may be removed to conform to standard spacing requirements when the main is again extended with the City's approval.

Fire hydrant installation is shown in Standard Detail W-010 and reflective pavement markers are shown in Standard Detail W-015.

4-1.19 COMBINATION AIR VALVES

Combination air valves as shown in Standard Detail W-260 shall be installed on high points of new water mains, where the elevation difference between the high point and the next low point exceeds one (1) pipe diameter, or as required by the City. The air valves shall be located outside the traveled portion of the roadway, preferably behind the curb or sidewalk and within the public right-of-way and the public utility easement. If possible, the water main profile shall be adjusted to eliminate the use of the air valves.

4-1.20 BLOW-OFFS

Each dead-end main shall be provided with a fire hydrant if flow and pressure are sufficient or with an approved flushing hydrant or a blow-off assembly shown in Standard Detail W-180 for flushing purposes. Flushing devices shall be sized to provide flows that will give a velocity of at least 2.5 feet per second in the water main being flushed. No flushing device shall be directly connected to any sewer. Blow-off assemblies shall be located outside the traveled portion of the roadway, behind the curb or sidewalk, and within the public right-of-way or public utility easement.

A 2 inch blow-off assembly shall be required for testing and disinfection of new water mains, where hydrants are not available.

4-1.21 CONNECTION TO EXISTING SYSTEM

Connections to existing water mains 8 inches and larger shall be via a wet tap shown in Standard Detail W-200 unless cut-in is required by the City in order to install additional valves. Connections to existing water mains smaller than 8 inch diameter shall be made by cutting in a tee, unless otherwise approved by the City.

4-1.22 EASEMENTS

All water mains, valves, fire hydrants, meters, sampling stations, air/vacuum valves, blow-offs, and other appurtenances not in public right-of-way shall have public utility easements designated on submitted plans to provide the City with permanent access to these mains and appurtenances, as well as easements for future line connections, as required. The easement for the water mains shall be 20 feet in width and 10 feet on all sides of the pipe lines, a minimum of 5 feet on each side of fire hydrants and other appurtenances (such as meters, sampling stations, air/vacuum valves, blow-offs, etc). Under special circumstances, the easement may be less than 20 feet in width with the City Engineer's approval, but shall not be less than 15 feet. Before the project is accepted by the City, easements shall be recorded using the City Easement Form. Easement drawings and legal description shall be included as exhibits.

If off-site easements are required on properties not owned by the Developer or the City, the Developer shall acquire the easements at his/her expense before construction plans are approved by the City.

4-1.23 SERVICE CONNECTIONS

Service connections including saddle, service line, meter box and appurtenances shall be installed as part of the construction of all new water system extensions. A fire sprinkler meter per City Standards shall be provided if required by the City Fire Chief. Irrigation systems, fire sprinkler systems and non-residential connections must be protected by a DOH approved backflow prevention assembly in accordance with WAC 246-290-490. See Standard Details W-090 through W-150.

For residential developments, meter boxes shall be located in front of the lot to be served unless otherwise approved by the City. They shall be close to the property line, in a landscape area within public right-of-way or public utility easement, but not in paved areas such as sidewalk or driveway. Meters for two neighboring lots shall be installed near the common lot line to ease meter reading. Meters located close to driveways shall use boxes with traffic rating. The distance from the water main to the meter box shall not exceed 50 feet unless it is approved by the City. Meters shall be located in or as close to the public right-of-way as possible. Service lines shall be perpendicular to the water main if possible. See Standard Details W-040 for residential services and W-050 for non-residential services.

For commercial and multi-family developments, meters shall be located behind the back of a curb or sidewalk and not behind parking space or other obstructions. Meters shall be located for ease of reading.

Minimum allowable service lines from mains to meters shall be 1 inch for a single family residential buildings and 2 inch for multi-family or commercial buildings. All duplexes and triplexes must have separate services and meters for each unit. Multifamily buildings with four or more units must have separate services and meters for each building. Each building shall be

served by a separate service and meter. Irrigation and fire sprinklers shall be served by separate services and meters unless otherwise approved by the City Engineer. A minimum pressure of 35 psi at the meter shall be maintained when service is flowing at anticipated maximum flow rates. If friction losses will cause the pressure at the building to drop below the minimum, the service line size shall be increased.

The standard meter size is ⅝ inch × ¾ inch for a single family residential house. Non-residential services and meter sizes (minimum ⅝ inch × ¾ inch) shall be determined by the engineer or architect per the Uniform Plumbing Code and approved by the City Building Official, and the plans shall show the locations and sizes of the services and meters.

Static service pressures at ground floor elevation shall be determined at all lots/buildings to ensure compliance with system pressure standards. Plans shall identify lots/buildings where the builder/owner will be required to install individual pressure reducing valve (PRV) when service pressures exceed 80 psi. A PRV shall be on the customer side of the meter, outside of the public right of way and a minimum of 3 feet after water meter box.

4-1.24 EXISTING WATER MAIN ABANDONMENT

Existing water mains out of service shall be removed or abandoned as required by the City. If water mains are to be abandoned, the ends of the abandoned water mains shall be plugged by filling with Class 2500 concrete for a minimum length of 12 inches.

4-1.25 PRESSURE REDUCING STATIONS

If a development is located in two or more pressure zones, pressure reducing stations may be installed by the Developer if required by the City Engineer.

4-1.26 CROSS-CONNECTION CONTROL

The City strictly prohibits interconnection of other water supplies with the City's water system.

Irrigation systems, fire sprinkler systems, commercial service connections and other water uses which may cause contamination of the City water system require a backflow prevention device to be installed. Approved backflow prevention assemblies shall meet the requirements of the WAC 246-290-490 "Cross Connection Control Regulation in Washington State", and the recommendations of the PNWS-AWWA Cross Connection Control Manual and the City of Arlington Cross Connection Control Program depending upon the degree of hazard. The types of backflow prevention devices to be used for a specific project shall be determined by the City's Cross Connection Specialist.

Fire sprinkler system connections to the City's water system shall be owned and maintained by the property owner, beginning immediately downstream of the valve where the fire sprinkler

system connects to the City's water main at the property or right-of-way line.

The backflow prevention assembly on fire sprinkler system connections shall be located as close to the serving water main as possible, either on the owner's property or in an easement.

A master meter used for eight or more units in a multi-family development, or for buildings exceeding thirty feet in height, require double check valve assemblies and a bypass with equal backflow prevention to avoid loss of service during maintenance and repair.

4-1.27 PRIVATE WELLS

To receive water services from the City, the property owner shall decommission the existing well on the same lot in accordance with WAC 173-160-381. The owner shall provide a copy of the decommission report to the City Utilities Division.

No backflow prevention device for a single family lot is required if the private well is verified to be permanently decommissioned.

New services will be locked until compliance is verified by the City's Cross Connection Specialist. Visual inspection of the piping is required for premises retaining active well systems.

4-2 MATERIAL STANDARDS

4-2.01 GENERAL

All materials shall be new and undamaged. The same manufacturer of each item shall be used throughout the work. All materials not specifically referenced shall comply with applicable sections of ANSI, ASTM, AWWA or the WSDOT/APWA Standard Specifications and approved by the City Engineer.

When specific manufacturers or models are specified in these Standards, no substitutions will be allowed without prior approval by the City. If required by the City, the Contractor shall furnish certification from the manufacturer of the materials being supplied that the inspection and all of the specified tests have been made and the results thereof comply with the requirements of the reference Standards.

4-2.02 DUCTILE IRON PIPE

Ductile iron pipe shall be Class 52 (Tyton joint only) and cement mortar lined unless otherwise specified and shall conform to AWWA/ANSI C151/A21.51. Standard thickness of cement mortar lining shall be in accordance with AWWA/ANSI C104/A21.4.

4-2.03 HIGH DENSITY POLYETHYLENE PIPE

High density polyethylene (HDPE) pipe shall conform to AWWA C906. The pressure rating shall be determined by the City Engineer on a case-by-case basis.

4-2.04 WATER SERVICE PIPE

Water service pipe shall be Driscopipe CTS Class 200 Hi-Mol Poly pipe. Driscopipe shall conform to ASTM D-27370SDR9 (PE3408). CTS 110 SS liners for polypipe shall be used.

4-2.05 FITTINGS AND JOINTS

All fittings for ductile iron pipe shall be ductile iron compact (short body) fittings conforming to AWWA/ANSI C153/A21.53 and shall be cement mortar lined conforming to AWWA/ANSI C104/A21.4.

Joints shall be mechanical joints or rubber gasket push-on joints (Tyton joints only) unless flanged joints or restrained joints are required and shown in the plans. Pipe with push-on joints shall be suitable for use with mechanical joint fittings. Ductile iron pipe fittings shall be pressure rating of 350 psi for push-on or mechanical joint fittings and 250 psi for flange joint fittings drilled in accordance with AWWA/ANSI C111/A21.11, unless otherwise noted.

Rubber gaskets for push-on joints (Tyton joint only) or mechanical joints shall be in accordance with AWWA/ANSI C111/A21.11. Gasket material for flanges shall be neoprene, Buna N, chlorinated butyl, or cloth inserted rubber.

4-2.06 RESTRAINED JOINTS

Where restrained joints are required, they shall be either bolted or boltless design, flexible after assembly, and can be disassembled without special tools. Any device utilizing round point set screws shall not be permitted. All couplings installed underground to connect ductile iron pipe shall be manufactured of ductile iron.

Restrained joints shall be Meg-A-Lug Series 1100, TR Flex, Grinnell 595 shackle clamp, or approved equal.

4-2.07 COUPLINGS

Flexible coupling and transition coupling cast components shall be ductile iron. Bolts and nuts shall be in accordance with ASTM A536-80, Grade 65-45-12. Bolts shall be high strength, low alloy steel track head bolts with national course rolled thread and heavy hex nuts. Gaskets shall meet AWWA/ANSI C111/A21.11 composition specifications.

4-2.08 BOLTS AND NUTS

Bolts, nuts and washers used for securing fittings shall be of similar materials. Steel bolts shall meet the requirements of ASTM A307 or ASTM F568 for carbon steel or ASTM F593 or ASTM F738 for stainless steel. Nuts shall meet the requirements ASTM A563 for carbon steel or ASTM F594 or ASTM F836 for stainless steel. Iron bolts and nuts shall meet the requirements of ASTM A536, grade 65-45-12.

4-2.09 GATE VALVES

All gate valves 12 inches and smaller shall be resilient seated gated valves conforming to the latest revision of AWWA C509 or C515. All gate valves shall be epoxy coated and turn counter clockwise to open. All gate valves shall have ANSI flanges or mechanical joints ends.

Buried gate valves shall be non-rising stem suitable for installation with the type and class of pipe being installed. Operating stems shall be equipped with standard 2 inch operation nut, and O-ring stem seals.

4-2.10 VALVE MARKER POSTS

Valve marker posts shall be Carsonite blue plastic markers and labeled “WATER” or approved equal. See City Standard Detail W-250.

4-2.11 VALVE BOXES

Valve boxes shall be installed on all buried valves. The box and lid shall be cast iron, 2 piece slip type. The cover shall have the word “WATER” cast in the upper surface. Valve boxes, lids and extensions shall be Olympic Foundry deep style lid. All castings shall be coated with asphaltic varnish.

A valve operating nut extension shall be furnished and installed on all valves where the finished grade is more than 36 inches above the valve operating nut. Extensions are to be a minimum of 12 inches long with only one extension per valve. The operating nut extension shall extend into the top section of the valve box. See Standard Detail W-190.

4-2.12 VALVE VAULTS

The valve vault shall be dimensioned and sized for valve removal and replacement. The vaults shall be furnished in pre-cast concrete sections with sufficient strength to withstand H-20 traffic loading together with access frames and covers.

4-2.13 COMBINATION AIR VALVES

Combination air valves shall be designed to operate with potable water under pressure to permit discharging a surge of air from an empty line when filling and relieve the vacuum when draining the system. The air valves shall also release an accumulation of air when the system is under pressure. This shall be accomplished in a single valve body designed to withstand a pressure of 300 psi.

The body and cover shall be cast iron conforming to ASTM A48, Class 30. Floats shall be stainless steel conforming to ASTM A 240 and designed to withstand 1,000 psi. Seats shall be Buna N rubber. Internal parts shall be stainless steel or bronze. Combination air valves shall conform to AWWA C512. See City of Arlington Standard Detail W-260.

4-2.14 BLOW-OFF ASSEMBLIES

Blow-off assemblies shall be as shown in City Standard Detail W-180.

4-2.15 FIRE HYDRANTS

Fire hydrants shall be 5 ¼ inch MVO and meet or exceed the requirements of AWWA C502 as well as the following:

1) Hydrant shall have a standard 4½ inch NST pumper port and two 2½ inch NST side ports, all opening by turning counter clockwise with 1½ inch operating nut;

2) Hydrant shall be painted with two coats of hi-gloss equipment yellow enamel paint, with the distance from the foot valve stenciled on the hydrant; and

3) 5” Storz adaptor.

Fire hydrants shall be the “Traffic Model” type with approved breakaway features. Fire hydrants shall be M&H 929 Reliant or Mueller Super Centurion 250 only.

4-2.16 TAPPING SLEEVES

Tapping sleeves shall be used in lieu of cut-in tees except at the direction of the City. Tapping valves shall be epoxy coated and resilient seat. Acceptable sleeves include:

Pipe Material	**Type of Tapping Sleeve**
Ductile Iron or Cast Iron Pipe	Epoxy Coated Fabricated Steel
Asbestos Cement	Fabricated Stainless Steel Full

4-2.17 SADDLES AND CORPORATION STOPS

Service saddles shall be ROMAC 202S and shall have stainless steel double straps. See Standard Details W-040 and W-050

Corporation stops shall be the ball valve type and shall be Ford or Mueller. Corporation stops for use with the saddle shall be of bronze in accordance with AWWA Standard C800 with AWWA IP or CC inlet by compression outlet.

4-2.18 METER BOXES

Meter boxes used for meters, sampling stations, and blow-offs shall be high density polyethylene meter boxes with solid ductile iron lids manufactured by Mid States Plastics, Inc., or approved equal. Air valves shall have double concrete meter boxes Fogtite 2T with solid steel lid. Refer to City Standard Detail W-040 and W-050 for sizes and part numbers.

4-2.19 PRESSURE REDUCING STATION

The Developer's Engineer shall design a pressure reducing station for a specific project. Submit to the City for approval. A typical pressure reducing station is shown in City Standard Detail W-080.

4-2.20 REDUCED PRESSURE BACKFLOW ASSEMBLY

All reduced pressure backflow assemblies (RPBA) shall be as listed on the current copy of the "Approved Backflow Prevention Assemblies" published by DOH. The assembly shall include a tightly closing resilient seated shut-off valve on each end of the body and each assembly shall be fitted with four properly located resilient seated test cocks. The RPBA shall be installed in an above ground enclosure. The enclosure shall be Hot Box, or approved equal. See Standard Details W-130 through W-150.

4-2.21 DOUBLE CHECK VALVE ASSEMBLY

All double check valve assemblies (DCVA) shall be as listed on the most current copy of the "Approved Backflow Prevention Assemblies" published by DOH. The assembly shall include a tightly closing resilient seated shut-off valve on each end of the body and each assembly shall be fitted with four properly located resilient seated test cocks. See Standard Details W-090 through W-120.

4-2.22 STEEL CASING

Steel casing shall be black steel pipe conforming to ASTM A53. Casing shall be as specified in City Standard Detail W-230.

4-2.23 CASING SPACERS AND END SEALS

Casing spacers and end seals shall be sized for pipe being installed and shall be manufactured by Advance Products & Systems, Cascade Waterworks, Pipeline Seal and Insulators Co., or approved equal.

4-2.24 CONCRETE

Thrust blocking, encasement, or slope anchor concrete shall be mixed from materials acceptable to the City and shall have a 30-day compressive strength of not less than 2,500 psi.

The mix shall contain five (5) sacks of cement per cubic yard and shall be of such consistency that the slump is between 1 inch and 5 inches. All concrete shall be mechanically mixed.

4-2.25 BEDDING MATERIAL

Select trench backfill shall be as specified in Section 9-03.12(3) "Gravel backfill for Pipe Zone Bedding" of the WSDOT/APWA Standard Specifications.

4-2.26 CONTROLLED DENSITY FILL

Controlled Density Fill (CDF) shall be a mixture of Portland Cement, admixture (optional), FlyAsh, aggregates and water. It shall be proportioned to provide a grouty, non-segregating; free flowing, self-consolidating and excavatable material that will result in a non-settling fill which has measurable unconfined compressive strength.

Controlled Density Fill (CDF) shall conform to the requirements of Section 2-09.3(1)E of the WSDOT/APWA Standard Specifications.

4-3 CONSTRUCTION STANDARDS

4-3.01 GENERAL REQUIREMENTS

All work shall be constructed as shown in the plans and in accordance with these Standards.

Materials shall be installed in compliance with the manufacturer's instructions and specifications, except where a higher quality of workmanship is required by the plans and these Standards. All work shall be in accordance with any applicable regulations of the State, County and local jurisdictions. The Contractor shall arrange for inspection by these agencies and shall submit evidence of their approval, if requested by the City.

4-3.02 MATERIAL SUBMITTALS

The Developer/Contractor shall provide material submittals to the City for approval after the plans are approved for construction. The Developer shall assume the risk for material or equipment, which is fabricated or delivered prior to the City's approval of material submittals.

Five (5) sets of material submittals are required. The City shall either approve or otherwise indicate the reasons for disapproval. Disapproved submittals shall be resubmitted to the City for approval.

The City's review of material submittals covers only general or conformance to the plans and these Standards. The Developer is responsible for quantity determination. No quantities are to be verified by the City. The Developer is responsible for any errors, omissions or deviations from the contract requirements. Review or approval of submittals by the City does not relieve the Developer from his obligation to furnish required items in accordance with the plans and these Standards.

Each "Material Submittal" section shall follow a cover page and state the category of the materials for this section. Each submittal must have the specific part number(s) checked or highlighted along with its specific purpose. The following shows the preferred order to list the material categories:

1) Pipe, Fittings, Pipe Restraints and Casing.

2) Valves (Gate Valves, Air Valves, Blow-off, and Valve Boxes).

3) Hydrants and Attachments.

4) Service Fittings, Service Pipe, Saddles, Ball Valves, Corps, Sleeves, etc.

5) Boxes for Meters, Sampling Stations, Blow-offs, and Air Valve Assemblies.

6) Cross Connection Control Assemblies (DCDA, RPBA, RPDA, DCVA).

7) Bedding Material with Sieve Analysis.

8) Other items if required.

4-3.03 PRE-CONSTRUCTION CONFERENCE

The Developer/Contractor shall contact the Public Works Department (360-403-3500) to schedule a pre-construction conference after the material submittals, grading, and right-of-way permits are approved. The conference shall include the Developer, Developer's Engineer, and Contractor, representatives from the permit agencies, other utility companies, and City staff. An

on-site tailgate meeting between the Contractor and the City Inspector shall be arranged by the Contractor at least 48 hours prior to commencing construction.

4-3.04 CONSTRUCTION SCHEDULE

The Developer/Contractor shall provide the City with the construction schedule a minimum of five (5) business days prior to start of water system extension construction to arrange staking inspection and to give permitting agencies and customers two (2) business days notice. No construction is allowed until the construction plans have been approved and all appropriate permits have been obtained.

4-3.05 EASEMENT

Prior to start of water system extension construction, the Developer must acquire public utility easements for construction of any water mains or facilities not located in the public right-of-way, in City easements, or on the Developer's property.

4-3.06 PERMITS

All public right-of-way permits for the water system extension shall be obtained by the Developer at their expense. The Developer shall provide the traffic control plan prepared by the Developer, Developer's Engineer, or Contractor. The Developer shall apply for and obtain permits from other agencies listed in Section 1-4.04 of these Standards.

4-3.07 HANDLING OF PIPE

All types of pipe shall be handled in a manner that prevents damage to the pipe, pipe lining or coating. Pipe shall be bagged or plugged from the manufacturer or supplier before unloading at the site. Pipe and fittings shall be loaded and unloaded using forks or cable choker in a manner to avoid shock or damage, and under no circumstances shall they be dropped, skidded, or rolled against other pipe. Damaged pipe will be rejected, and the Contractor shall immediately place all damaged pipe apart from the undamaged pipe and shall remove the damaged pipe from the project site within 24 hours.

Pipe shall be stacked in such a manner as to prevent damage to the pipe, to prevent dirt and debris from entering the pipe, and to prevent any movement of the pipe. The bottom tiers of the stack shall be kept off the ground on timbers, rails or other similar supports. Pipe on succeeding tiers shall be alternated by bell and plain end. Timbers of 4"×4" shall be placed between tiers and chocks shall be placed at each end to prevent movement. Each size of pipe shall be stacked separately.

Threaded pipe ends shall be protected by couplings or other means until the pipe is installed. Dirt or other foreign material shall be prevented from entering the pipe or pipe joints during handling and installation. When pipe installation is not in progress, the open ends of the pipe

shall be closed by a watertight plug or by other means approved by the City to ensure cleanliness inside the pipe.

4-3.08 STAKING

Staking shall be performed by or under the direct supervision of the Developer's Land Surveyor licensed in the State of Washington. Provide the City with two (2) business days notice to inspect construction staking before construction begins.

Staking shall be placed in 50 foot intervals and at all fittings on base line or edge of easement with stationing, hub elevations, and cuts to top of pipe.

4-3.09 DEVIATION FROM PLANS

No deviations from the approved plans and these Standards shall be allowed without the City's approval. Minor changes may be approved by the City Engineer. If major changes are required, the Developer's Engineer shall revise and sign the plans for the City Engineer's approval prior to restart of construction.

If the City is aware of any deviation from the approved plans and determines that it is not acceptable, the City shall give a written notice to the Developer. The project will not be accepted unless the deviation is corrected.

4-3.10 INSPECTION AND TESTING

The City Inspector shall have access to the project site for the purpose of inspections and testing at all times. The Contractor shall provide proper facilities for such access, inspection, and testing.

If any work is covered without approval or consent of the City Inspector, it must be uncovered for inspection if required by the City Inspector.

Before a pressure test is to be observed by the City Inspector, the Contractor shall make whatever preliminary tests to ensure that the material and/or equipment are in accordance with the plans and these Standards.

Written and/or verbal notices of deficiency shall be given to the Contractor. The Contractor shall correct such deficiencies before final inspection by the City Inspector.

4-3.11 WATER QUALITY

The Contractor is required to implement water pollution controls and maintain these until the project is accepted by the City. The Contractor shall familiarize themselves with the requirements of DOE and other regulatory agencies having jurisdiction over such matters.

Water with chlorine residual must be dechlorinated using City approved means and discharged into the environment when the water has zero chlorine residual. Dechlorinated water discharged into the environment shall be done so without causing erosion or impact to the environment. With the approval of the Utilities Manager, water with chlorine residual may be discharged into the City's sanitary system. Water containing chlorine residual shall not be discharged into the storm drainage system or any waterway.

The oil and chemical storage site shall be approved by the City and the area shall be diked. There shall be no disposal of waste oil or oil products on the project site. The Contractor shall provide a waste oil disposal tank if needed.

4-3.12 CONSTRUCTION ON EXISTING EASEMENTS

All work on the public utility easements shall be performed in accordance with easement provisions. Easements shall be restored equal to or better than the original conditions. The Contractor shall not work on easement areas until specifically authorized by the City Engineer. The City and the Contractor shall coordinate with the property owner(s).

4-3.13 PRE-CONSTRUCTION PHOTOS

Before commencing any construction work as described in the plans, the Contractor shall provide photographs of pre-existing conditions of the area that will be disturbed during construction operations. Photographs will be obtained as follows:

1) 50 foot interval in easements up station and down station.

2) Any other locations as directed by the City Inspector.

The photographs shall be 5 inch x 7 inch, color prints, contained in albums, catalogued, and cross-referenced. A digital copy shall also be provided by the Contractor.

4-3.14 UNDERGROUND UTILITIES

The plans show the approximate locations of various existing utilities known to the Design Engineer such as gas lines, water mains, storm drainage, power lines, telephone lines, TV cables, fiber optics, and other obstructions based on information obtained from various sources. This information is not guaranteed to be accurate, and the Contractor is responsible to check for interferences and obstructions by inquiry from the different utilities and by underground exploration before commencing excavation.

The Contractor shall request field locating and notify the owners of underground utilities about the scheduled commencement of excavation through the one-call system (1-800-424-5555). If the utilities are not included in the one call number system service, notice shall be provided

individually to those owners of underground utilities known to or suspected of having underground utilities within the area of proposed excavation.

Notice shall be made to owners of underground utilities not less than two (2) business days or more than ten (10) business days prior to scheduled date of commencement of excavation.
Test pits, for the purpose of locating underground utilities or structures in advance of the construction, shall be excavated and backfilled by the Contractor. Test pits shall be backfilled immediately after their purpose has been satisfied and the surface restored and maintained in a manner satisfactory to the applicable agency.

The Contractor shall excavate around and under active utilities with special care and shall support and maintain them in service. Where it is necessary to cut, move or reconnect any service lines, arrangements shall be made with the respective utility owners.

The Contractor shall coordinate with utility owners, arrange for the movement or adjustment, either temporary or permanent, and notify the City, in advance, of any conflicts affecting the work schedule, and/or possible cost increase to the City if the project is a City capital improvement project.

The Contractor shall be responsible for any damage of utilities or services resulting from his operations and shall hold the City harmless from any claims resulting from disruption of service or damage to utilities.

4-3.15 TRENCH EXCAVATION

Trench excavation and backfill operations within State right-of-way: All excavation and backfill within the State right-of-way shall adhere to the *WSDOT/APWA Standard Specifications*.

Trench excavation and backfill operations within County right-of-way: Excavation within Snohomish County right-of-way shall conform first to Snohomish County Road Standards, and secondly to *WSDOT Standards.*

Trench excavation and backfill operations within City right-of-way: Excavation within the City right-of-way shall conform to these Standards.

Clearing and grubbing limits may be established by the City or governing agency for certain areas and the Contractor shall confine his operations within those limits. Debris resulting from the clearing and grubbing shall be disposed of by the Contractor.

Trenches shall be excavated to the line and grade shown in the plans or designated by the City. Where higher pressure class pipe or special bedding is required because of excess trench width, it shall be furnished.

Unsuitable material below the depth of the bedding shall be removed to the extent approved by the City Inspector and replaced with satisfactory materials as determined by the City Engineer.

The length of trench excavation in advance of pipe laying shall be kept to a minimum and shall not exceed more than 100 feet without written approval of the City Engineer.

When trenching operations take place in the public right-of-way, the pavement and all other improvements shall be restored as required by the right-of-way permit.

When excavation of rock is encountered, all rock shall be removed to provide a clearance below and on each side of all pipe, valves, and fittings of at least 6 inches for pipe sizes 24 inches or smaller and 9 inches for pipe sizes 30 inches and larger. Material removed shall be replaced with appropriate backfill material, which shall be compacted to 95% standard proctor. See City of Arlington Standard Detail W-270.

4-3.16 SHEETING AND SHORING

The Contractor shall provide and install sheeting and shoring as necessary to protect workers, the work and existing utilities and other properties in compliance with OSHA and WISHA requirements. All sheeting and shoring above the pipe shall be removed prior to backfilling. Sheeting below the top of the pipe may be cut off and left in place. Removal of the sheeting and shoring shall be accomplished in such a manner that there will be no damage to the work or to other properties.

4-3.17 TRENCH DEWATERING

The Contractor shall maintain sufficient pumping equipment on the project site to keep the trench free from standing water. Surface runoff shall not be allowed to flow to the trench. The trench water or other deleterious materials shall not be allowed to enter the pipe at any time. If water is found to be entering the new water main at any time, the Contractor shall plug the water main and cease working until the trench water is completely pumped out or otherwise controlled, to the satisfaction of the City Inspector. Dewatering and its methods shall be the responsibility of the Contractor. Any method used must be in accordance with the specifications and requirements of the City and DOE.

4-3.18 PIPE BEDDING

Bedding material, when specified or required by the City, shall be as specified in these Standards and *WSDOT/APWA Standard Specifications*. For the type of pipe (rigid or flexible) to be installed, pipe zone bedding is defined as 6 inches below the pipe and around the pipe, and 12 inches above the pipe. Native material may be used for bedding of ductile iron pipe if judged to be suitable by the City Engineer. Gravel backfill for pipe zone bedding shall be select granular material free from wood waste, organic material, and other extraneous or objectionable materials and shall have a maximum dimension of 1½ inches. Pipe zone bedding up to 12 inches over the

top of the pipe shall be evenly and carefully placed. Gravel backfill for pipe zone bedding shall be compacted to 95% maximum dry density per ASTM D1557 by approved methods (hand-held tools), so as to provide firm and uniform support for the full length of the pipe, valves, and fittings. See City of Arlington Standard Detail W-270.

4-3.19 CONCRETE THRUST BLOCKING

Bends, tees, plugs, reducers, and caps, unless otherwise specified, shall be blocked in accordance with the City Standard Details W-160 and W-170. All poured in place blocking shall have a minimum measurement of twelve inches 12 inches between the pipe and the undisturbed soil. Concrete blocking shall have a minimum of ¼ square foot bearing against the fitting. The Contractor shall install blocking which is adequate to withstand full test pressure as well as to continuously withstand operating pressure under all conditions of service. All concrete shall be 2,500 psi minimum and mechanically mixed.

Blocking shall, unless otherwise shown or directed, be placed so that pipe and fittings will be accessible for repair. Eight-mil polyethylene sheets shall be installed around all fittings and all bolts, nuts, and glands for future dismantling.

In the event of a shut down where time does not permit the proper setting of the concrete blocking, ecology blocks shall be installed with concrete poured around the connection point of the fitting and the blocks with the approval of the City Inspector.

4-3.20 TRENCH BACKFILL AND COMPACTION

Trench backfill shall be done above the pipe zone bedding. All backfill material shall be free from cinders, ashes, refuse, vegetable or organic material, boulders, rocks or stones, frozen soil, or other unsuitable material. Trench backfill material shall be as specified in these Standards and *WSDOT/APWA Standard Specifications.*

Compaction of the backfill shall, at the minimum, be accomplished by mechanical tamper, by vibrating, by rolling, or by a combination of these methods, as approved by the City Engineer. Water settling is not permitted. The Contractor shall provide the services of a testing laboratory acceptable to the City to perform on-site density tests to show that the specified density has been obtained. The approval of the compaction method and the achievement of the specified density shall, in no way, relieve the Contractor of responsibility for all repairs caused by settlement of the backfill prior to acceptance and during the two year period after acceptance of the project.

Prior to backfilling, form lumber and debris shall be removed from the trench. Sheeting used by the Contractor shall be removed just ahead of the backfilling. Backfill shall not be deposited in the trench in any manner, which will damage or disturb the pipe or the initial backfill. Care shall be taken to prevent any damage to the pipe or its protective coating. After the initial backfill is placed, the remaining backfill material shall be placed in successive layers not exceeding 1 foot, (12 inches) in loose thickness, and each layer shall be compacted to the density specified below.

Asphalt pavement restoration shall either be by a patch or overlay method as required and noted on the right-of-way permit. When a patch method is used, the trench limits shall be saw cut prior to the final patch.

All pavement cuts shall be made by saw cuts. The saw cuts shall be 1 foot outside the trench width. If the permit requires an overlay, then the Contractor may use a jackhammer for cutting the existing pavement. Grinding may be required.

All trenching shall be backfilled in accordance with the City Standard Detail W-270. All trench backfill materials shall be compacted to 95% maximum dry density, as determined by ASTM D1557.

If the City and permitting agency determine that native material is suitable for backfill, the Contractor may use the native material.

When the trench is perpendicular to the traveled lane or any driveways, the full depth shall be backfilled with crushed surfacing top course material. When the trench is parallel, the top 4 feet must be backfilled with crushed surfacing top course material. Controlled Density Fill (CDF) may be required by the City or the permitting agency.

Backfill compaction shall be performed in 8 to 12 inch lifts. The Contractor shall perform compaction tests in 4 foot vertical increments maximum. The test results shall be given to the City for review and approval prior to paving. Tests shall be performed at maximum intervals of 50 feet along the length of the trench.

If the area is unpaved and not subject to vehicle traffic, the backfill shall be compacted to a minimum of 90% of maximum dry density as determined by ASTM D-1557.

4-3.21 LAYING DUCTILE IRON PIPE

Work shall be accomplished in accordance with AWWA C600 and the manufacturer’s recommendations.

Depths of pipe shall conform to approved plans. The typical cover depth of pipe is 3 feet (36 inches) measured from finished grade to top of pipe.

The bottom of the trench shall be finished to grade in such a manner that the pipe will have bearing along the entire length of the barrel. Bolts on mechanical pipe and fittings shall be tightened uniformly with a "Torque" wrench which measures the torque for mechanical joints as follows:

2 inch to 3 inch pipe sizes ⅝ inch bolts	40 to 60 foot pounds
4 inch to 24 inch pipe size ¾ inch bolts	60 to 90 foot pounds

Except where restrained joint systems are required, mechanical or push-on Tyton joints shall be used. Installation of push-on joint pipe shall be in accordance with the manufacturer's instructions.

When it is necessary to deflect pipe from a straight line in either the horizontal or the vertical plane, the amount of joint deflection shall not exceed one half (½) of the maximum deflection recommended by the pipe manufacturer. The Contractor shall submit to the City the pipe manufacturer's joint deflection recommendations prior to pipe installation as a part of the Material Submittals.

Where field conditions require deflection or curves not anticipated on the plans, the City will determine the methods to be used.

Whenever it becomes necessary to cut a length of pipe, the cut shall be done in conformance with all safety recommendations of the cutting equipment manufacturer. Cutting shall be done in a safe manner without creating damage to the pipe or cement mortar lining. The cut shall be made by an abrasive pipe saw or an approved pipe cutter.

The outside of slip joint pipes shall be beveled and smoothed so that good connections can be made without gasket damage.

All parts of the pipe ends, couplings, fittings and appurtenances shall be cleaned to remove oil, grit, or other foreign matters from the joints. Care shall be taken to keep the joints from contacting the soil.

4-3.22 POLYETHYLENE ENCASEMENT

Installation of polyethylene encasement shall be in accordance with the latest AWWA Standard C105. All ductile iron pipe and fittings installed in highly corrosive soils, as directed by the City Engineer, shall be wrapped except as specifically excluded in the plans or in these Standards.

4-3.23 FIRE HYDRANT INSTALLATION

Fire hydrants shall be set as shown in the City Standard Details W-010 through W-030 and AWWA Standard C600. The portion of the hydrants above the ground shall be painted with 2 coats of high gloss equipment yellow paint. The entire hydrant run shall be restrain jointed.

All hydrants shall stand plumb and shall have their nozzles parallel with or at right angles to the curb or at the City Fire Chief's discretion, with pumper nozzle facing the curb. Hydrants shall be set to the established grade. Hydrants shall be installed so that the breakaway flange is 2 inches

above finished grade.

When a dry barrel hydrant is set, drainage shall be provided at the base of the hydrant by placing 1½ inches of washed drain rock from the bottom of the trench to at least 12 inches above the drain port opening in the hydrant and to a distance of 2 foot around the elbow. Fire hydrants shall not be located within 10 feet horizontally of a sanitary sewer main or side sewer.

When a hydrant is installed in an unpaved area, a minimum of 3 feet × 3 feet × 4 inch concrete pad shall be poured 2 inches below the breakaway flange around the hydrant barrel to provide adequate resistance to avoid transmitting shock moment to the lower barrel and inlet connection in the case of vehicle impact. The center of the hydrant shall be at the center of the concrete pad. Prior to pouring concrete, the ground shall be compacted according to the section of Trench Backfill and Compaction in these Standards. See Standard Detail W-010.

Additional information regarding placement of hydrants can be found in AWWA Manual M17.

When fire hydrants are located in parking lots, or other areas where permitted speed limits do not exceed five miles per hour, hydrant guard posts shall be installed where the hydrant is not protected by a cement concrete curb (or extruded curb per Standard Details) on all sides where vehicles may have access. Guard posts shall be installed according to the minimum dimensions shown in the City Standard Detail W-030. Fire hydrants located in undeveloped or rural areas must have City of Arlington standard hydrant locks installed by the Developer.

Reflective pavement markers for fire hydrants are required and shall be installed per Standard Detail W-015.

4-3.24 VALVE INSTALLATION

Prior to installation, valves shall be inspected for approved part numbers/manufacturers; cleanliness of valve ports especially seating surfaces, handling damage, and cracks. Defective valves shall be rejected.

When butterfly valves are installed, the operation nuts must be on the north or east sides of the water mains or as directed by the City Inspector.

The valve and valve box shall be set plumb and centered on the valve. Valves 12 inches or larger shall be supported by a concrete block (16 inches x 16 inches x 4 inch solid concrete) on a sufficiently tamped trench bottom so that the pipe will not be required to support the weight of the valve. In no case shall valves be used to bring misaligned pipe into alignment during installation. Pipe shall be supported in such a manner as to prevent stress on the valve.

Valves shall be installed in the closed position. Where the valve operating nut is more than 3 feet below finished grade, a valve stem extension conforming to the Standard Details must be installed. See City Standard Detail W-190. Tapping valves shall be water tested prior to tapping

water main.

A valve box or vault shall be provided for every valve. Valve box top sections shall be adjusted flush with the finished pavement and, in those areas to be excavated for future roadway grades, enough adjustment shall be provided in the valve box to allow the top of the box to be adjusted to the required grade.

Backfill around valves shall be carefully tamped in 6 inch lifts for the full depth of the trench with the valve box in place. Provide a minimum of 2 feet x 2 feet x 4 inch concrete pad for a single valve box and a minimum of 4 feet x 4 feet x 4 inch concrete pad for multiple valve boxes installed in gravel or unpaved areas as shown in Standard Detail W-190.

4-3.25 COMBINATION AIR AND VACUUM RELEASE VALVE

Location of the air/vac shown in the plans is approximate. The Contractor shall set the air valves at the high points of the water main. The water main profile may need adjustment so that the high point and air/vacuum valve is installed in a convenient location with the City Inspector's approval. Installation shall be as shown in City Standard Detail W-260.

4-3.26 BLOW-OFF ASSEMBLIES

Blow-off assemblies shall be installed as shown in City Standard Detail W-180. A valve marker post shall be installed when the gate valve is installed in unpaved area or as directed by the City Inspector.

4-3.27 VALVE MARKER INSTALLATION

Marker posts shall be set for all valves located in unpaved areas and as directed by the City except auxiliary hydrant valves. Installation shall be as shown in City Standard Detail W-250.

4-3.28 SERVICE LINES

New Service Installations

Generally, corporation stops are located at ten o'clock or two o'clock positions on the circumference of the pipe, and may be screwed directly into the tapped and threaded main without any additional appurtenances if the pipe diameter is 8 inches or larger, ductile iron pipe with a thickness of Class 52 or higher. Taps may be installed with double strap stainless steel saddles. When more than one tap in an existing cast iron pipe is necessary to deliver the required flow, the taps should be staggered around the circumference at least 12 inches apart (not in line). Service line must be pressure tested before placing in service. Corporation stops with IPT threads are not acceptable, unless approved by the City or are used on large taps. Service installation shall be as shown in City Standard Details W-040 through W-070.

Reconnecting Existing Services

Service connections shall be installed as shown in the approved plans and Standard Details. Install services in paved areas by boring and under sidewalks and curbs by boring and tunneling. Damages shall be repaired by the Contractor. Provide 30 inch minimum cover on service lines. Install service lines at 90 degrees horizontally to the main to intercept the existing meters. Flush the service line prior to connection to the meter.

Install angle ball meter valves, setters (if required) and boxes as shown in City Standard Details W-040 and W-050 or as directed by the City.

Existing service connections shall not be transferred to the new mainline until the new mainline has been successfully flushed, disinfected, tested and approved by the City Inspector. When transferring services from the existing mainline to the new mainline, the Contractor shall take sanitary precautions to protect the potable water supply in both the existing and new mains.

4-3.29 PRESSURE REDUCING STATION

Installation shall be as shown in City Standard Detail W-080, in approved plans, and in accordance with the manufacturer's recommendations. The pressure reducing valves, strainers, pressure relief, pipe and fittings shall be constructed in accordance with the applicable AWWA and Uniform Plumbing Code requirements. Pressure reducing valves 6 inches or larger shall be supported by pipe supports. Supports shall be bolted to the vault floor.

Pressure relief discharge pipe shall be placed in a location that will not be subject to damage or erosion during discharge of water. The Contractor shall schedule and perform a start-up with the presence of the PRV manufacturer's representative(s).

4-3.30 CONNECTION TO EXISTING WATER MAIN

Points of connection to existing water mains shall be exposed prior to trenching of the new mains, and not less than 48 hours prior to the anticipated connection time. Unless specifically provided for elsewhere in these Standards, the Contractor is responsible for giving at least five (5) business days notice to the City. The City shall be responsible for notifying the City Fire Chief and customers affected by the shut-off. Water main shut-off shall not be scheduled to take place on Fridays, or on the day before a holiday, unless otherwise approved by the City Engineer.

The Contractor shall ensure that existing fittings are in accordance with the approved plans and that the connection will be made in accordance with the plans. The Contractor shall immediately notify the City Engineer and the Design Engineer if the connection cannot be made in accordance with the plans so that the connection details may be revised and approved by the City Engineer.

Connection to the existing water system shall be done only after the new mains are flushed and have passed pressure and purity tests. All connections to the existing water system must be approved by the City and in the presence of the City Inspector. Only authorized City representatives shall operate the valves in the existing water system.

Connections to existing water system may be made under pressure with a tapping machine by determining the size and type of pipe and installing a tapping tee with a tapping gate valve. Tapping tees shall be installed as shown in City Standard Detail W-200. Work shall not start until all materials, equipment, and labor are ready. The tapping tee and valve shall be installed in a horizontal position so that the valve stem is vertical. Where cut-ins are required in existing pipes, the work shall be conducted as to minimize the interruption of service. Necessary pipe, fittings and gate valves shall be assembled at the site ready for installation prior to the shut-off of water in the existing main. Once the water main has been shut off, the work shall be prosecuted vigorously and shall not be halted until the water main is back to service.

The interiors of all pipe and fittings, particularly couplings and sleeves, to be used in final cut-in connection shall be swabbed or sprayed with a 1% hypochlorite solution before they are installed.

Flushing shall start as soon as repairs or connections are completed and shall be continued until discolored water is eliminated. Flushing shall be done by the City Inspector.

4-3.31 SCHEDULE OF TESTS

The Contractor shall notify the City Inspector at least 2 business days before a section of water main is ready for inspection and test. The Inspector will inspect and observe the hydrostatic test. The Contractor shall contact the City at least 2 business days prior to purity test and flushing, the Contractor shall be present at the project site when the City Inspector takes water samples. The Contractor shall provide sufficient manpower and resources to accomplish the work in a timely manner. Flushing shall be done by or under direct supervision of the City Inspector.

4-3.32 HYDROSTATIC PRESSURE TESTS

Water main, appurtenances and service connections shall be tested in sections of convenient lengths under a hydrostatic pressure of 220 psi for 15 minutes.

Pumps, gauges, plugs, saddles, corporation stops, miscellaneous hose, piping, and measuring equipment necessary for performing the test shall be furnished and operated by the Contractor.

Sections to be tested shall normally be limited to a maximum of 1,000 feet. The pipe shall be backfilled sufficiently to prevent movement of the pipe under pressure. Thrust blocking shall be in place for an adequate time for concrete to cure before testing. Where permanent blocking is not required, the Contractor shall furnish and install temporary blocking and remove it after

testing.

The Contractor shall provide or rent from the City an approved DCVA to fill the new water mains for testing and flushing. The new water mains shall be filled and remain under 200 psi to 210 psi pressure for 24 to 48 hours to allow air to escape and the pipe lining of the pipe to absorb water.

The pressure test shall be accomplished by pumping the main up to 200 psi to 210 psi, stopping the pump for 15 minutes, and pumping the main up to the test pressure again. During the test, the section being tested shall be observed to detect any visible leakage.

A clean container shall be used for holding water for pumping up pressure on the main being tested. The quantity of water required to restore the pressure shall be accurately determined by pumping through a positive displacement water meter. The meter shall be approved by the City Inspector. Acceptability of the test will be determined as follows:

The quantity of water lost from the main shall not exceed the number of gallons per hour as determined by the formula:

$$L = \frac{SD\sqrt{P}}{266{,}400}$$

in which,

L	=	allowable leakage (gallons/hour)
D	=	nominal diameter of the pipe (inches)
P	=	test pressure during the leakage test (psi)
S	=	gross length of pipe tested (feet)

There shall not be an appreciable or abrupt loss in pressure during the 15 minute test period. Any visible leakage detected shall be corrected by the Contractor regardless of the allowable leakage specified above. Should the tested section fail to meet the pressure test successfully as specified, the Contractor shall locate and repair the defects and then retest the pipeline. If the project is a City capital improvement project, there should be no additional cost to the City.

Tests shall be made with the hydrant auxiliary gate valves open and the hydrant valve in the closed position. Once the new line is successfully tested, each valve shall be tested by closing each in turn and relieving the pressure behind it. The mains shall be tested between valves. As possible, no hydrostatic pressure shall be placed against the opposite side of the valve being tested. This test of the valve will be acceptable if there is no immediate loss of pressure on the gauge when the pressure comes against the valve being checked. The Contractor shall verify that the pressure differential across the valve does not exceed the rated working pressure of the valve.

Prior to calling the City Inspector for pressure test, the Contractor shall have all equipment available for set up but not connected until the City Inspector is present for operation. All services shall be flushed.

Defective materials or workmanship discovered as a result of hydrostatic field test shall be replaced by the Contractor. Whenever it is necessary to replace defective material or correct the workmanship, the hydrostatic test shall be repeated to the satisfaction of the City.

4-3.33 DISINFECTION AND FLUSHING OF WATER MAINS

Before being placed into service, new water mains and repaired portions of existing mains shall be chlorinated and a satisfactory bacteriological report obtained. Disinfection of water mains shall be accomplished by the Contractor in accordance with the requirements of the *Washington State Department of Health*, AWWA Standard C651 and in a manner satisfactory to the City. Sections shall be disinfected between adjacent valves unless, in the opinion of the City Engineer, a longer section may be satisfactorily handled. All filling and flushing shall be done through a meter with a DCVA rented from the City. Valves shall be operated by City staff only.

Flushing

Where dry calcium hypochlorite is used for disinfection of the pipe, flushing shall be done after disinfection. If a hydrant is not installed at the end of the water main, the Contractor shall provide a tap large enough to develop a flow velocity of at least 2.5 feet per second in the water main. The flushing period must be approved by the City.

The source water used for disinfection and pressure testing shall be flushed prior to its use to ensure that contaminants or debris are not introduced into the new pipe.

Taps for temporary or permanent release of air, chlorination or flushing purposes shall be provided by the Contractor as a part of the construction of the water mains.

Chlorination

The section to be tested shall be chlorinated so that a chlorine residual of no less than 25 mg/l (parts per million or ppm) remains in the water after standing 24 hours in the pipe. The initial chlorine content of the water shall not be less than 50 mg/l. The forms of chlorine that may be used in the disinfection operations are liquid chlorine and calcium hypochlorite granules.

Liquid Chlorine: Chlorine shall be applied by solution fed at one end of the section with a valve or hydrant at the opposite end open sufficiently to permit a flow through during chlorine application. The chlorine solution shall be fed into the pipeline already mixed by an automatically proportioning applicator to provide a steady application rate no less than 50 mg/l (ppm) chlorine. Hydrants along the chlorinated section shall be open during application until the presence of chlorine has definitely been detected in each hydrant run. When a chlorine concentration of no less than 50 ppm has been established throughout the line, the valves shall be closed and the line left undisturbed for 24 hours.

Dry Calcium Hypochlorite: Calcium hypochlorite conforming to AWWA B300 is available in granular tablet form and must contain approximately 65% available chlorine by weight. This procedure is allowed only when the extension has been kept clean and dry. If piping has been submerged, or is unclean, refer to AWWA Standard C651.

Granulated chlorine: (dry calcium hypochlorite at 65% - 70% chlorine) shall be placed in the pipe to yield a dosage no less than 50 mg/l. The number of ounces of 65% test calcium hypochlorite required for a 20 foot length of pipe equals 0.00843ld, in which "D" is the diameter in inches (WSDOT). The main shall be filled with water at a rate to ensure that the water within the main will flow at a velocity no greater than 1 foot per second. Precautions shall be taken to ensure that air pockets are eliminated. When a chlorine concentration of not less than 50 ppm has been established throughout the line, the valves shall be closed and the line left undisturbed for 24 hours. If the water temperature is less than 41 degrees F, the water shall remain in the pipe for at least 48 hours.

The line shall then be thoroughly flushed and water samples taken. The Contractor shall exercise special care in flushing to avoid damage to surrounding property and to conform to these Standards.

4-3.34 FINAL FLUSHING AND TESTING

Following chlorination, chlorinated water shall be flushed from the new water main until the replacement water throughout its length shows absence of chlorine. In the event chlorine is normally used in the source of supply, the tests shall show a residual not in excess of that normally carried in the water supply system (never to exceed 2 mg/l).

After final flushing and before the new water main is connected to the distribution system. The Contractor shall schedule the sample collection with the City a minimum of two (2) business days in advance of test. The number of samples from the source and the number of representative sample points required will be determined by the City Inspector. Appropriate sample taps shall be furnished by the Contractor. No hose or fire hydrant shall be used in the collection of samples.

At least one set of samples shall be collected from every 1,200 feet of the new water main, plus one set from the end of the line and at least one set from each branch. All samples shall be tested for total coliform bacteria and for heterotrophic bacteria by the heterotrophic plate count (HPC) analysis. The maximum allowable coliform content of the flushed sample shall be zero. The maximum allowable HPC population count in all source samples shall be 80/ml. Any source sample that exceeds a count of 80/ml shall be ruled as an indeterminate test and a new set of source and construction samples for analysis shall be required. The maximum allowable HPC population count from any construction sample shall be no greater than twenty (20) counts above the highest source HPC population count.

Before placing the lines into service, a satisfactory report shall be received by the City from the certified laboratory evidencing successful tests on samples collected from representative points in the system extension.

Should the initial test result in an unsatisfactory bacteriological test, additional chlorination using the above procedure shall be repeated until satisfactory results are obtained. The Contractor shall be responsible for disposal of treated water flushed from the mains.

Chlorinated water shall never be flushed into the storm drain or a body of water. This includes lakes, rivers, streams, and stormwater drainage systems, any waters where fish or other natural aquatic life can be expected.

4-3.35 ADJUST EXISTING STRUCTURE TO GRADE

Existing Structure Adjustment

Existing structures, including valve box covers affected by a pavement overlay, or adjustment in surface grade, shall normally be adjusted to grade within three (3) business days after the pavement overlay. If the City determines that the structure is critical to operations immediate adjustment may be required.

Valve Box Adjustment in Paved Areas

Raising the existing valve box shall be accomplished by adjusting the existing top section of the valve box or replacing the valve box.

If the valve box base section needs to be extended, the Contractor shall install a 4 inch diameter cast iron soil pipe, with the bell end of the soil pipe inserted over the top of the existing valve box base section. The spigot end of the soil pipe shall be located a minimum of 6 inches and a maximum of 9 inches below finished grade. The valve box top section shall be slipped over the soil pipe and adjusted to the final grade. A polyethylene sheet, 8-mil thick, shall be placed between the valve box and soil pipe to prevent metal to metal contact where the sections overlap.

In asphalt concrete pavement and overlay areas, excavation of the valve box to be raised shall be accomplished by saw cutting or neat line jack hammering the pavement a minimum of 12 inches around the perimeter of the valve box. The final adjustment of valve boxes shall be done within 24 hours after paving. Paving, repaving, and patching shall be completed within 72 hours.

Valve Box Adjustment in Unimproved Areas

Adjustment of valve box covers located in unpaved areas shall be the same as in paved areas. Provide a minimum of 2 feet × 2 feet × 4 inch concrete pad at the surface as

indicated in City Standard Detail W-190.

4-3.36 ABANDONING FACILITIES

Abandonment of Water Main

Water mains no longer in service shall be removed and disposed of by the Contractor. The water main may be abandoned in place with the approval of the City Engineer.

When water mains are abandoned, the ends of the pipe and fittings shall be plugged with concrete which shall have a minimum length of 12 inches. The City may require the Contractor to fill the abandoned water mains with sand or cement grout depending on the size, material, and location of the water main.

Abandonment of Services

The Contractor shall remove the service lines, corporation stops and plug saddles with MIPT brass plug.

Abandonment of Structures

Abandonment of structures shall be completed only after water facilities have been properly abandoned. All valves and valve boxes shall be removed on abandoned valves.

4-3.37 LANDSCAPING AND LAWN REMOVAL AND REPLACEMENT

Any landscaping and lawn damaged by the Contractor shall be restored to conditions prior to construction. The Contractor shall try to minimize the area of disturbance and restore everything as close to the original condition as possible.

4-3.38 BORING UNDER ROOTS

Boring under the root systems of trees that cannot be removed shall be accomplished by excavating a trench or pit on each side of the tree, being careful to avoid root injury, and then hand digging or pushing the pipe through the soil under the tree. The pit walls shall be a minimum of 7 feet from the center of the tree and shall have sufficient depth to lay the pipe at the grade shown on the plan and profile. Trees shall be removed unless otherwise directed by the City Engineer.

4-3.39 BORING AND JACKING

The Contractor shall verify the vertical and horizontal location of existing utilities. If required to avoid conflicts and maintain minimum clearances, adjustment shall be made to the grade of the casing.

The pipe shall be bored and jacked where indicated. The Contractor shall remove or penetrate all obstructions encountered. If groundwater is found to be a problem during boring operations, the Contractor shall do all that is necessary to control the flow sufficiently to protect the excavation, pipe and equipment so that the work is not impaired. Any pipe damaged during the boring and jacking operation shall be repaired by the Contractor in a manner approved by the City Engineer.

Special care shall be taken during the installation of the bored and jacked pipe to ensure that no settlement or caving is caused to the above surface. Any such caving caused by the placement of the pipe shall be the Contractor's responsibility and the Contractor shall repair any area affected as directed by the City Engineer.

During the jacking operations, particular care shall be exercised to prevent caving ahead of the pipe which will cause voids outside of the pipe. If voids exist, the Contractor shall drill through the wall of the pipe and fill the voids by pumping cement grout. All voids shall be filled to the satisfaction of the City Inspector.

The carrier pipe shall be installed in the casing as shown in the City Standard Details. The Contractor shall support the carrier pipe with casing spacers as shown in the Standard Details. The casing spacers shall conform to these Standards. The material shall be resistant to abrasion and sliding wear. There shall be a minimum of two spacers per length of pipe, and the spacing between spacers shall be as shown in City Standard Detail W-230. Spacers shall be installed per manufacturer’s instructions.

Boring and receiving pits shall be backfilled with select native material approved by the City Engineer and compacted to 95% maximum dry density as determined by ASTM D-1557. The Contractor shall provide sufficient select backfill material to make up for the rejected material.

All disturbed ground shall be restored to its original condition or better.

4-3.40 WORKING WITH ASBESTOS CEMENT PIPE

When working with asbestos cement pipe, the Contractor is required to minimize workers’ exposure to asbestos material at or below the exposure limit as prescribed in WAC 296-62-07705 State and Federal Guidelines and Certification and PSAPCA requirements.

4-3.41 ASBESTOS CEMENT WATER MAIN CROSSINGS

Where a new utility line crosses below an existing asbestos cement (A.C.) water main, the A.C. water main shall be replaced with ductile iron pipe to a minimum of 8 feet on either side of the pipe crossing. Where directed by the City Engineer, the trench shall be backfilled with CDF from the bottom of the trench to the bottom of the A.C. main. All DIP crossings shall be constructed using ROMAC extended range transition couplings.

4-3.42 CONTROLLED DENSITY FILL

Controlled Density Fill (CDF) can be proportioned to be flowable, non-segregating, or excavatable by hand or machine. Desired flow-ability shall be achieved with the following guidelines:

Low Flowability	below 6 inch slump
Normal Flowability	6 – 8 inch slump
High Flowability	8 inch slump or greater

CDF shall be placed by any reasonable means into the area to be filled. CDF patching, mixing and placing may be started if weather conditions are favorable, when the temperature is at 34 degrees F and rising. At the time of placement, CDF must have a temperature of at least 40 degrees F. Mixing and placing shall stop when the temperature is 38 degrees F or less and falling. Each filling stage shall be as continuous as possible. CDF shall not be placed on frozen ground.

Trench section to be filled with CDF shall be contained at either end of the trench section by bulkhead or earth fill.

When used to support existing A.C. pipe, the flowable CDF shall be brought up uniformly to the bottom of the A.C. pipe, as shown on the plans, or as directed by the City Engineer. The Contractor shall provide steel plates to span the utility trenches and prevent traffic contact with CDF for at least 24 hours after placement or until CDF is compacted or hardened to prevent rutting by construction equipment or traffic.

If CDF is used for trench backfill on ductile iron pipe shall be encased in ⅝ inch minus crushed rock and services shall be encased in sand.

4-3.43 VAULT INSTALLATION

Vaults for water facilities (pressure reducing stations, valves, water service, flow meters, backflow prevention devices, etc.) shall be installed at the locations shown on the plan and as staked. It shall be constructed as shown on the plans, Standard Details and as directed by the City Engineer.

The excavation shall have a minimum of one (1) foot clearance between the vault outer surface and the earth bank. The Contractor shall use foundation gravel or bedding concrete on top of undisturbed soil to support the vault. The vault shall be plumb and watertight. The access cover shall be seated properly to prevent rocking and shall be adjusted to match the finished grade.

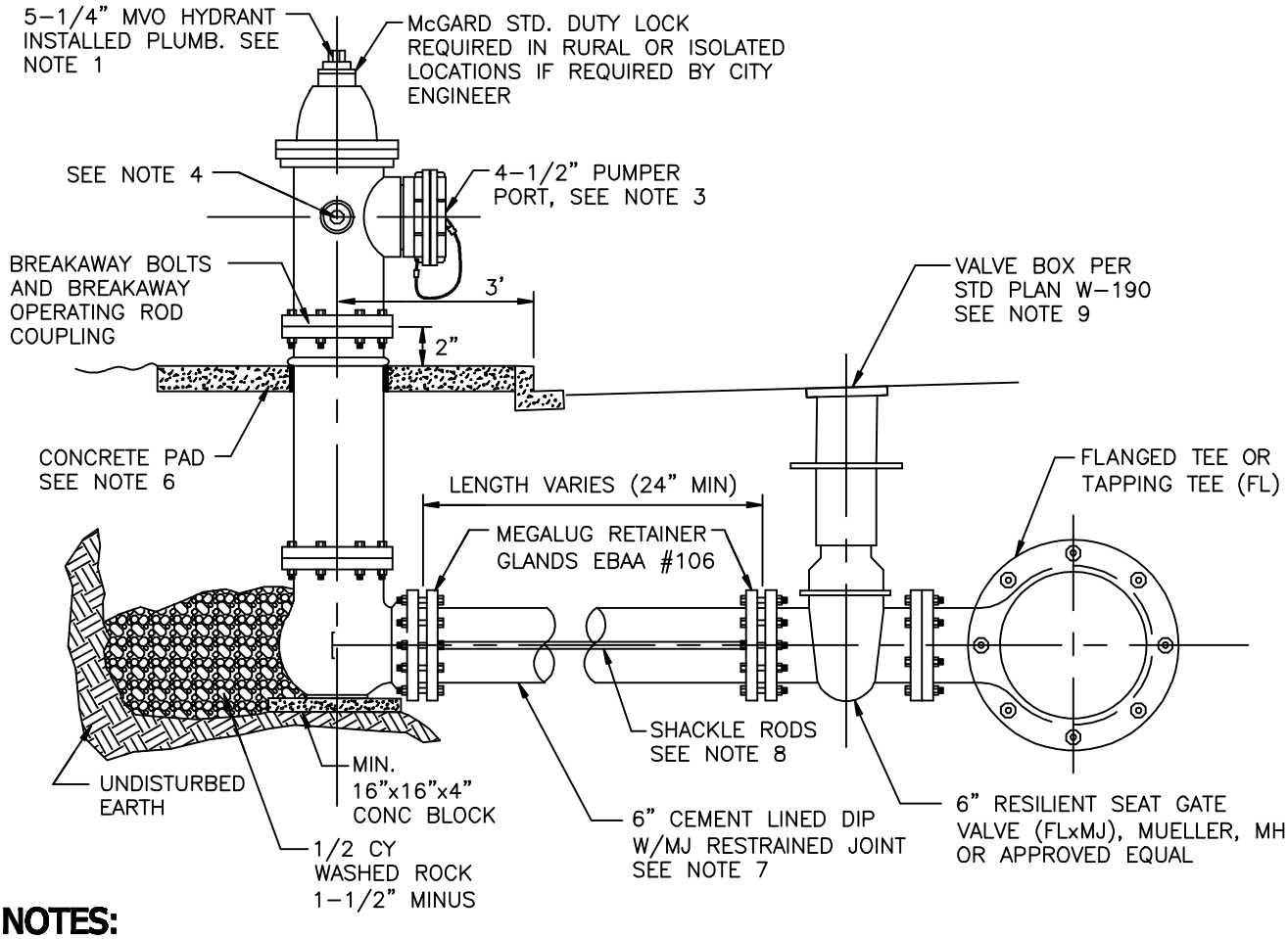
The vault floor shall drain to daylight, or to a location specified on the plans. Gravity drain pipe shall be a minimum of 3 inches in diameter.

Where knockout locations for the pipe do not coincide with the locations of pipe penetrations into the vault, the Contractor shall core drill openings for pipe.

A sump pump shall be required if directed by the City Engineer.

4-3.44 UTILITY CROSSING

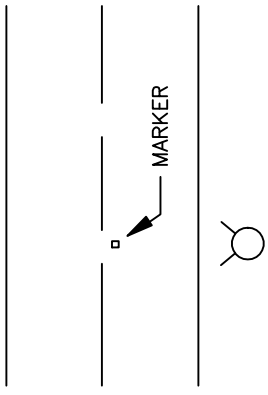
If the minimum vertical distance between utility pipes is less than 6 inches and such installations are approved by the permitting agency, a rigid foam pad shall be placed between the pipes. The pad shall be; outside diameter (O.D) × O.D. × 2.5 inches thick minimum or as required to protect the pipes and O.D. is equal to the outside diameter of the larger pipe. The pad shall be a polyethylene foam plank (Dow Plastics Ethafoam 220), or approved equal. Additional measures may be necessary to ensure system integrity and may be required as evaluated by the permitting agency on a case by case basis.

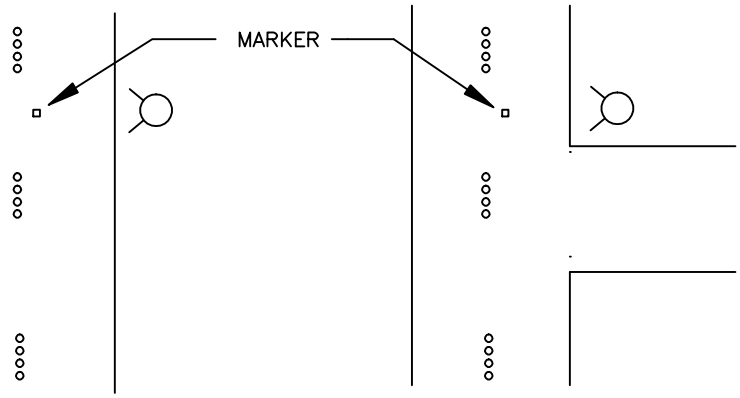


NOTES:

1. HYDRANTS AND ALL MATERIALS SHALL CONFORM TO AWWA STANDARDS AND SHALL BE OF STANDARD MANUFACTURE (M&H 929 RELIANT OR MUELLER SUPER CENTURION 250 ONLY).
2. THE CENTER OF THE HYDRANT SHALL BE 3' FROM FACE OF CURB. IF THERE IS NO CURB, THE CENTER OF HYDRANT SHALL BE 3' FROM RIGHT–OF–WAY AND A MINIMUM OF 5' FROM TRAVELED LANE.
3. ONE 5" TO 4–1/2" PUMPER PORT W/N.S.T. AND STORZ ADAPTER ASSEMBLY. PUMPER PORT TO BE FACING STREET OR ROADWAY FOR THE FIRE ENGINE ACCESS.
4. TWO 2–1/2" HOSE PORTS W/N.S.T. AND 1–1/4" OPERATING NUTS.
5. PROVIDE GUARD POSTS FOR VEHICULAR TRAFFIC PROTECTION IF REQUIRED BY CITY ENGINEER PER STD. DETAIL W–030.
6. INSTALL 3'x3'x4" CONCRETE PAD (3000 PSI) AROUND HYDRANT IN UNPAVED AREAS INCLUDING PLANTER STRIPS. COMPLETELY SURROUND HYDRANT W/FULL DEPTH OF CONCRETE PAD WITH 1/4" JOINT MATERIAL BEFORE PLACING CONCRETE.
7. HYDRANT RUN TO BE 6" CEMENT LINED DUCTILE IRON PIPE CLASS 52 WITH RESTRAINED JOINTS (MEGALUG OR APPROVED EQUAL). HYDRANT RUN LONGER THAN 50 FEET SHALL BE 8" DIA. OR LARGER.
8. ¾" GALV. SHACKLE RODS WITH THE EYE BOLTS AT BOTH ENDS REQUIRED FROM VALVE TO HYDRANT.
9. FIRE HYDRANTS SHALL BE PAINTED WITH TWO COATS OF HIGH GLOSS EQUIPMENT YELLOW "RUST–OLEUM" TYPE PAINT.
10. INSTALL 24"x24"x4" CONCRETE PAD (3000 PSI) AROUND VALVE BOX AND 48"x48"x4" FOR MULTIPLE VALVE BOXES IN UNPAVED AREA.

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS	STANDARD DETAIL NUMBER
	DATE	07/31/2008		
	REF STAD SPEC		FIRE HYDRANT ASSEMBLY	W–010



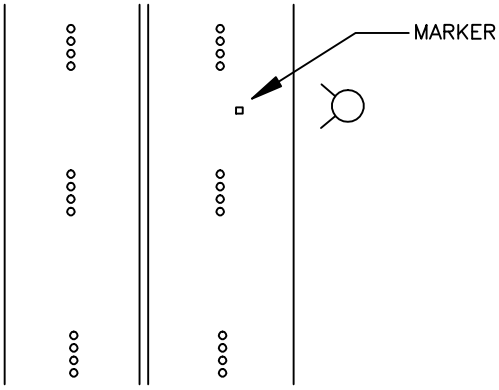


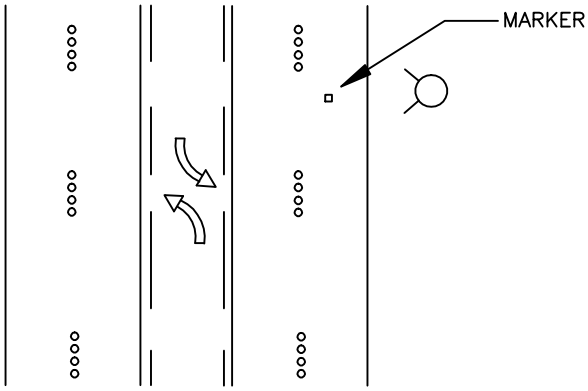
TWO LANE ROAD

OFFSET MARKER TO INDICATE WHICH SIDE OF STREET HYDRANT IS ON. MARKER TO BE PLACED 4" TO 6" OFF OF CENTERLINE

ON SIDE STREETS

WHERE THE HYDRANT IS WITHIN 20' OF THE MAIN TRAVELED STREET, THE MARKER IS TO BE INSTALLED ON THAT MAIN STREET AND 4" TO 6" OFF THE CENTERLINE.





FOUR LANE ROAD

OFFSET MARKER TO INDICATE WHICH SIDE OF STREET HYDRANT IS ON. MARKER TO BE PLACED 4" TO 6" OFF OF DOTS OR PAINTED LANE DIVIDER.

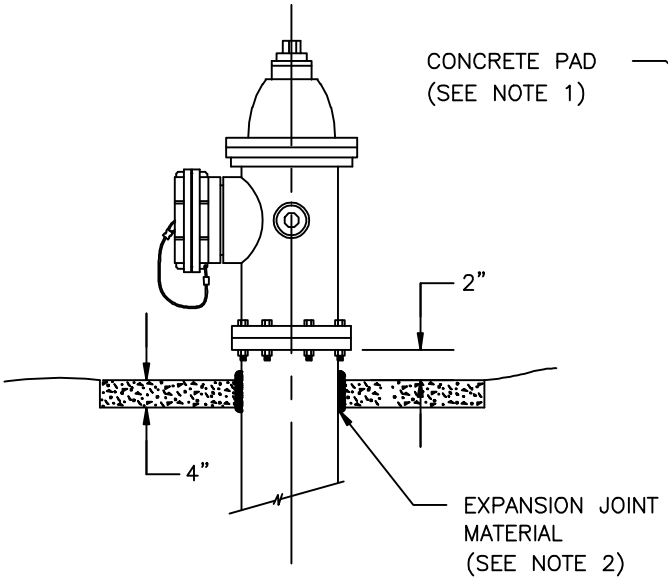
FIVE LANE ROAD

OFFSET MARKER TO INDICATE WHICH SIDE OF STREET HYDRANT IS ON. MARKER TO BE PLACED 4" TO 6" OFF OF DOTS OR PAINTED LANE DIVIDER.

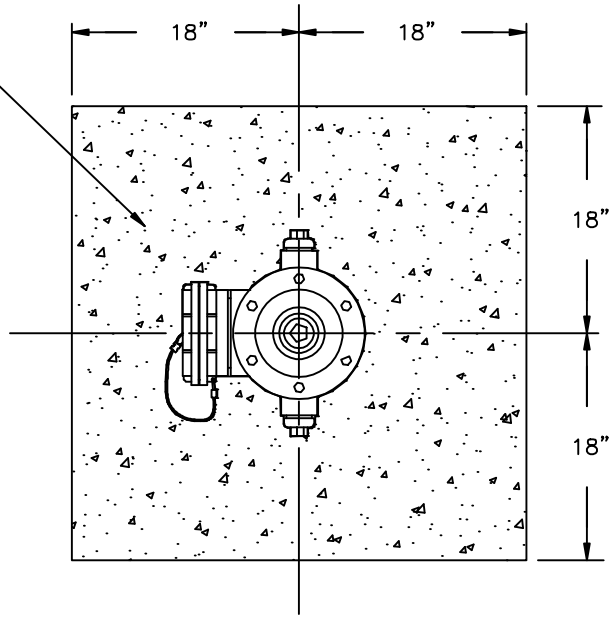
NOTE:

MARKER: TYPE 88 AB STIMSONITE TWO WAY (BLUE)

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS	STANDARD DETAIL NUMBER
	DATE	07/31/2008		
	REF STAD SPEC		FIRE HYDRANT MARKER	W-015



ELEVATION

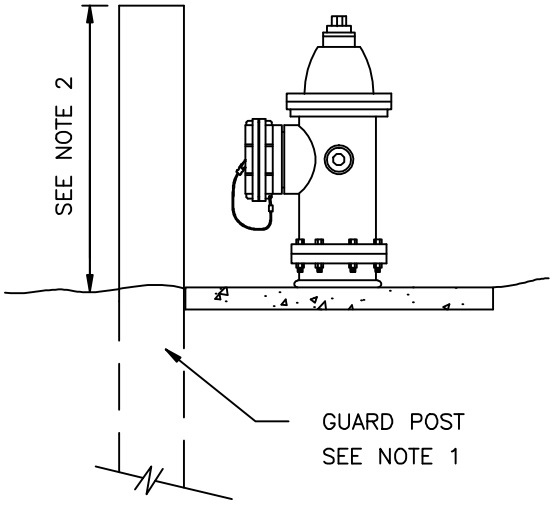


PLAN

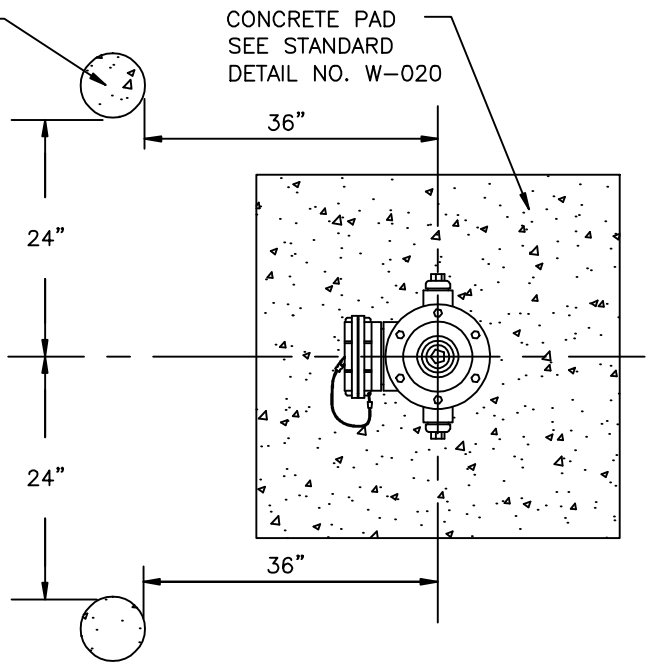
NOTES:

1. CONCRETE SHALL BE CLASS 3000 PSI MIN.
2. INSTALL 1/4" EXPANSION JOINT MATERIAL WITH FULL DEPTH OF CONCRETE PAD AROUND HYDRANT.

CITY OF ARLINGTON	APPROVED BY: L. OLIVE DATE: 07/31/2008 REF STAD SPEC:	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS FIRE HYDRANT CONCRETE PAD	STANDARD DETAIL NUMBER W-020



ELEVATION



PLAN

NOTES:

1. GUARD POSTS SHALL BE 8' LONG, 6" DIAMETER, CONCRETE FILLED CLASS 52 D.I. PIPE OR 8' LONG 8" DIAMETER REINFORCED CONCRETE. PAINTED WITH TWO COATS OF HIGH GLOSS CATERPILLAR YELLOW (RUST-OLEUM) TYPE PAINT.

2. TOP OF GUARD POST SHALL BE LEVEL WITH TOP OF OPERATING NUT.

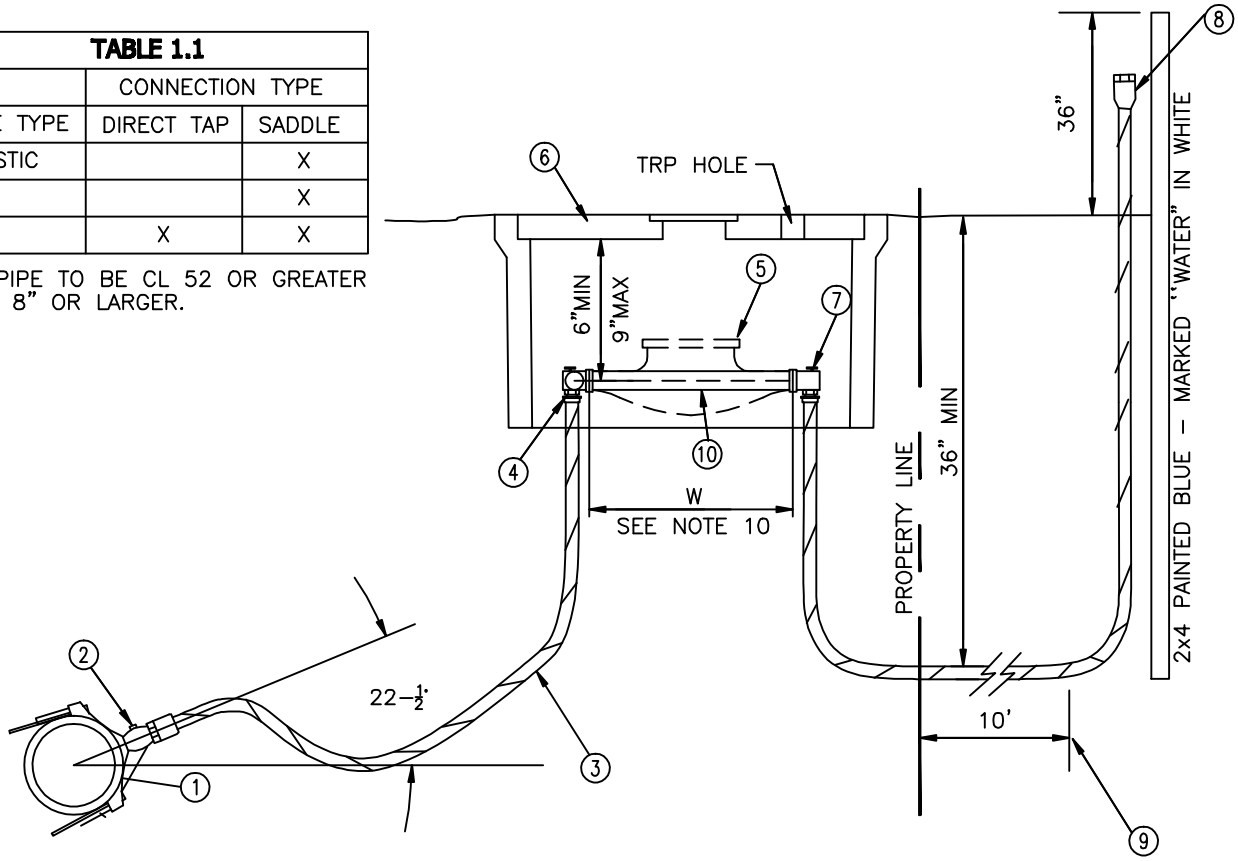
CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS
	DATE	07/31/2008	
	REF STAD SPEC		FIRE HYDRANT GUARD POST

STANDARD DETAIL NUMBER

W-030

TABLE 1.1		
	CONNECTION TYPE	
PIPE TYPE	DIRECT TAP	SADDLE
PLASTIC		X
AC		X
DI *	X	X

* DI PIPE TO BE CL 52 OR GREATER AND 8" OR LARGER.



NOTES AND MATERIALS:

1. 1" CC SERVICE SADDLE W/DOUBLE STAINLESS STEEL STRAP OR DIRECT TAP CC THREAD CORP SEE TABLE 1.1 ABOVE.
2. 1" BALL VALVE CORPORATE STOP CC X COMPRESSION WITH KEY FACING UP, MUELLER OR FORD ONLY.
3. 1" HDPE CTS CLASS 200 HIGH SERVICE PIPE (200 PSI RATING) WITH STAINLESS STEEL STIFFENER AND 10 GAUGE COATED COPPER TRACER WIRE WRAPPED AROUND THE PIPE AND ATTACHED ON BOTH ENDS.
4. FOR 5/8"X3/4" METER, A 1" COMPRESSION ANGLE METER BALL VALVE x 5/8" METER IS REQUIRED. FOR 1" METER, A 1" COMPRESSION ANGLE METER BALL VALVE x 1" METER IS REQUIRED. BALL VALVES ARE LOCKABLE.
5. METER SHALL BE INSTALLED BY CITY UTILITIES DIVISION AT OWNER'S EXPENSE.
6. METER BOX SHALL BE MIDSTATES PLASTICS 1324-12 W/SOLID DI LID WITH 1 3/4" HOLE FOR TOUCH READ PAD (TRP).
7. 5/8" x 3/4" METERS REQUIRE A 3/4" ANGLE METER CHECK COUPLING x 5/8" METER WITH A 3/4" MIPT x 1" COMPRESSION ADAPTER. 1" METER REQUIRES A 1" ANGLE METER CHECK COUPLING x 1" METER.
8. 1" COMPRESSION x FIPT ADAPTER WITH 1" PLASTIC PLUG.
9. EXTEND SERVICE PIPE 10' BEYOND PROPERTY LINE AND AN ADDITIONAL 5' BEYOND EASEMENT LINE.
10. METER LENGTH BLANK STUB.

APPROVED BY	L. OLIVE	
DATE	07/31/2008	
REF STAD SPEC		

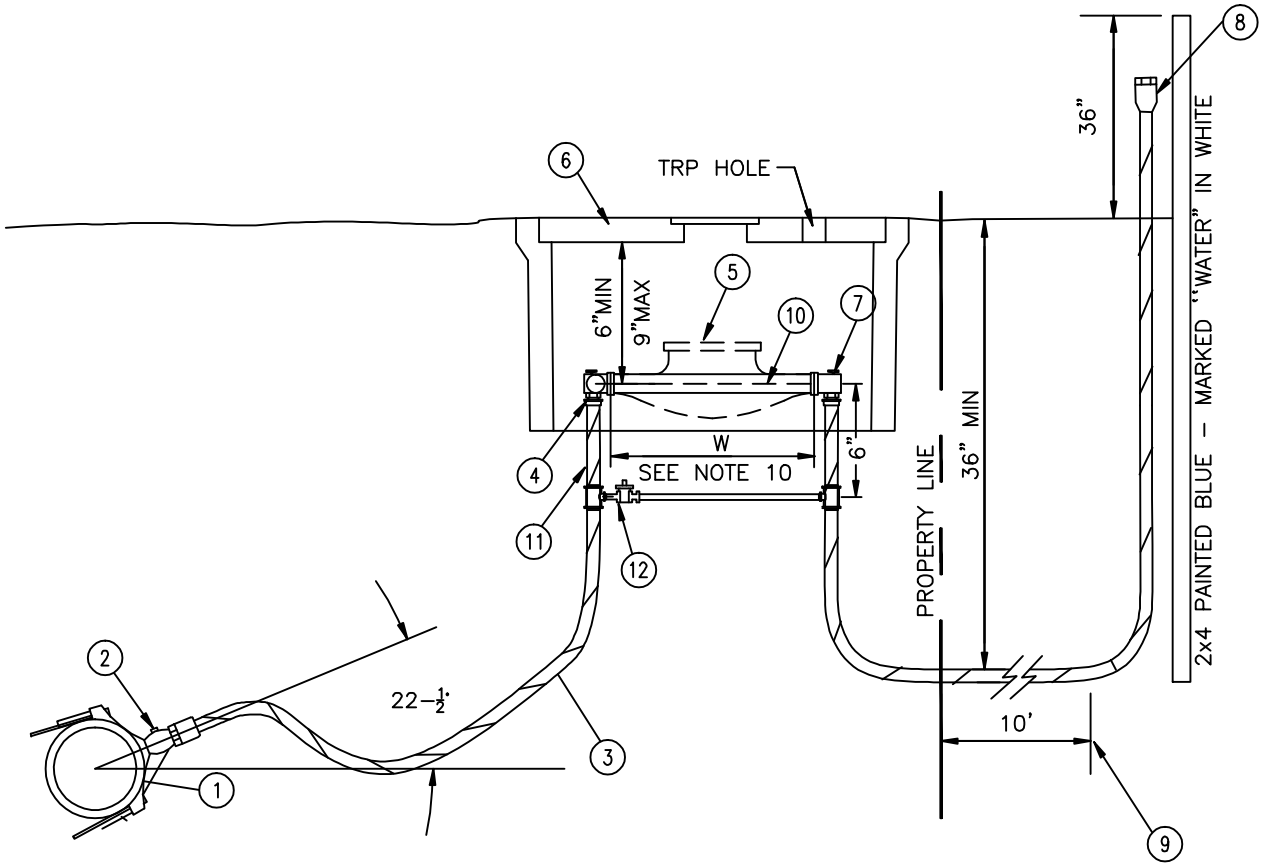
DEPARTMENT OF PUBLIC WORKS

STANDARD DETAILS

5/8" x 3/4" & 1"
RESIDENTIAL WATER SERVICE

STANDARD DETAIL NUMBER

W-040



NOTES AND MATERIALS:

(1) 2" CC SERVICE SADDLE W/DOUBLE STAINLESS STEEL STRAP.

(2) 2" BALL VALVE CORPORATE STOP COMPRESSION WITH KEY FACING UP, MUELLER OR FORD ONLY.

(3) 2" HDPE CTS CLASS 200 HIGH SERVICE PIPE (200 PSI RATING) WITH STAINLESS STEEL STIFFENER AND 10 GAUGE COATED COPPER TRACER WIRE WRAPPED AROUND THE PIPE AND ATTACHED ON BOTH ENDS.

(4) 2" COMPRESSION ANGLE METER BALL VALVE (LOCKABLE).

(5) METER (SIZE AS SHOWN IN PLAN) SHALL BE INSTALLED BY CITY UTILITIES DIVISION AT OWNER'S EXPENSE. CITY WILL INSTALL ADAPTERS AT BOTH ENDS OF METER IF THE METER IS NOT 2".

(6) METER BOX SHALL BE MIDSTATES PLASTICS (1730-18) W/SOLID DI LID WITH 1 3/4" HOLE FOR TOUCH READ PAD (TRP).

(7) 2" ANGLE METER CHECK COUPLING (LOCKABLE).

(8) COMPRESSION x FIPT ADAPTER WITH PLASTIC PLUG.

(9) EXTEND SERVICE PIPE 10' BEYOND PROPERTY LINE AND AN ADDITIONAL 5' BEYOND EASEMENT LINE.

(10) METER LENGTH BLANK STUB FOR A 2" METER, W=17-1/4".

(11) 2" METER SETTER, FORD OR MUELLER.

(12) BYPASSES MUST BE HIGH BYPASS OR SIDE-BY SIDE WITH THE METER.

APPROVED BY	L. OLIVE	
DATE	07/31/2008	
REF STAD SPEC		

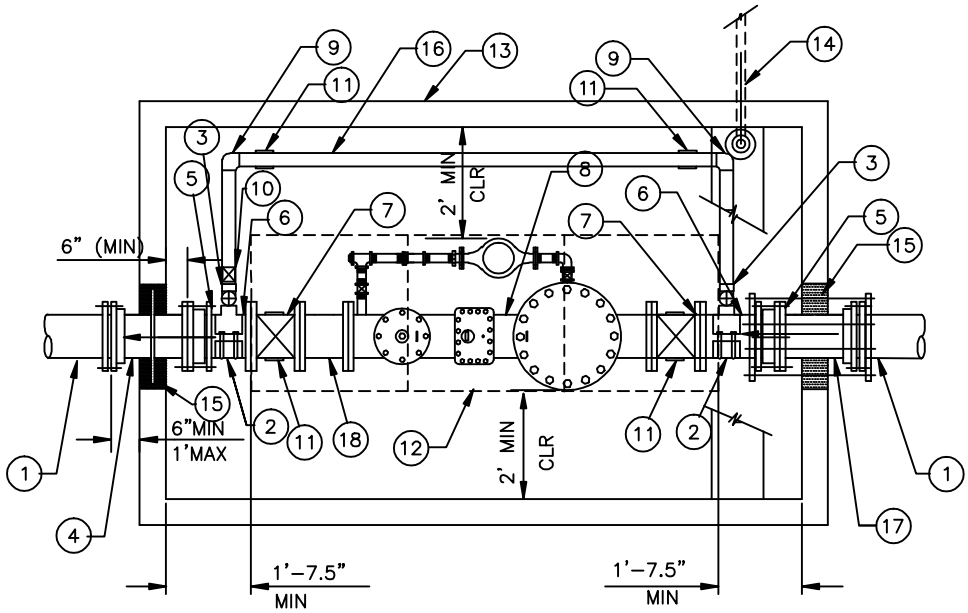
DEPARTMENT OF PUBLIC WORKS

STANDARD DETAILS

2" AND SMALLER
NON-RESIDENTIAL WATER SERVICE

STANDARD DETAIL NUMBER

W-050



MATERIAL LIST:

1. DIP SIZED TO MATCH METER. USE 4" DIP AND REDUCERS IF METER IS SMALLER THAN 4".
2. 4" x 1-1/2" FIPT NYLON COATED DOUBLE STAINLESS STRAP SADDLE
3. 1-1/2" BALL CORP WITH FIPT x COMP ADAPTER
4. WALL SLEEVE (FLxMJ) TO BE USED WITH CAST IN-PLACE VAULTS.
5. FLANGE COUPLING ADAPTOR (FLxMJ)
6. SPOOL (PExFL) IF NEEDED
7. GATE VALVE RS CL 200 (FLxFL).
8. METER ASSEMBLY SEE NOTE 4.
9. 1-1/2" 90 DEGREE BEND, COMPRESSION
10. 1-1/2" FIPT "Y" STRAINER
11. FABRICATED ADJ. STAINLESS OR GALV. STEEL SUPPORT
12. UTILITY VAULT CO WITH DOUBLE DOOR TRAFFIC LOAD RATED LOCKING STEEL COVERS OR EQUAL.
13. UTILITY VAULT CO OR APPROVED EQUAL, PRECAST VAULT THAT PROVIDES MINIMUM CLEARANCES.
14. 2" GRAVITY SUMP DRAIN EXTEND TO DAYLIGHT OR STORM DRAINAGE SYSTEM.
15. NON-SHRINK GROUT
16. 1-1/2" TYPE K COPPER
17. SPOOL (FLxPE) WITH SHACKLE BOLTS TO BE USED ON PRECAST VAULTS.
18. FLANGE x FLANGE SPOOL, LENGTH AS REQUIRED
19. VERTICAL CLEARANCES PER STANDARD DETAIL NO. W-100

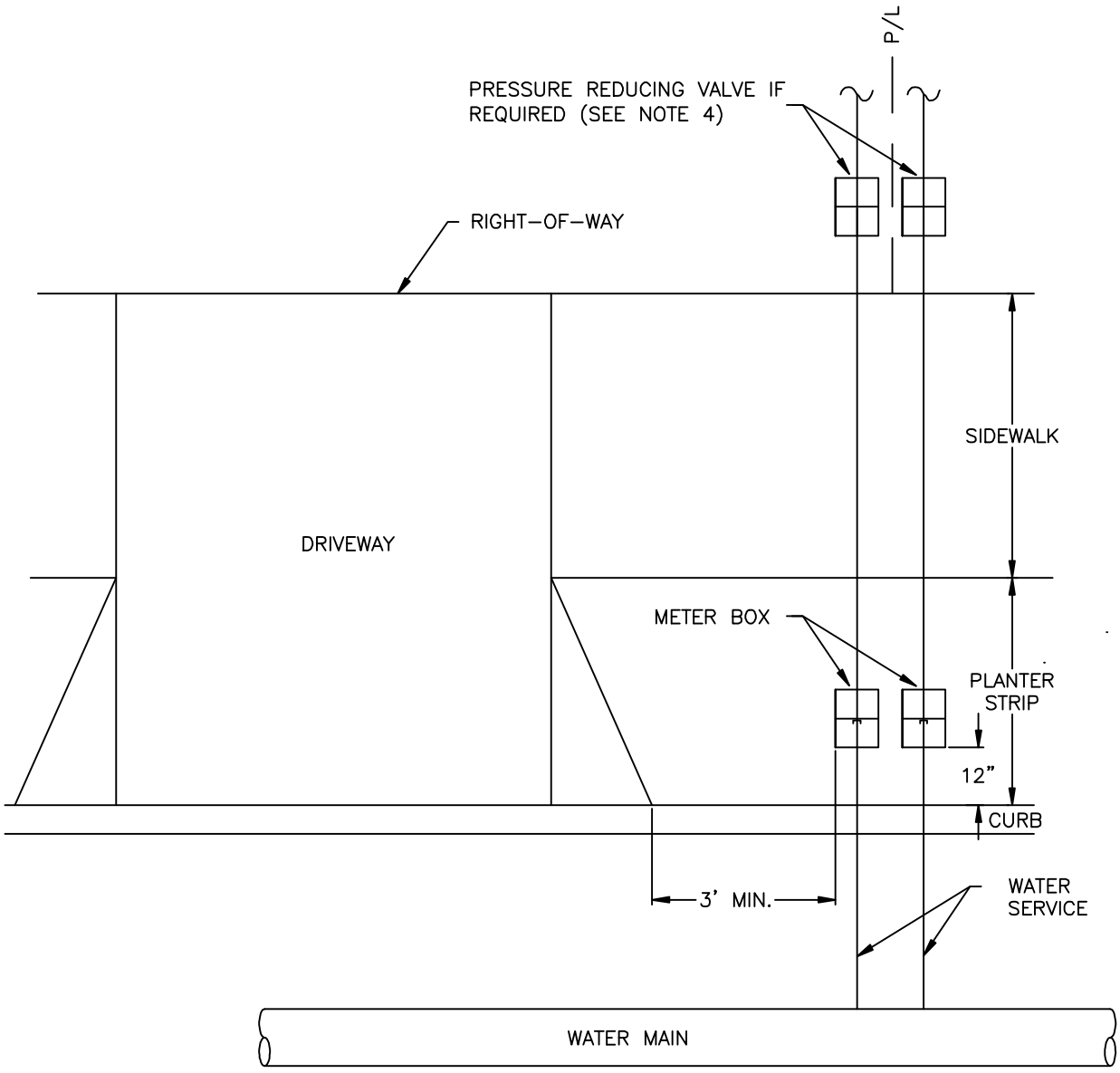
NOTES:

1. MINIMUM VAULT INSIDE HEIGHT SHALL BE 78".
2. METERS SHALL HAVE A 12" MINIMUM CLEARANCE BETWEEN FLOOR AND LOWEST PART OF METER.
3. MINIMUM CLEARANCE BETWEEN METER AND TOP OF VAULT SHALL BE 36".
4. BRAND AND STYLE OF METER AND ACCESSORIES TO BE DETERMINED BY CITY OF ARLINGTON UTILITIES DIVISION
5. PIPING AND VALVES SHALL BE SUPPORTED BY POURED-IN-PLACE CONCRETE OR GALVANIZED STEEL STANDS. THE NUMBER OF AND PLACEMENT OF SUPPORT STANDS TO BE DETERMINED BY CITY ENGINEER ACCORDING TO SIZE OF PIPE AND METER.
6. OS&Y VALVES SHALL HAVE A MINIMUM CLEARANCE OF 3" BETWEEN STEM AND TOP OF VAULT WHEN VALVE IS FULLY OPEN.

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS
	DATE	07/31/2008	
	REF STAD SPEC		3" AND 4" WATER SERVICE

STANDARD DETAIL NUMBER

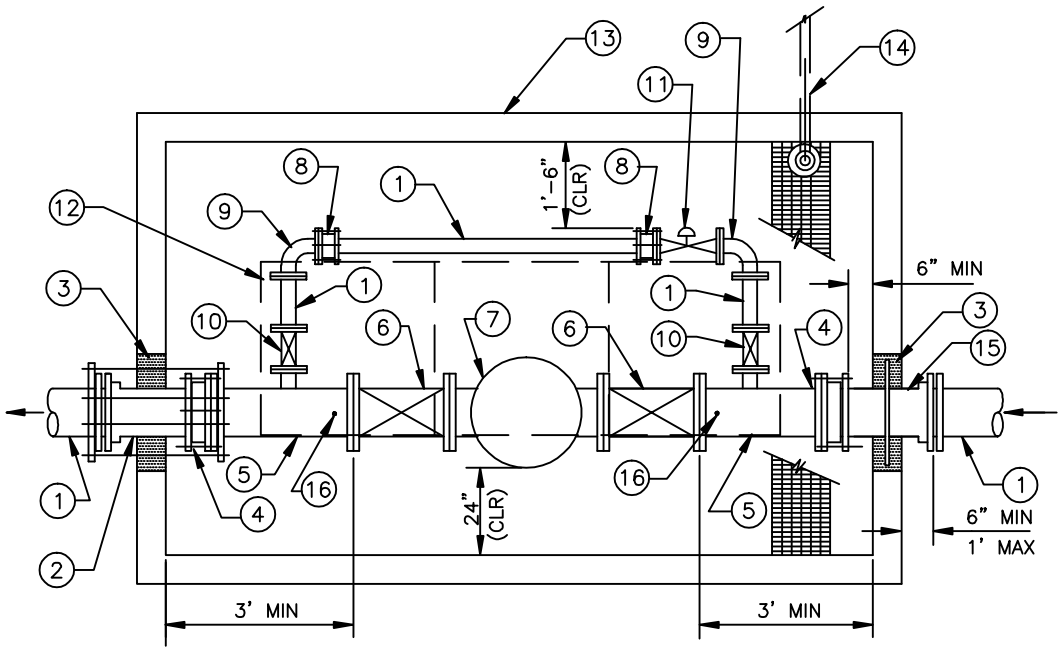
W-060



NOTES:

1. INDIVIDUAL METERS ARE REQUIRED FOR EACH RESIDENTIAL UNIT UP TO AND INCLUDING TRIPLEXES.
2. SEE STANDARD DETAIL NO. W–040 FOR CONFIGURATION OF METER AND SERVICE CONNECTION.
3. METER AND PRESSURE REDUCING VALVE (PRV) LOCATIONS SHOWN IN THE PLAN ARE APPROXIMATE. FINAL LOCATIONS SHALL BE DETERMINED BY CITY INSPECTOR DURING CONSTRUCTION.
4. A PRV IS REQUIRED IF THE STATIC PRESSURE AT THE METER IS GREATER THAN 80 POUNDS PER SQUARE INCH (PSI).
5. METER BOXES SHALL NOT BE INSTALLED IN DRIVEWAY OR OTHER TRAFFIC AREA UNLESS APPROVED BY CITY ENGINEER.
6. WHEN POSSIBLE CLUSTER METER BOXES AT PROPERTY LINES.

CITY OF ARLINGTON	APPROVED BY: L. OLIVE DATE: 07/31/2008 REF STAD SPEC:	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS WATER METER INSTALLATION LOCATIONS	STANDARD DETAIL NUMBER W–070



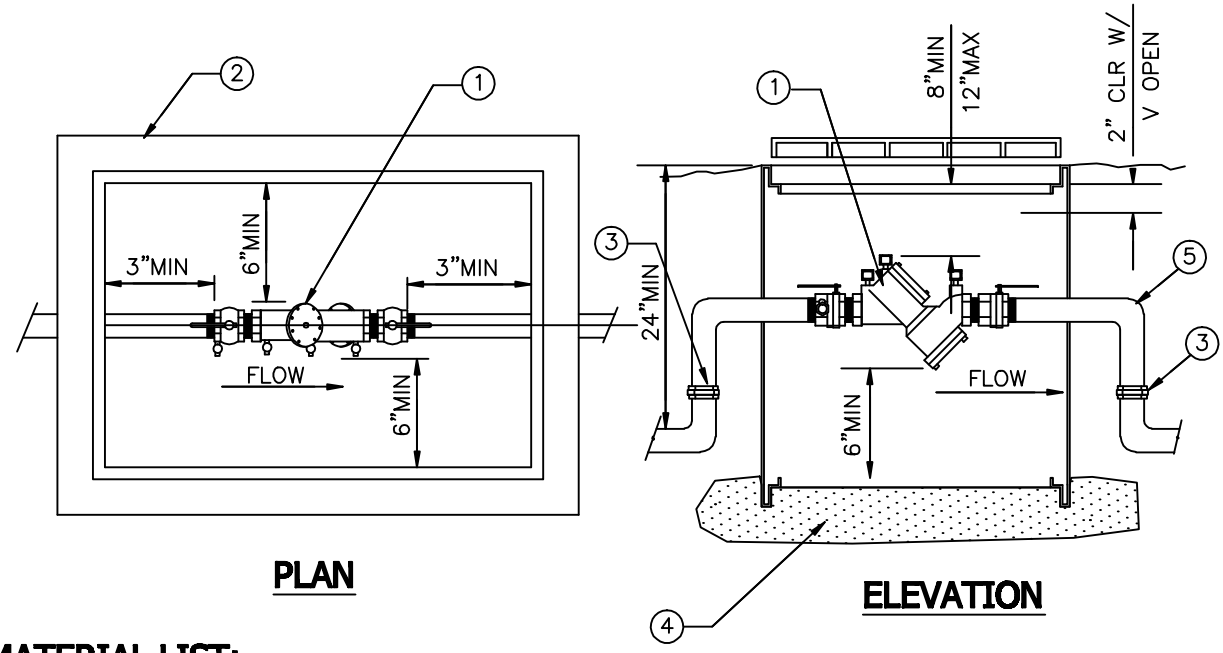
MATERIAL LIST:

1. DUCTILE IRON PIPE
2. SPOOL (MJxPE) WITH SHACKLE BOLTS TO BE USED IN PRECAST VAULTS
3. NON–SHRINK GROUT
4. FLANGE COUPLING ADAPTOR (FLxMJ)
5. TEE (ALL FL)
6. RESILIENT SEAT GATE VALVE CL 200 (FLxFL), MUELLER, MH OR APPROVED EQUAL
7. PRV CLAY–VAL (FLxFL) MOD 92G–01 GLOBE CL 200 TRIM SS303
8. FLANGE COUPLING ADAPTOR
9. 90° ELL (ALL MJ W/MEGA LUGS)
10. GATE VALVE (FLxFL)
11. PRV (FLxFL) MOD 92G–01 GLOBE CL 200 TRIM SS303
12. UTILITY VAULT CO LID WITH TRAFFIC SPRING LOADED LOCKING STEEL COVERS OR APPROVED EQUAL THAT PROVIDES MINIMUM CLEARANCE.
13. UTILITY VAULT CO PRECAST VAULT WITH TRAFFIC LOAD RATED DOUBLE DOOR.
14. 2" GRAVITY SUMP DRAIN EXTEND TO DAYLIGHT DRAIN
15. WALL SLEEVE (FLxPE) TO BE USED WITH CAST IN PLACE VAULTS.
16. 1/4" PRESSURE GAUGE TAPS WITH 1/4" BALL VALVES FOR ISOLATION.

NOTES:

1. MINIMUM VAULT INSIDE HEIGHT SHALL BE 78", OR AS APPROVED BY CITY ENGINEER.
2. MINIMUM CLEARANCE BETWEEN PRV'S AND FLOOR SHALL BE 12".
3. PROVIDE LIQUID FILLED 2 1/2" GAUGES AMETEK SERIES 550L OR EQUAL.
4. ALL EQUIPMENT MUST BE RATED FOR SOURCE PRESSURE.
5. PIPING AND VALVES SHALL BE SUPPORTED BY ADJUSTABLE GALVANIZED OR STAINLESS SUPPORTS. NUMBER OF AND PLACEMENT OF SUPPORTS TO BE DETERMINED BY CITY ENGINEER ACCORDING TO VALVE SIZE.
6. BRAND, MINIMUM CLEARANCES, TYPE OF PRV AND ACCESSORIES TO BE DETERMINED BY CITY OF ARLINGTON UTILITIES DIVISION.
7. ADDITIONAL VALVES ARE REQUIRED AT BOTH ENDS OF THE PRV STATION

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS	STANDARD DETAIL NUMBER
	DATE	07/31/2008		
	REF STAD SPEC		PRESSURE REDUCING STATION	W–080



MATERIAL LIST:

(1) WASHINGTON STATE APPROVED DOUBLE CHECK VALVE ASSEMBLY INCLUDING TWO BRASS BALL VALVES AND FOUR RESILIENT SEATED TEST COCKS.

(2) IN NON–TRAFFIC AREAS USE:
FOR 3/4" TO 1" ASSEMBLIES, USE A MID STATE MSBCF 1324–12.
FOR 1–1/4" TO 2" ASSEMBLIES, USE A MID STATE MSBCF 1730–18.
IN TRAFFIC AREAS:
A TRAFFIC LOADED BOX MUST BE USED AND LOCATION APPROVED BY THE CITY OF ARLINGTON PRIOR TO INSTALLATION.

(3) PROVIDE TWO UNIONS.

(4) IF A DAYLIGHT DRAIN CANNOT BE PROVIDED THERE MUST BE A 6" MIN LAYER OF FREE DRAINING GRAVEL AT THE BOTTOM OF BOX.

(5) ANGLES MAY BE IN OR OUT OF BOX SO LONG AS SUFFICIENT ROOM IS ALLOWED AT EACH END FOR VALVE OPERATION AND DCVA REPAIR OR MAINTENANCE.

NOTES:

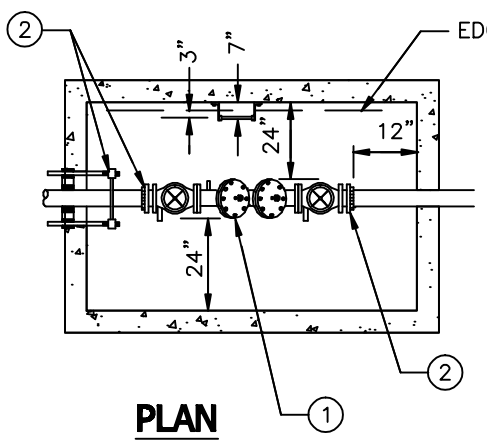
1. INSTALL ACCORDING TO MANUFACTURER'S SPECIFICATIONS.
2. INSTALL ONLY IN HORIZONTAL CONFIGURATION, UNLESS APPROVED OTHERWISE BY CITY ENGINEER.
3. INSTALL TEST COCKS FACE UP OR TO ONE SIDE.
4. INSTALL BRASS PLUGS IN ALL TEST COCKS.
5. FOR 3/4" TO 1" ASSEMBLIES, USE A MIDSTATES 1324–12.
6. FOR 1–1/4" TO 2" ASSEMBLIES, USE A MID STATE MSBCF 1730–18.
7. ASSEMBLY REQUIRES CERTIFICATION UPON INSTALLATION AND RECERTIFICATION ANNUALLY.
8. ALL MINIMUM CLEARANCES MUST BE MET. SEE STANDARD DETAIL NO. W–100.
9. ASSEMBLY MAY BE INSTALLED INSIDE BUILDING IF MINIMUM CLEARANCES ARE MET AND APPROVED BY CITY ENGINEER.
10. ALL BRANCH CONNECTIONS SHALL BE LOCATED DOWN STREAM OF THE ASSEMBLY. ANY BRANCH CONNECTION ON THE SUPPLY SIDE OF THE ASSEMBLY MUST BE PROTECTED BY A SEPARATE APPROVED BACKFLOW PREVENTION DEVICE.

APPROVED BY	L. OLIVE	
DATE	07/31/2008	
REF STAD SPEC		

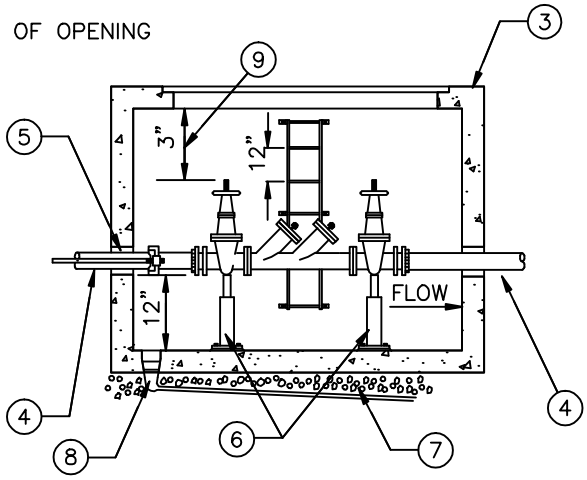
DEPARTMENT OF PUBLIC WORKS
STANDARD DETAILS

DOUBLE CHECK VALVE ASSEMBLY (DCVA) FOR 2" AND SMALLER

STANDARD DETAIL NUMBER
W–090



PLAN



ELEVATION

MATERIAL LIST:

(1) WASHINGTON STATE APPROVED DOUBLE CHECK VALVE ASSEMBLY INCLUDING: 2 EACH O.S.& Y RESILIENT SEATED GATE VALVES, AND FOUR RESILIENT SEATED TEST COCKS.

(2) UNI–FLANGE WITH SET SCREWS OR MJ x FL ADAPTER WITH MEGALUG OR GALVANIZED SHACKLE TO MAIN WITH TWO 3/4" RODS, OR MJ RETAINER GLANDS.

(3) PRECAST CONCRETE VAULT WITH STEEL ACCESS HATCH (AS MANUFACTURED BY UTILITY VAULT 675 LA/WA CO OR AN APPROVED EQUAL). COVER TO READ "WATER". PROVIDE OSHA APPROVED HOT DIPPED GALVANIZED STEEL LADDER. INSTALL LADDER IN SUCH A WAY AS TO PROVIDE VAULT ACCESS THAT DOES NOT INTERFERE WITH INSTALLED EQUIPMENT OR MAINTENANCE THEREOF. PROVIDE A SPRING LOADED TRAFFIC LOAD RATED DOUBLE DOOR.

(4) DUCTILE IRON PIPE (SIZED AS REQUIRED) CLASS 52.

(5) WATER TIGHT GROUT SHALL BE USED IN ALL VAULT PENETRATIONS.

(6) 2 EACH GALVANIZED OR STAINLESS STEEL ADJUSTABLE PIPE SUPPORTS FOR 2–1/2" AND LARGER PIPE.

(7) GRAVEL FOUNDATION AS REQUIRED.

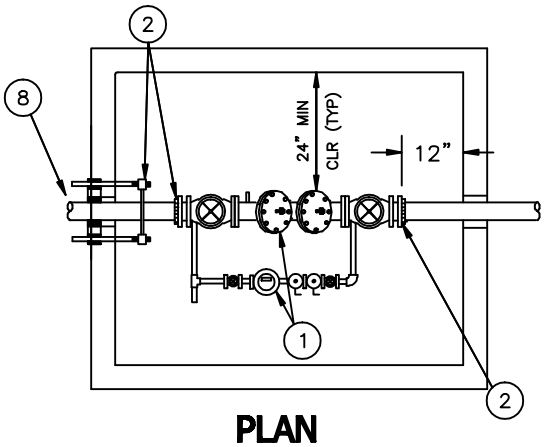
(8) DRAIN, SLOPE TO DAYLIGHT WHEN POSSIBLE PROVIDE A MINIMUM OF 12" FREE DRAINING GRAVEL UNDER THE VAULT IF DAYLIGHT DRAIN CANNOT BE PROVIDED.

(9) 3" MIN CLEARANCE FROM UNDERSIDE OF VAULT LID TO STEM AND OS&Y WHEN FULLY OPEN.

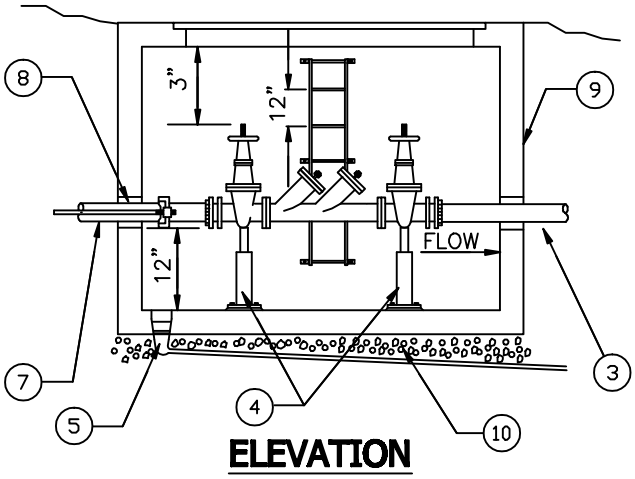
NOTES:

1. TEE AND GATE VALVE REQUIRED ON MAIN.
2. ASSEMBLY REQUIRES CERTIFICATION UPON INSTALLATION AND RECERTIFICATION ANNUALLY.
3. TEST COCKS ARE REQUIRED TO BE PLUGGED IF ASSEMBLY IS INSTALLED UNDERGROUND.
4. INDOOR INSTALLATION OF ASSEMBLY IN PERMISSIBLE IF MINIMUM CLEARANCES ARE MET AND APPROVED BY CITY ENGINEER.
5. MAXIMUM HEIGHT OF ASSEMBLY IS FIVE FEET UNLESS AN OSHA APPROVED PLATFORM IS PROVIDED.
6. MINIMUM INSIDE VAULT HEIGHT IS 78", OR AS APPROVED BY THE ENGINEER, FOR 2–1/2" SERVICE AND LARGER.
7. METER SHALL BE INSTALLED SUCH THAT IT CAN BE READ WITHOUT ENTERING VAULT WITH ACCESS HATCH OPEN.
8. ALL DIMENSIONS ARE MINIMUM CLEARANCE REQUIREMENTS.

CITY OF ARLINGTON	APPROVED BY: L. OLIVE DATE: 07/31/2008 REF STAD SPEC:	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS DOUBLE CHECK VALVE ASSEMBLY (DCVA) 2-1/2" AND LARGER	STANDARD DETAIL NUMBER W–100



PLAN



ELEVATION

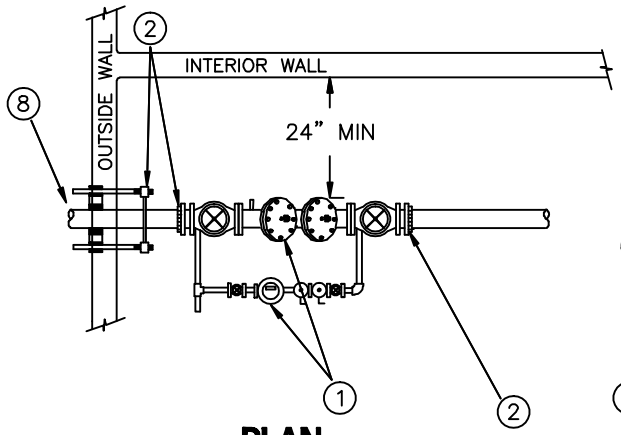
MATERIAL LIST:

1. WASHINGTON STATE APPROVED DOUBLE CHECK DETECTOR VALVE ASSEMBLY WHICH MUST BE INSTALLED IN THE SAME ORIENTATION FOR WHICH IT WAS APPROVED. ASSEMBLY TO INCLUDE: TEST COCKS, 3/4" BRASS OR COPPER BYPASS WITH IN-LINE VALVES AND A 5/8" REMOTE METER. METER TO READ IN CUBIC FEET, AND BE REMOTED TO AN EXTERNAL WALL OF BUILDING METER BOX.
2. UNI-FLANGE WITH SET SCREWS OR MJ x FL ADAPTER WITH MEGALUG OR GALVANIZED SHACKLE TO MAIN WITH TWO 3/4" RODS, OR MJ RETAINER GLANDS FOR BOTH UPSTREAM AND DOWNSTREAM OF ASSEMBLY.
3. DUCTILE IRON PIPE (SIZED AS REQUIRED) CLASS 52.
4. TWO GALVANIZED ADJUSTABLE PIPE SUPPORTS FOR 2-1/2" DIAMETER AND LARGER PIPE.
5. A MINIMUM 4" FLOOR DRAIN OR WALL FOOTING DRAIN MUST BE PROVIDED.
6. FLUSHING CAPABILITIES MUST BE PROVIDED WITH A 2" FLUSHING LINE DOWNSTREAM OF ASSEMBLY TO OUTSIDE OR APPROVED INTERNAL DRAIN.
7. WHERE ASSEMBLY IS TO BE LOCATED ABOVE EXTERNAL GROUND LEVEL, ALL BENDS REQUIRED TO LOWER INLET PIPE (TO PROVIDE REQUIRED EXTERNAL GROUND COVER) SHALL BE FLANGE FITTINGS OR BE WITH HORIZONTAL AND VERTICAL THRUST RESTRAINTS.
8. WATER TIGHT GROUT SHALL BE USED IN ALL VAULT PENETRATIONS.
9. PRECAST CONCRETE VAULT WITH STEEL ACCESS HATCH (AS MANUFACTURED BY UTILITY VAULT 675 LA/WA CO OR AN APPROVED EQUAL). COVER TO READ "WATER". PROVIDE OSHA APPROVED HOT DIPPED GALVANIZED STEEL LADDER. INSTALL LADDER IN SUCH AWAY AS TO PROVIDE VAULT ACCESS THAT DOES NOT INTERFERE WITH INSTALLED EQUIPMENT OR MAINTENANCE THEREOF PROVIDE A TRAFFIC LOAD RATED DOUBLE DOOR.
10. 5/8" CRUSHED ROCK BASE (6" MIN. DEPTH).

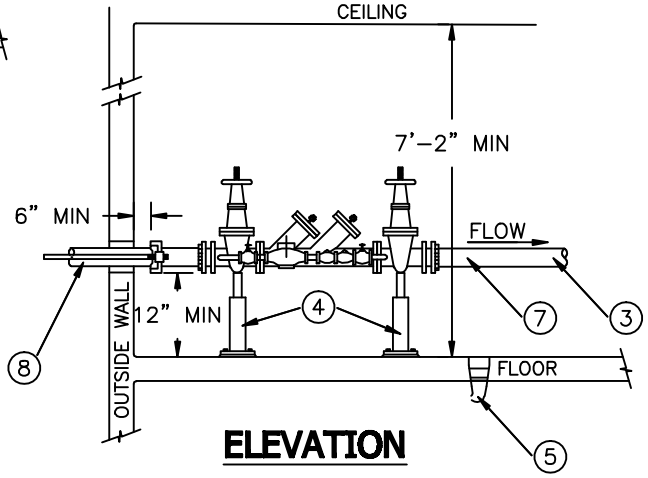
NOTES:

1. TEE AND GATE VALVE REQUIRED AT WATER MAIN.
2. ASSEMBLY REQUIRES CERTIFICATION UPON INSTALLATION, AND RECERIFICATION ANNUALLY AT OWNER'S EXPENSE.
3. TEST COCKS ARE REQUIRED TO BE PLUGGED.
4. MAXIMUM HEIGHT OF ASSEMBLY FROM FLOOR IS FIVE FEET UNLESS AN OSHA APPROVED PLATFORM IS PROVIDED.
5. FIRE DEPARTMENT PUMPER CONNECTION MUST BE DOWNSTREAM OF ASSEMBLY.
6. NEITHER OS & Y VALVE CAN BE USED AS A POST INDICATOR VALVE. (THESE ARE ONLY PART OF THE BACKFLOW ASSEMBLY)

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS	STANDARD DETAIL NUMBER
	DATE	07/31/2008		
	REF STAD SPEC		DOUBLE CHECK DETECTOR ASSEMBLY-OUTSIDE (DCDA) 2-1/2" AND LARGER SERVICES	W-110



PLAN



ELEVATION

MATERIAL LIST:

(1) UL–FM LISTED SOFT SEATED WASHINGTON ST APPROVED DOUBLE CHECK DETECTOR VALVE ASSEMBLY WHICH MUST BE INSTALLED IN THE SAME ORIENTATION FOR WHICH IT WAS APPROVED. ASSEMBLY TO INCLUDE: TEST COCKS, 3/4" BRASS OR COPPER BYPASS WITH IN–LINE VALVES AND A 5/8" REMOTE METER. METER TO READ IN CUBIC FEET, AND BE REMOTED TO AN EXTERNAL WALL OF BUILDING METER BOX.

(2) UNI–FLANGE WITH SET SCREWS OR MJ x FL ADAPTER WITH MEGALUG OR GALVANIZED SHACKLE TO MAIN WITH TWO 3/4" RODS, OR MJ RETAINER GLANDS FOR BOTH UPSTREAM AND DOWNSTREAM OF ASSEMBLY.

(3) DUCTILE IRON PIPE (SIZED AS REQUIRED) CLASS 52.

(4) TWO GALVANIZED ADJUSTABLE PIPE SUPPORTS FOR 2–1/2" DIAMETER AND LARGER PIPE.

(5) A 4" MINIMUM FLOOR DRAIN OR WALL FOOTING DRAIN MUST BE PROVIDED IN THE SAME ROOM.

(6) FLUSHING CAPABILITIES MUST BE PROVIDED WITH A 2" FLUSHING LINE DOWNSTREAM OF ASSEMBLY TO OUTSIDE OR AN APPROVED INTERNAL DRAIN.

(7) WHERE ASSEMBLY IS TO BE LOCATED ABOVE EXTERNAL GROUND LEVEL, ALL BENDS REQUIRED TO LOWER INLET PIPE (TO PROVIDE REQUIRED EXTERNAL GROUND COVER) SHALL BE FLANGE FITTINGS OR BE WITH HORIZONTAL AND VERTICAL THRUST RESTRAINTS.

(8) ALL WALL PENETRATIONS SHALL BE SEALED PER THE CURRENT BUILDING CODE.

NOTES:

1. TEE AND GATE VALVE REQUIRED AT WATER MAIN.
2. ASSEMBLY REQUIRES CERTIFICATION UPON INSTALLATION, AND RECERTIFICATION ANNUALLY AT OWNER'S EXPENSE.
3. TEST COCKS ARE REQUIRED TO BE PLUGGED.
4. MAXIMUM HEIGHT OF ASSEMBLY FROM FLOOR IS FIVE FEET UNLESS AN OSHA APPROVED PLATFORM IS PROVIDED.
5. ALL DIMENSIONS ARE MINIMUM CLEARANCE REQUIREMENTS.
6. FIRE DEPARTMENT PUMPER CONNECTION MUST BE DOWNSTREAM OF ASSEMBLY.
7. NEITHER OS & Y VALVE CAN BE USED AS A POST INDICATOR VALVE (THESE ARE ONLY PART OF THE BACKFLOW ASSEMBLY).
8. THE ROOM SHOULD BE INSULATED PER THE CURRENT BUILDING CODE AND HEATED TO ABOVE FREEZING. ONLY CONSTRUCTION MATERIALS THAT CAN WITHSTAND OCCASIONAL SUBMERGENCE WILL BE ALLOWED.

APPROVED BY	L. OLIVE	
DATE	07/31/2008	
REF STAD SPEC		

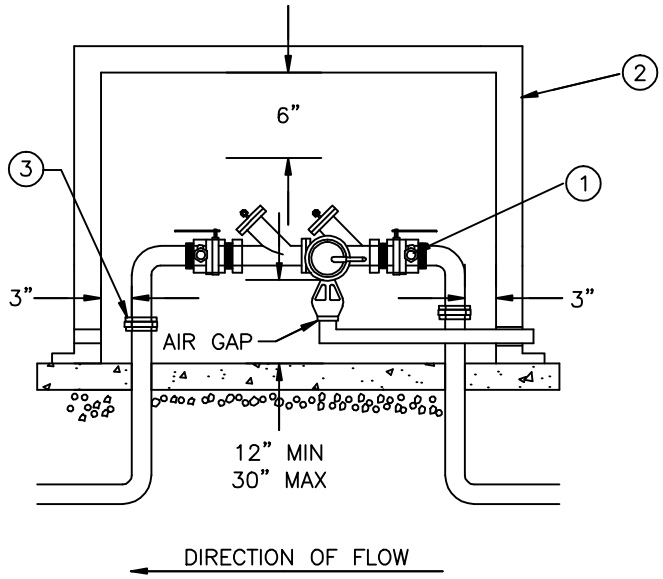
DEPARTMENT OF PUBLIC WORKS

STANDARD DETAILS

DOUBLE CHECK DETECTOR ASSEMBLY–INSIDE (DCDA) 2–1/2" AND LARGER SERVICES

STANDARD DETAIL NUMBER

W–120



ELEVATION

MATERIAL LIST:

1. UL–FM LISTED WASHINGTON STATE APPROVED REDUCED PRESSURE BACKFLOW ASSEMBLY INCLUDING TWO BALL VALVES, AND TESTS COCKS.
2. INSULATED PROTECTIVE ENCLOSURE (HOT BOX) REQUIRED FOR OUTSIDE INSTALLATIONS. THE PROTECTIVE ENCLOSURE MUST BE PROVIDED WITH DRAINS AT BOTH ENDS OF THE BOTTOM SUFFICIENTLY SIZED TO PROVIDED FREE GRAVITY DRAINAGE OF MAXIMUM DISCHARGE OF RELIEF VALVE PORT (2" MIN).
3. 90° ELBOW WITH A CLOSE NIPPLE AND UNION ON VERTICAL.

NOTES:

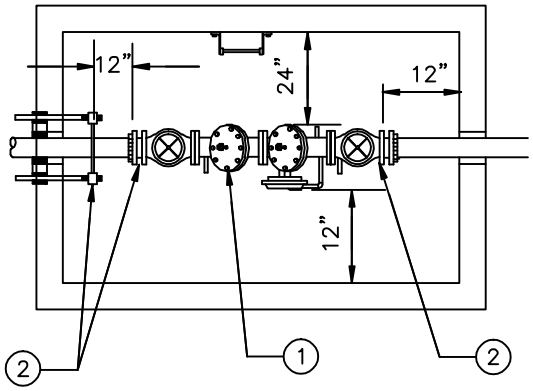
1. ASSEMBLY REQUIRES CERTIFICATION UPON INSTALLATION AND RECERTIFICATION ANNUALLY, BY OWNER.
2. THE ENCLOSURE MUST BE INSTALLED ON A 4" THICK CONCRETE PAD.
3. AN ELECTRICAL OUTLET MUST BE PROVIDED.
4. GUARD POSTS SHALL BE INSTALLED IF LOCATED IN A TRAFFIC AREA.
5. ALL BRANCH CONNECTIONS SHALL BE LOCATED ON THE DOWNSTREAM SIDE OF THE ASSEMBLY.

APPROVED BY	L. OLIVE	
DATE	07/31/2008	
REF STAD SPEC		

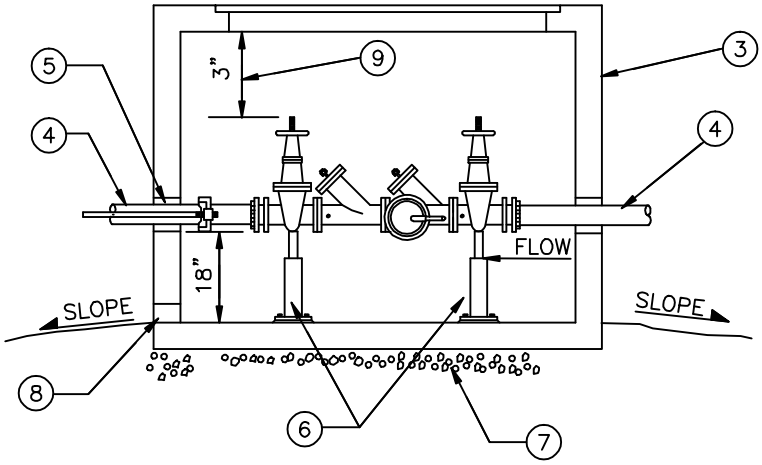
DEPARTMENT OF PUBLIC WORKS
STANDARD DETAILS

REDUCED PRESSURE BACKFLOW ASSEMBLY (RPBA) 2" AND SMALLER

STANDARD DETAIL NUMBER
W–130



PLAN



ELEVATION

MATERIAL LIST:

1. WASHINGTON STATE APPROVED REDUCED PRESSURE BACKFLOW ASSEMBLY INCLUDING: 2–O.S.& Y RESILIENT SEATED GATE VALVES, AND TEST COCKS.
2. UNI–FLANGE WITH SET SCREWS OR MJ x FL ADAPTOR WITH MEGALUG OR GALVANIZED SHACKLE TO MAIN WITH TWO 3/4" RODS, OR MJ RETAINER GLANDS.
3. PRECAST CONCRETE ENCLOSURE WITH STEEL ACCESS HATCH (AS MANUFACTURED BY UTILITY VAULT CO OR APPROVED EQUAL). ABOVE GROUND INSTALLATIONS WILL BE PROVIDED WITH 6'–6"x36" STEEL DOOR FOR ACCESS, THE EXTERIOR WILL BE PAINTED WITH AN APPROVED PAINT, PROVIDED WITH SUFFICIENT INSULATION TO PREVENT FREEZING AND SITE WILL BE PROVIDED WITH A 6' HIGH SECURITY FENCE WITH PEDESTRIAN AND VEHICLE GATES. SEMI–BURIED INSTALLATIONS WILL BE PROVIDED WITH OSHA APPROVED LADDER. INSTALLED IN SUCH A WAY AS TO NOT INTERFERE WITH INSTALLED EQUIPMENT MAINTENANCE.
4. DUCTILE IRON PIPE (SIZED AS REQUIRED) CLASS 52.
5. WATER TIGHT GROUT SHALL BE USED IN ALL VAULT PENETRATIONS.
6. 2 EACH GALVANIZED ADJUSTABLE PIPE SUPPORTS.
7. 5/8" CRUSHED ROCK FOUNDATION AS REQUIRED.
8. DRAIN SHALL BE INSTALLED WITH APPROVED AIR GAP, BE ABLE TO BE BORE SIGHTED TO DAYLIGHT WHICH MUST BE ABOVE 100 YEAR FLOOD LEVEL. DRAIN WILL BE SIZED SO AS TO PROVIDE FREE GRAVITY DRAINAGE OF MAXIMUM DISCHARGE OF RELIEF VALVE PORT.
9. 3" MIN CLEARANCE FROM UNDERSIDE OF VAULT LID TO STEM OF OS&Y WHEN FULLY OPEN.

NOTES:

1. TEE AND GATE VALVE REQUIRED AT WATER MAIN.
2. TEST COCKS ARE REQUIRED TO BE PLUGGED.
3. MAXIMUM HEIGHT OF ASSEMBLY IS FIVE FEET UNLESS AN OSHA APPROVED PLATFORM IS PROVIDED.
4. MINIMUM INSIDE VAULT HEIGHT IS 78", OR AS APPROVED BY CITY ENGINEER, FOR 2–1/2" SERVICE AND LARGER.
5. INSIDE INSTALLATIONS SEE STD. DETAIL NO. W–120.
6. ALL DIMENSIONS ARE MINIMUM CLEARANCE REQUIREMENTS.
7. ASSEMBLY REQUIRES CERTIFICATION UPON INSTALLATION AND RECERTIFICATION ANNUALLY.

CITY OF ARLINGTON	APPROVED BY	L. OLIVE
	DATE	07/31/2008
	REF STAD SPEC	

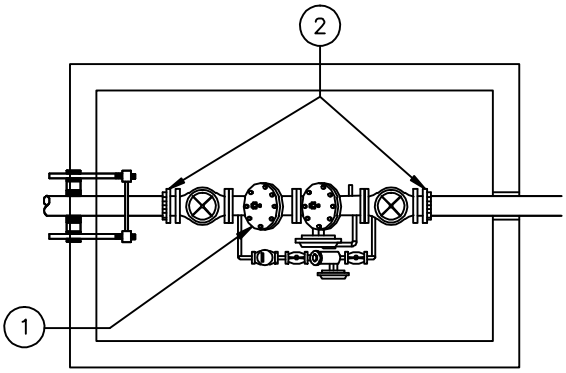
DEPARTMENT OF PUBLIC WORKS

STANDARD DETAILS

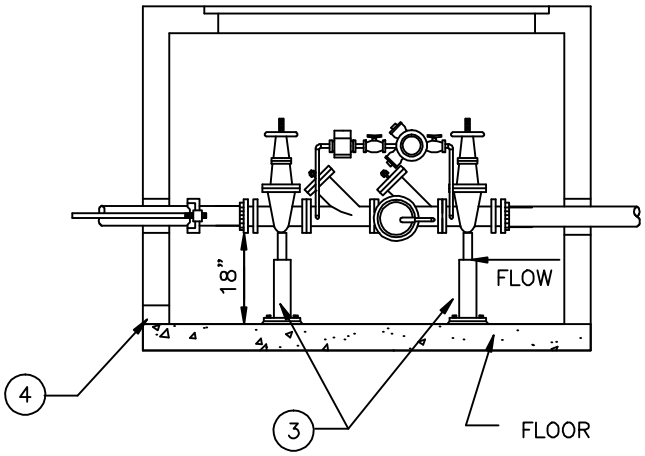
REDUCED PRESSURE BACKFLOW ASSEMBLY (RPBA) 2–1/2" AND LARGER

STANDARD DETAIL NUMBER

W–140



PLAN



ELEVATION

MATERIAL LIST:

(1) WASHINGTON STATE APPROVED REDUCED PRESSURE DETECTOR ASSEMBLY INCLUDING: 2 EACH O.S.& Y RESILIENT SEATED GATE VALVES, TEST COCKS, 3/4" BRASS OR COPPER BYPASS WITH IN-LINE VALVES, 5/8" METER (METER TO READ IN CUBIC FEET), AND A 3/4" REDUCED PRESSURE BACKFLOW ASSEMBLY.

(2) UNI-FLANGE WITH SET SCREWS OR MJ x FL ADAPTER WITH MEGALUG OR GALVANIZED SHACKLE TO MAIN WITH 2 EACH 3/4" RODS, OR MJ RETAINER GLANDS.

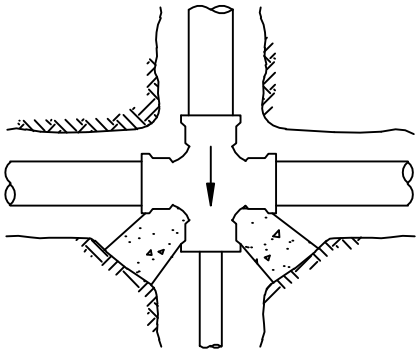
(3) TWO – GALVANIZED ADJUSTABLE PIPE SUPPORTS FOR 2-1/2" DIAMETER AND LARGER PIPE.

(4) DRAIN SHALL BE INSTALLED WITH APPROVED AIR GAP, BE ABLE TO BE BORE SIGHTED TO DAYLIGHT WHICH MUST BE ABOVE 100 YEAR FLOOD LEVEL. DRAIN WILL BE SIZED SO AS TO PROVIDE FREE GRAVITY DRAINAGE OF MAXIMUM DISCHARGE OF RELIEF VALVE PORT.

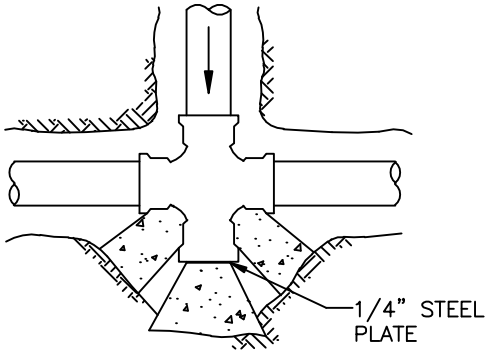
NOTES:

1. TEE AND GATE VALVE REQUIRED AT WATER MAIN.
2. TEST CLOCKS ARE REQUIRED TO BE PLUGGED IF ASSEMBLY IS INSTALLED UNDERGROUND.
3. ASSEMBLY REQUIRES CERTIFICATION UPON INSTALLATION AND RECERTIFICATION ANNUALLY, BY OWNER.
4. 3" AND LARGER RPDAS REQUIRE EITHER AN APPROVED BUILDING ENCLOSURE OR MUST BE INSTALLED INSIDE THE BUILDING BEING SERVED.

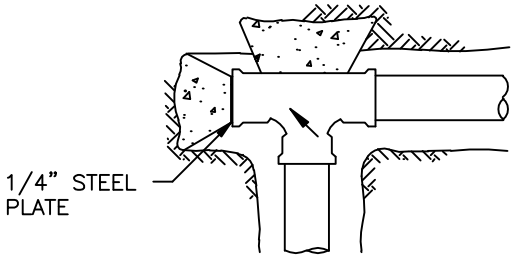
CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS	STANDARD DETAIL NUMBER
	DATE	07/31/2008		
	REF STAD SPEC		REDUCED PRESSURE DETECTOR ASSEMBLY (RPDA) 3" AND LARGER	W-150



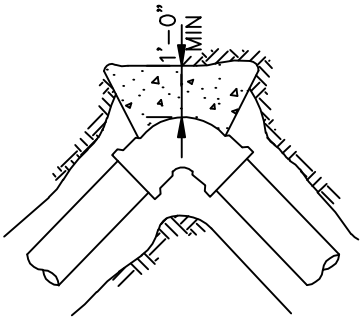
UNBALANCED CROSS



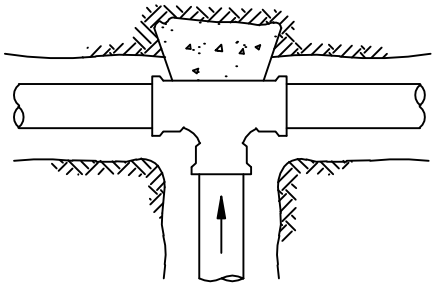
CROSS WITH PLUG



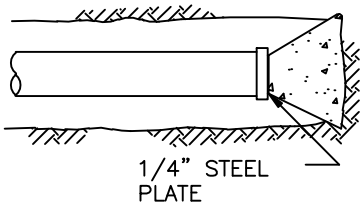
PLUGGED TEE



HORIZONTAL BEND



TEE



PIPE & CAP

THRUST BLOCK AREA IN SQUARE FEET (SEE STD DETAIL NO W-165)

PIPE SIZE	SOIL	FIRM SILT OR FIRM SILTY SAND				COMPACT SAND				COMPACT SAND & GRAVEL			
	FITTING	90° BEND	TEE	45° BEND CAP OR PLUG	11 1/4° & 22 1/2° BEND	90° BEND	TEE	45° BEND CAP OR PLUG	11 1/4° & 22 1/2° BEND	90° BEND	TEE	45° BEND CAP OR PLUG	11 1/4° & 22 1/2° BEND
	4"	7.0	4.2	4.2	1.7	2.9	2.1	2.1	1.0	2.2	1.6	1.6	1.0
	6"	13.3	9.4	9.4	3.8	6.7	4.7	4.7	1.9	5.0	3.5	3.5	1.4
	8"	23.3	16.7	16.7	6.7	11.7	8.4	8.4	3.4	8.8	6.3	6.3	2.5
	12"	53.0	37.5	37.5	15.0	26.5	18.8	18.8	7.5	20.0	14.0	14.0	5.6
AREAS CALCULATED ON 300 PSI TEST PRESSURE AND 3'-0" MIN COVER OVER WATERMAIN													

▨ IF ECOLOGY BLOCKS MAY BE USED IN LIEU OF POURED-IN-PLACE BLOCKING FOR FITTINGS IN SHADED PORTION OF TABLE RESTRAINED JOINTS MUST BE USED.

FOR NOTES SEE STD DETAIL NO W-165

CITY OF ARLINGTON

APPROVED BY	L. OLIVE
DATE	07/31/2008
REF STAD SPEC	

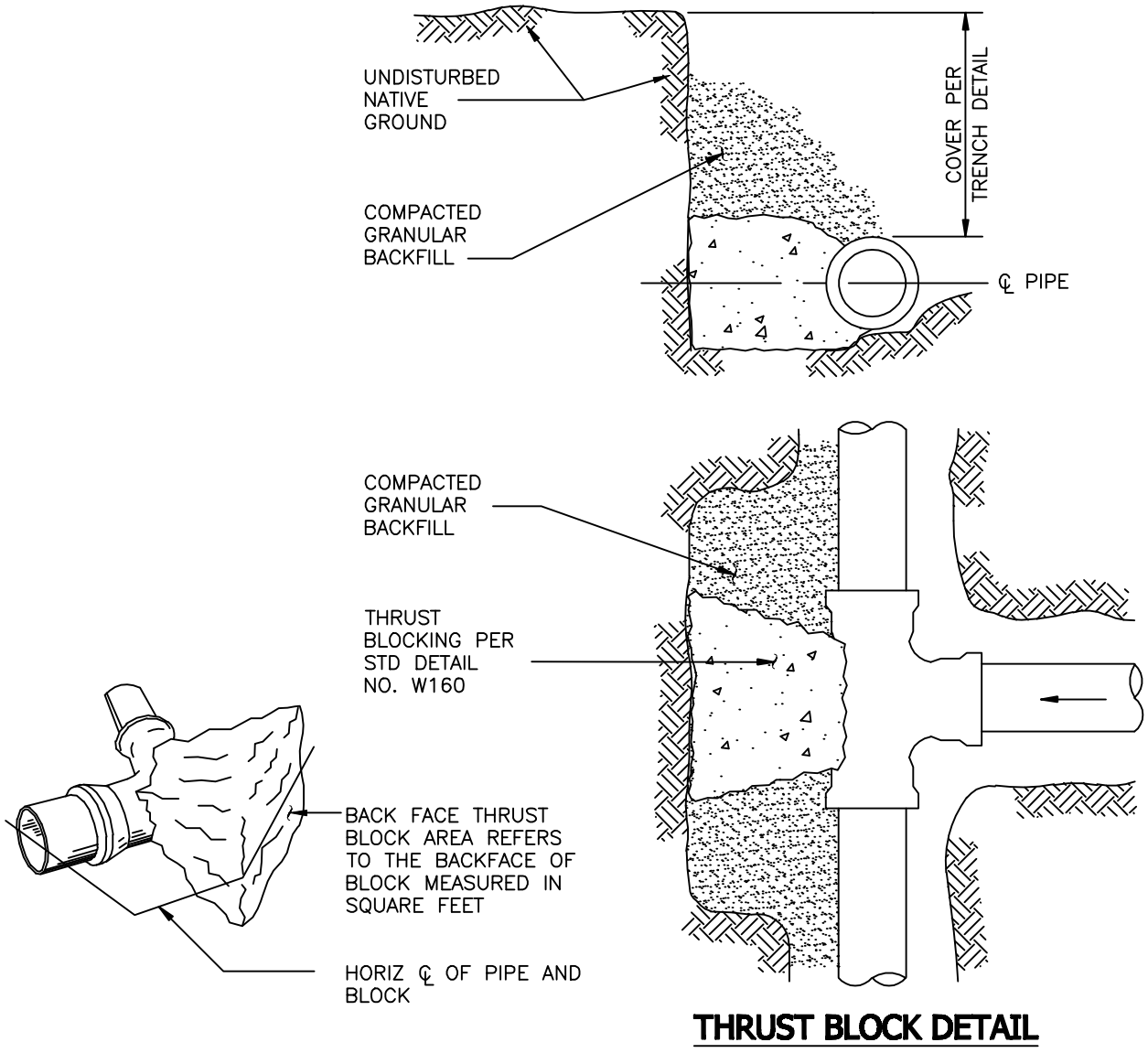
DEPARTMENT OF PUBLIC WORKS

STANDARD PLANS

THRUST BLOCK

STANDARD DETAIL NUMBER

W-160

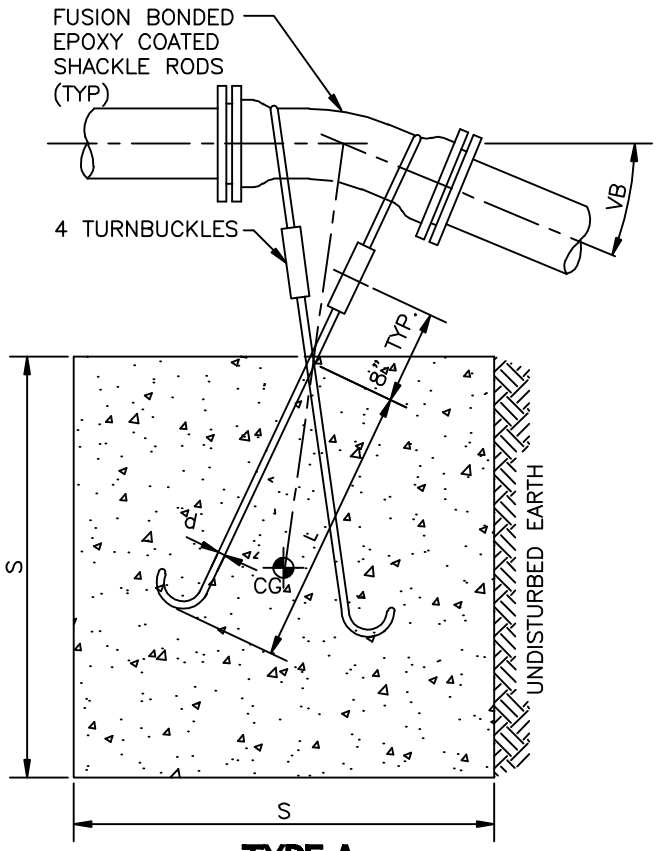


THRUST BLOCK DETAIL

NOTES:

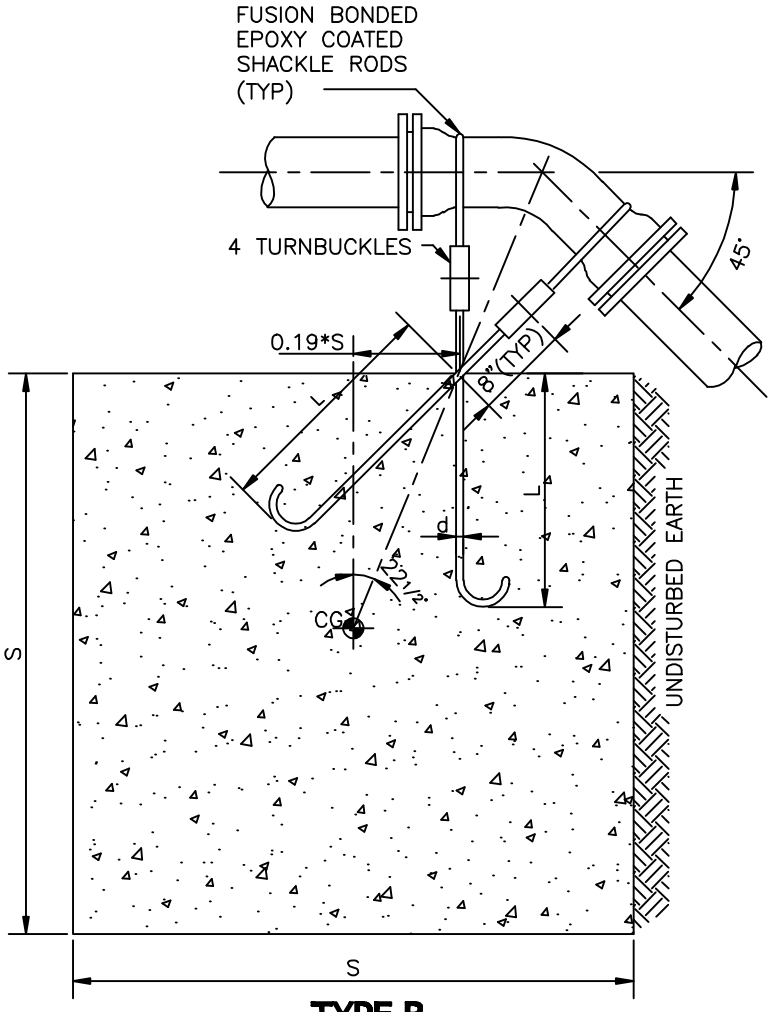
1. LOCATION AND SIZE OF BLOCKING FOR PIPE LARGER THAN 12" DIAMETER AND FOR SOIL TYPES DIFFERENT THAN SHOWN SHALL BE DETERMINED BY THE CITY ENGINEER.
2. ALL BLOCKING FOR HORIZONTAL FITTINGS (POURED IN PLACE) SHALL BEAR AGAINST UNDISTURBED NATIVE GROUND OR FILL MATERIAL COMPACTED TO 95% MAXIMUM DENSITY.
3. ALL POURED THRUST BLOCKS SHALL BE BACKFILLED AFTER MINIMUM 1 DAY. PRESSURE TESTING SHALL OCCUR AFTER CONCRETE HAS REACHED COMPRESSIVE STRENGTH (f'c).
4. ALL BLOCKING TO BE CONCRETE CL 3000–1 (3000 PSI).
5. BLOCKING AGAINST FITTINGS SHALL BEAR AGAINST THE GREATEST FITTING SURFACE AREA POSSIBLE, BUT SHALL NOT COVER OR ENCLOSE BELL ENDS, JOINT BOLTS OR GLANDS. ACCESS TO BOLTS AND GLANDS SHALL BE PROVIDED.
6. ALL HORIZONTAL BLOCKING THRUST AREAS SHALL BE CENTERED ON PIPE.
7. WHERE POURED–IN–PLACE BLOCKING IS REQUIRED AT A POINT OF CONNECTION TO AN EXISTING WATERMAIN, THE BLOCKING SHALL BE INSTALLED PRIOR TO CONNECTION WHENEVER POSSIBLE OR AS DIRECTED BY THE CITY ENGINEER.
8. TEMPORARY BLOCKING, IF USED, SHALL BE APPROVED BY THE CITY ENGINEER.

CITY OF ARLINGTON	APPROVED BY: L. OLIVE DATE: 07/31/2008 REF STAD SPEC:	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS THRUST BLOCK	STANDARD DETAIL NUMBER W–165



TYPE A

TYPE A BLOCKING FOR 11 1/4° & 22 1/2° VERTICAL BENDS						
		VB		S	d	L
PIPE SIZE NOM DIA INCHES	TEST PRESSURE PSI	VERTICAL BEND DEGREES	NO OF CU FT OF CONC BLOCKING	SIDE OF CUBE FEET	DIA OF SHACKLE RODS (2) INCHES	DEPTH OF RODS IN CONCRETE INCHES
4"	300	11 1/4	8	2	3/4	18
		22 1/2	12	2 1/4		24
6"	300	11 1/4	12	2 1/4	3/4	24
		22 1/2	27	3		
8"	300	11 1/4	16	2 1/2	3/4	24
		22 1/2	43	3 1/2		
12"	300	11 1/4	64	4	1	36
		22 1/2	125	5	1	36

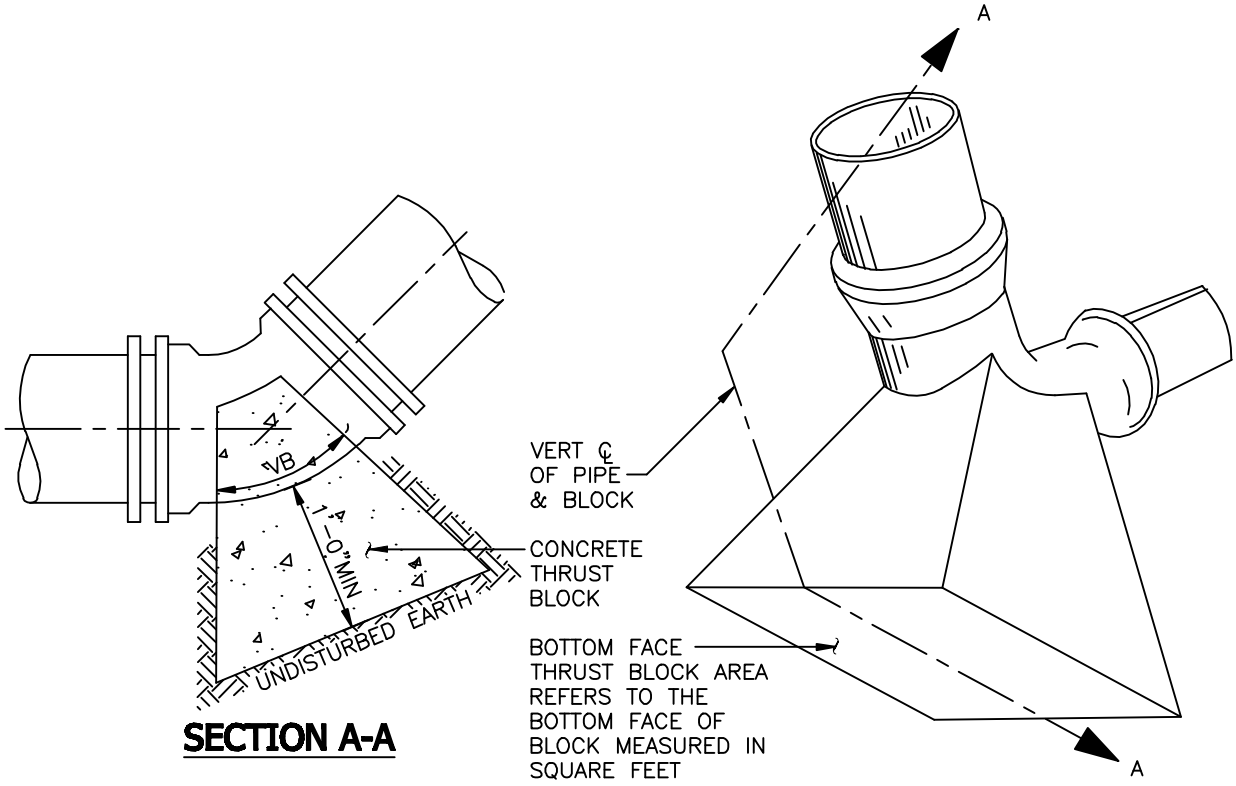


TYPE B

TYPE B BLOCKING FOR 45° VERTICAL BENDS						
		VB		S	d	L
PIPE SIZE NOM DIA (INCHES)	TEST PRESSURE (PSI)	VERTICAL BEND (DEGREES)	NO OF CU FT OF CONC BLOCKING	SIDE OF CUBE (FEET)	DIA OF SHACKLE RODS (4) (INCHES)	DEPTH OF RODS IN CONCRETE (INCHES)
4"	300	45	27	3	3/4	20
6"			64	4		
8"			125	5		
12"			216	6	1	30

FOR NOTES SEE STD DETAIL NO. W-175

APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS	STANDARD DETAIL NUMBER
DATE	07/31/2008	VERTICAL THRUST BLOCK TYPE A & TYPE B	W-170
REF STAD SPEC			



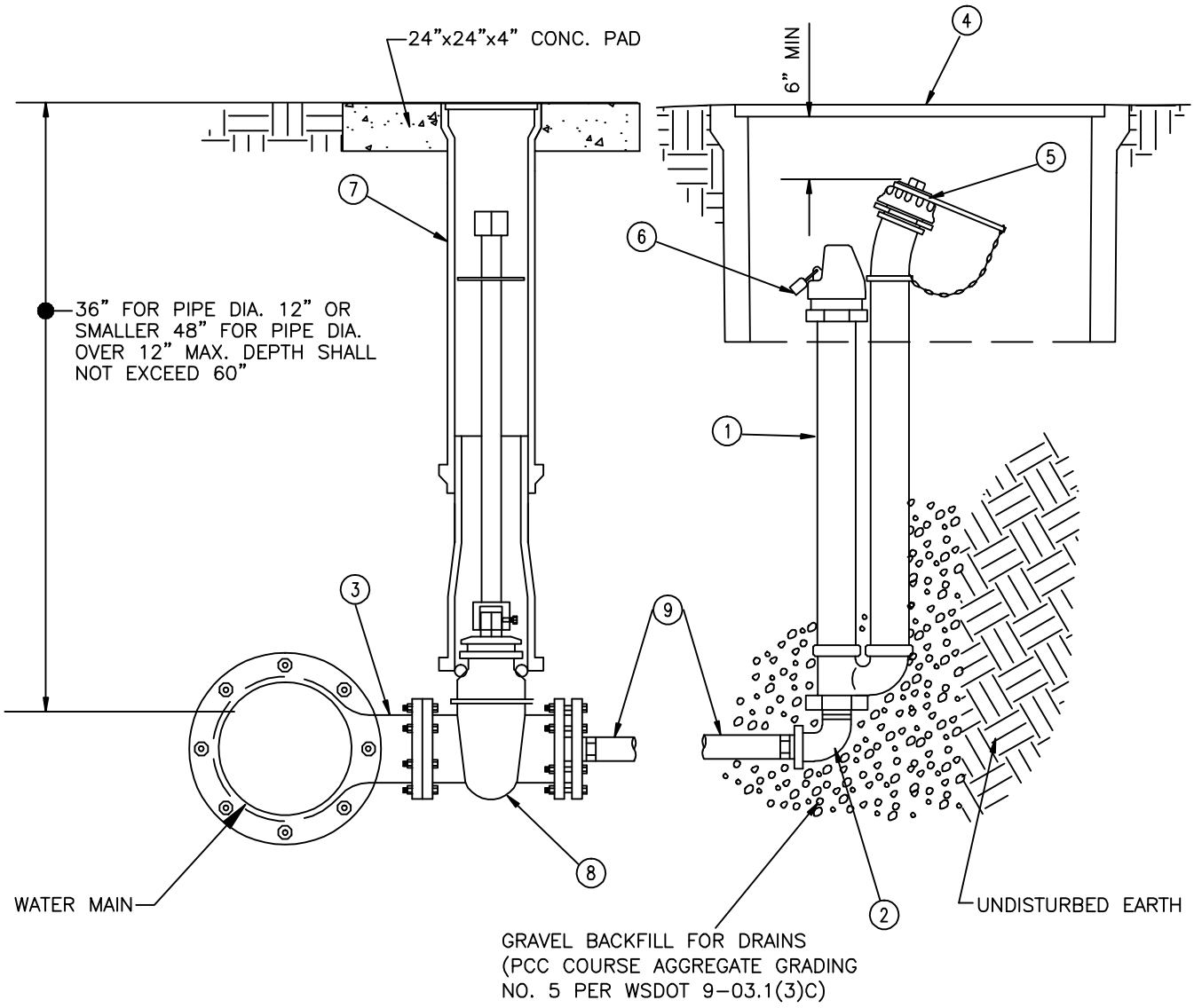
SECTION A-A

TYPE "C" BLOCKING FOR 11¼°, 22½°, 45° AND 90° VERTICAL BENDS THRUST BLOCK AREA IN SQUARE FEET									
SOIL	FIRM SILT OR FIRM SILTY SAND			COMPACT SAND			COMPACT SAND & GRAVEL		
PIPE SIZE / FITTING	90° BEND	TEE, 45°BEND & DEAD END	11¼° & 22½° BEND	90° BEND	TEE, 45°BEND & DEAD END	11¼° & 22½° BEND	90° BEND	TEE, 45°BEND & DEAD END	11¼° & 22½° BEND
4"	5.8	4.2	1.7	2.9	2.1	1.0	2.2	1.6	1.0
6"	13.3	9.4	3.8	6.7	4.7	1.9	5.0	3.5	1.4
8"	23.3	16.7	6.7	11.7	8.4	3.4	8.8	6.3	2.5
12"	53.0	37.5	15.0	26.5	18.8	7.5	20.0	14.0	5.6
AREAS CALCULATED ON 300 PSI TEST PRESSURE AND 3'-0"MIN COVER OVER WATERMAIN									

NOTES:

1. LOCATION AND SIZE OF BLOCKING FOR PIPE LARGER THAN 12" DIAMETER AND FOR SOIL TYPES DIFFERENT THAN SHOWN SHALL BE DETERMINED BY THE CITY ENGINEER.
2. ALL BLOCKING FOR VERTICAL FITTINGS (POURED IN PLACE) SHALL BEAR AGAINST UNDISTURBED NATIVE GROUND.
3. ALL POURED THRUST BLOCKS SHALL BE BACKFILLED AFTER MINIMUM 1 DAY. PRESSURE TESTING SHALL OCCUR AFTER CONCRETE HAS REACHED COMPRESSIVE STRENGTH (f'c).
4. ALL BLOCKING SHALL BE CONCRETE CL 3000-1 (3000 psi).
5. AFTER INSTALLATION, SHACKLE RODS & TURNBUCKLES SHALL BE CLEANED AND COATED WITH 2 COATS OF ASPHALTIC VARNISH, ROYSTON ROYKOTE #612M OR APPROVED EQUAL.
6. SHACKLE RODS SHALL BE FUSION BONDED EPOXY COATED ROUND MILD STEEL, ASTM A 36.
7. BLOCKING AGAINST FITTINGS SHALL BEAR AGAINST THE GREATEST FITTING SURFACE AREA POSSIBLE, BUT SHALL NOT COVER OR ENCLOSE BELL ENDS, JOINT BOLTS OR GLANDS REASONABLE ACCESS TO BOLTS AND GLANDS SHALL BE PROVIDED.

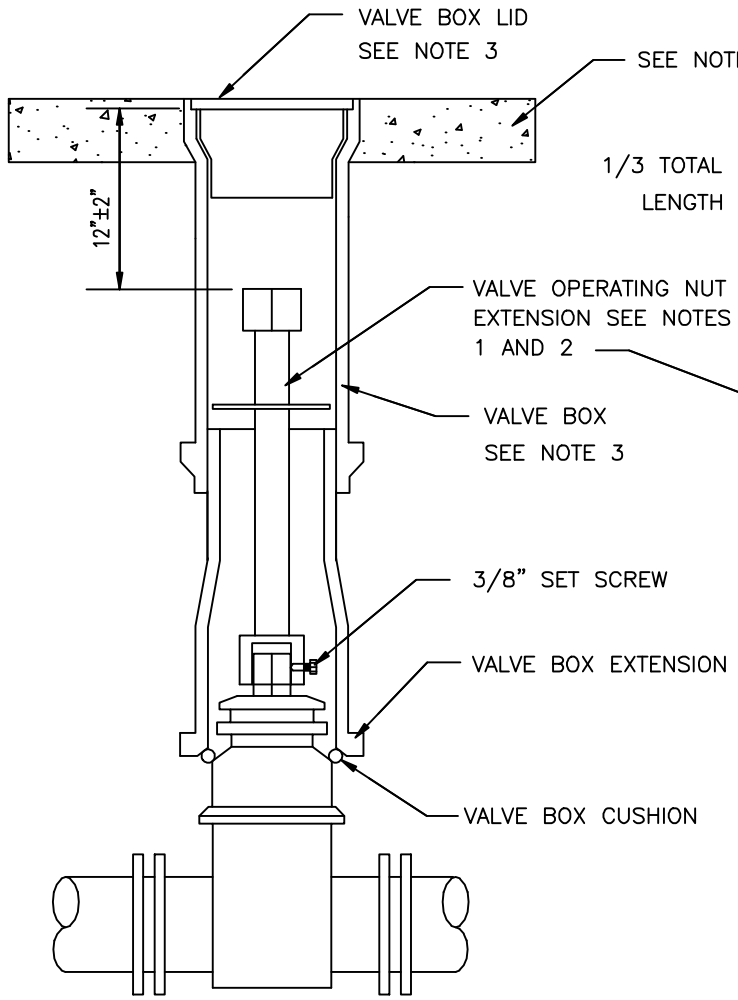
CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS	STANDARD DETAIL NUMBER
	DATE	07/31/2008		
	REF STAD SPEC		VERTICAL THRUST BLOCK TYPE C	W-175



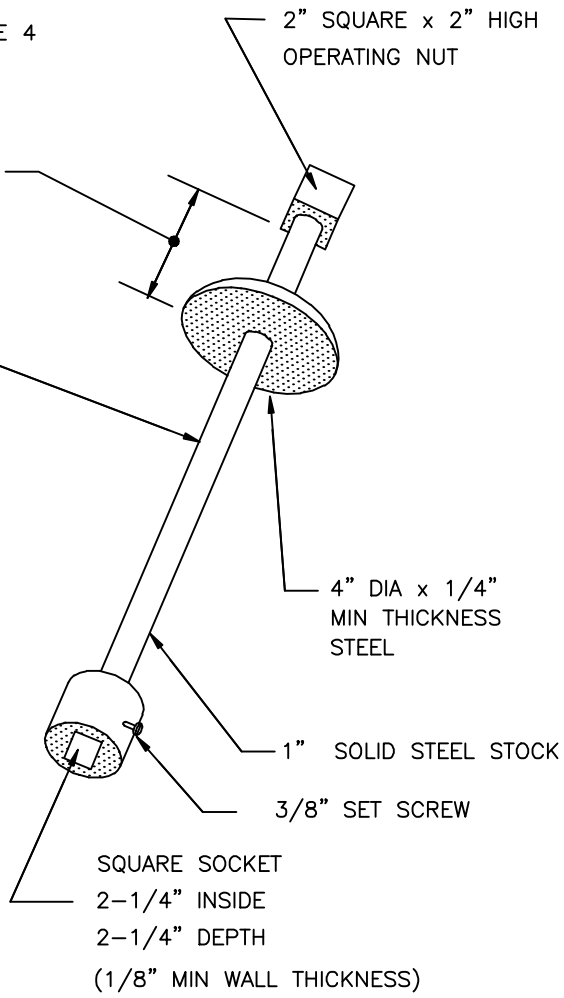
MATERIAL LIST:

1. BLOWOFF HYDRANT KUPFERLE FOUNDRY #78 BRONZE TO BRONZE DESIGN SERVICEABLE FROM ABOVE WITH OUTLET EXPOSED. 2-1/2" NST OUTLET LOCKING CAP ON OPERATOR.
2. 2" BRASS 90° BEND
3. MAINLINE SIZE TEE WITH 6" FLANGE
4. MID-STATES PLASTICS METER BOX MSBCF 1730-18/W DI LID.
5. 2-1/2" CAP NATIONAL STANDARD THREAD.
6. LOCK TO BE SUPPLIED BY CITY OF ARLINGTON.
7. CAST IRON VALVE BOX AND EXTENSION PER STD DETAIL W-190
8. 6" GATE VALVE WITH RESILIENT SEAT (MUELLER, M&H OR APPROVED EQUAL) WITH A 6" FLANGE X 2" COMPANION FLANGE
9. 2" HDPE HI MOL CL 200 CTS POLY PIPE W/2 2" MIP COMPRESSION ADAPTERS

CITY OF ARLINGTON	APPROVED BY: L. OLIVE DATE: 07/31/2008 REF STAD SPEC:	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS 2" BLOWOFF ASSEMBLY	STANDARD DETAIL NUMBER W-180



VALVE BOX AND EXTENSION

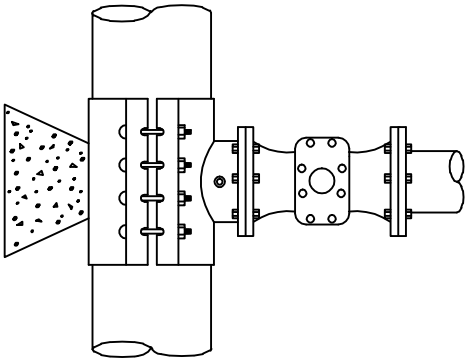


VALVE OPERATING NUT EXTENSION

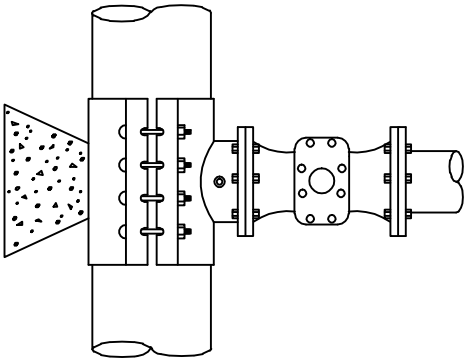
NOTES:

1. VALVE OPERATING NUT EXTENSIONS ARE REQUIRED WHEN THE VALVE NUT IS MORE THAN THREE (3) FEET BELOW FINISHED GRADE. EXTENSIONS ARE TO BE A MINIMUM OF ONE (1) FOOT LONG. ONLY ONE EXTENSION WILL BE ALLOWED PER VALVE.
2. ALL VALVE OPERATING NUT EXTENSIONS ARE TO BE MADE OF STEEL, SIZED AS NOTED, AND PAINTED WITH TWO (2) COATS OF METAL PAINT.
3. VALVE BOXES SHALL BE CAST IRON, TWO PIECE UNITS, DESIGNED WITH DEEP SKIRT (2") LIDS W/LUGS, EQUAL TO "RICH NO. 940" AS MANUFACTURED BY RICH OR SATHER.
4. 4" THICK CONCRETE PAD AROUND VALVE BOXES OUTSIDE OF PAVED AREAS. 2'x2' SQUARE AROUND SINGLE VALVE BOXES AND 4'x4' AROUND MULTIPLE VALVE BOXES.

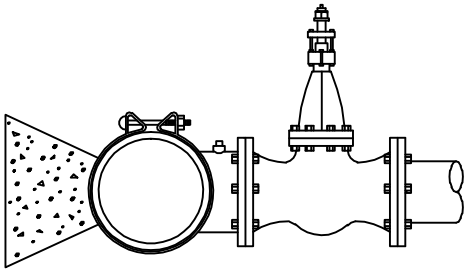
CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS
	DATE	07/31/2008	
	REF STAD SPEC		VALVE BOX AND OPERATING NUT EXTENSION
			STANDARD DETAIL NUMBER W–190



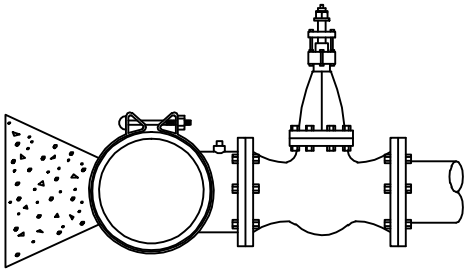
PLAN



PLAN



ELEVATION



ELEVATION

STEEL FABRICATED EPOXY COATED TAPPING SLEEVE

INSTALLED ON DI PIPE

FABRICATED STAINLESS STEEL TAPPING SLEEVE

INSTALLED ON AC PIPE

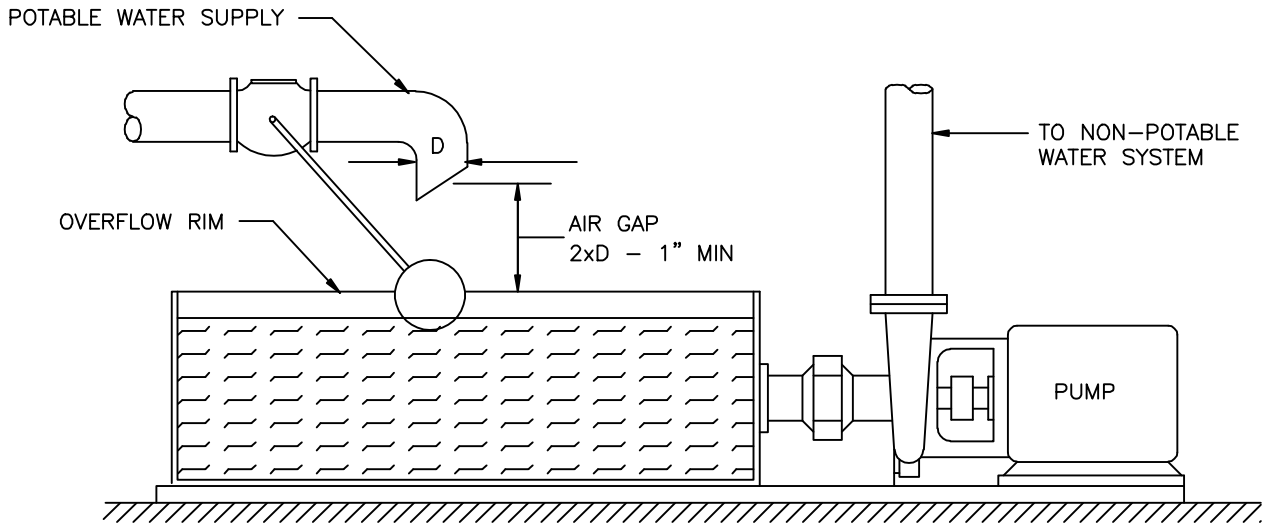
NOTES:

1. STAINLESS STEEL TAPPING TEES SHALL HAVE FULL CIRCLE SEAL.
2. STEEL TAPPING TEES SHALL BE EPOXY COATED.
3. ALL TEES AND VALVES TO BE WATER TESTED BEFORE TAPPING.

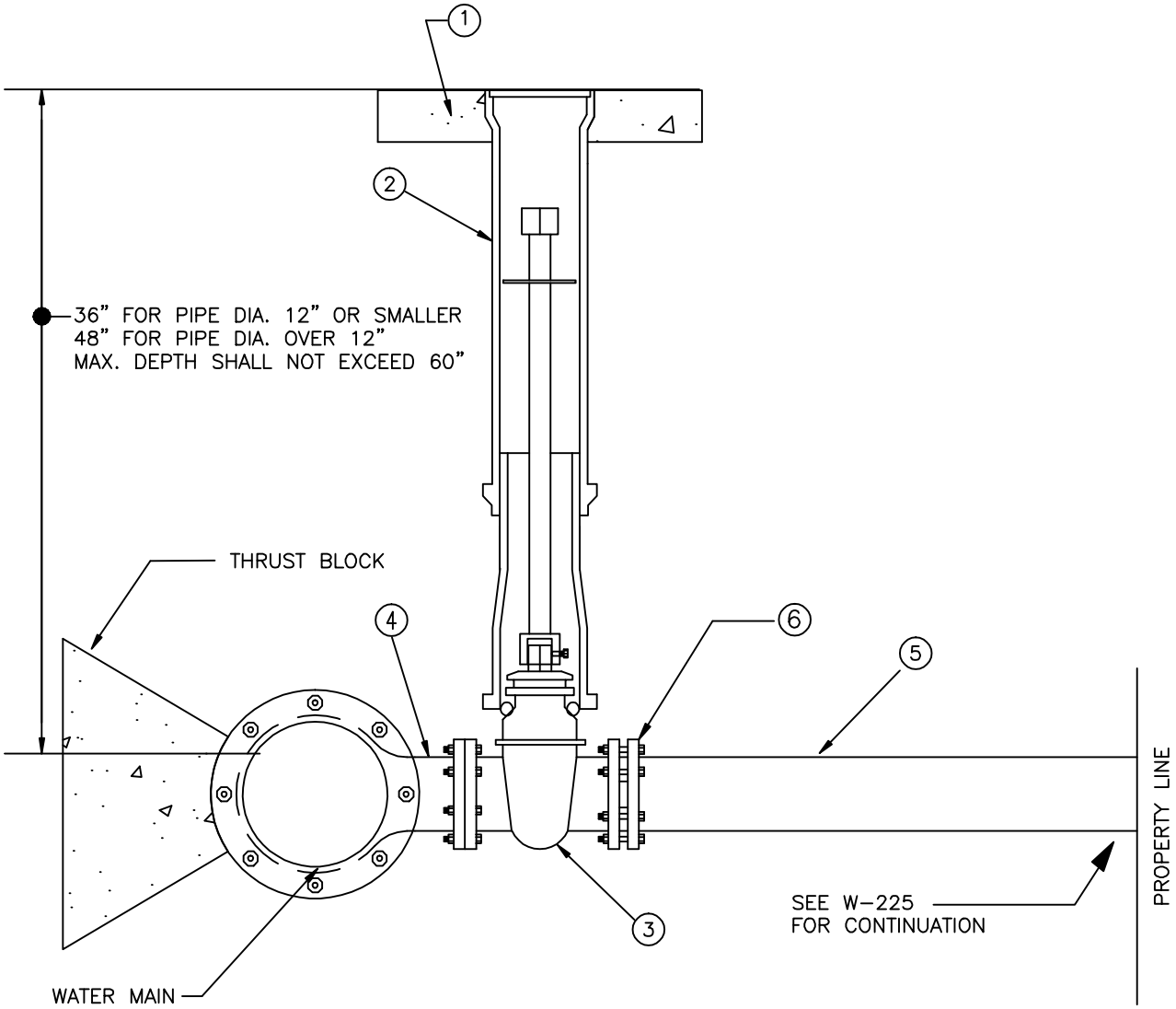
CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS
	DATE	07/31/2008	
	REF STAD SPEC		TAPPING SLEEVES
			STANDARD DETAIL NUMBER W-200

APPROVED AIR GAP SEPARATION

AN APPROVED AIR GAP IS A PHYSICAL SEPARATION BETWEEN THE FREE FLOWING DISCHARGE END OF A POTABLE WATER SUPPLY PIPELINE AND THE OVERFLOW RIM OF AN OPEN OR NON-PRESSURE RECEIVING VESSEL. THESE VERTICAL, PHYSICAL SEPARATIONS MUST BE AT LEAST TWICE THE DIAMETER OF THE INLET PIPE BUT NEVER LESS THAN ONE INCH. IF SPLASHING IS A PROBLEM, TUBULAR SCREENS MAY BE ATTACHED OR THE SUPPLY LINE OUTLET MAY BE CUT AT A 45 DEGREE ANGLE. IF SUPPLY LINE IS CUT AT A 45 DEGREE ANGLE THE AIR GAP DISTANCE IS MEASURED FROM THE CENTER OF THE ANGLE. HOSES ARE NOT ALLOWED. BYPASSES ARE NOT ALLOWED. THE INSPECTION OF AIR GAPS SHALL BE INCLUDED IN THE YEARLY TESTING PROGRAM FOR BACKFLOW DEVICES.



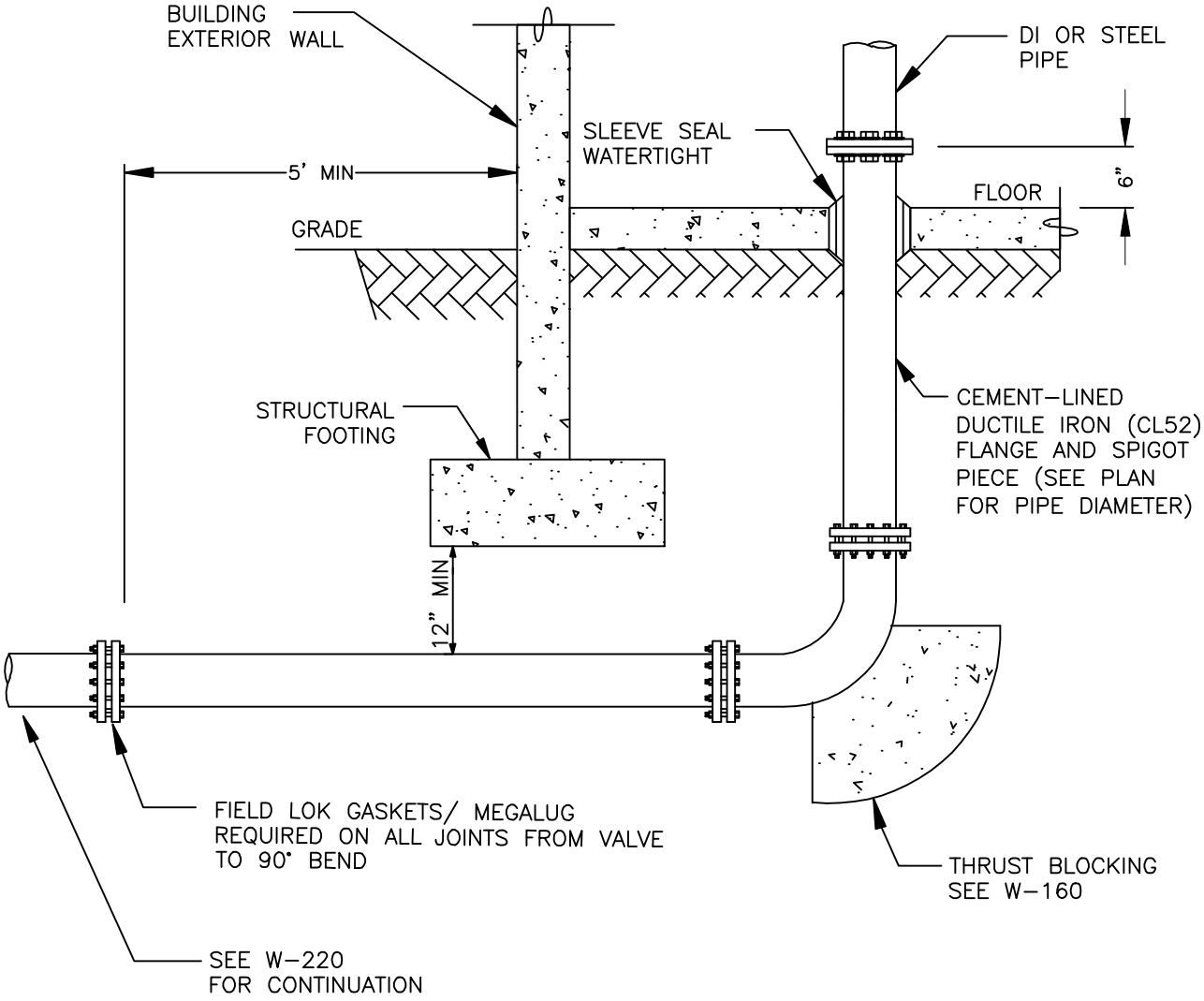
CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS
	DATE	07/31/2008	
	REF STAD SPEC		AIR GAP FOR MAKEUP TANK
			STANDARD DETAIL NUMBER W-210



MATERIAL LIST:

1. 24"x24"x4" CONCRETE PAD IN UNPAVED AREA
2. CAST IRON VALVE BOX AND EXTENSION PER STANDARD DETAIL NO. W-190
3. 6" GATE VALVE WITH RESILIENT SEAT (MUELLER, M&H OR APPROVED EQUAL)
4. MAINLINE SIZE TEE WITH FLANGE
5. 6" D.I.P.
6. MEGALUG

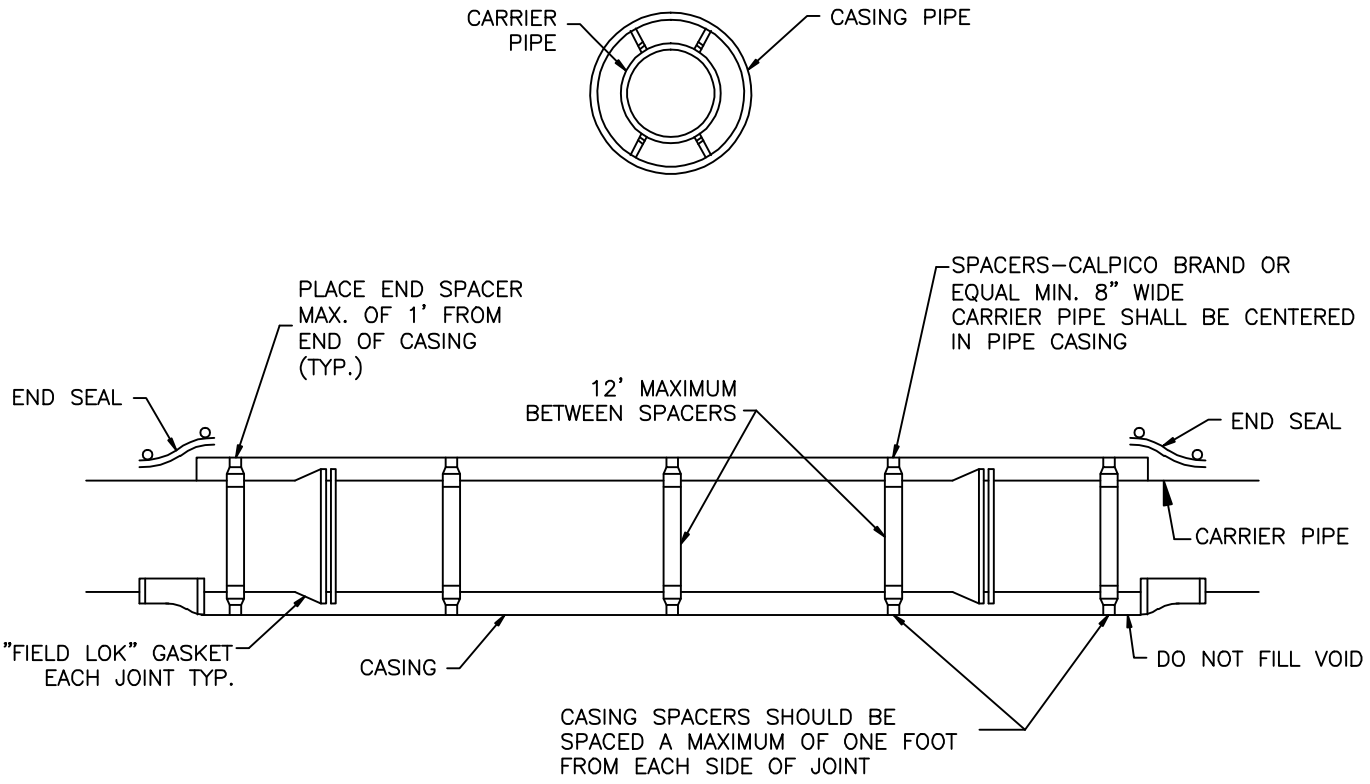
CITY OF ARLINGTON	APPROVED BY: L. OLIVE DATE: 07/31/2008 REF STAD SPEC:	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS FIRE LINE CONNECTION	STANDARD DETAIL NUMBER W-220



CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS
	DATE	07/31/2008	
	REF STAD SPEC		FIRE LINE UNDERGROUND FLOOR FLANGE DETAIL

STANDARD DETAIL NUMBER

W–225



CARRIER PIPE DIAMETER	4"	6"	8"	10"	12"
CASING DIAMETER (MJ/MEGALUG JOINT CARRIER PIPE)	14"	16"	18"	20"	22" *
STEEL CASING THICKNESS	0.25"	0.25"	0.25"	0.25"	0.25"
SPACER BAND WIDTH	8"	8"	8"	8"	8"

* USE 24" DUCTILE IRON PIPE

NOTES:

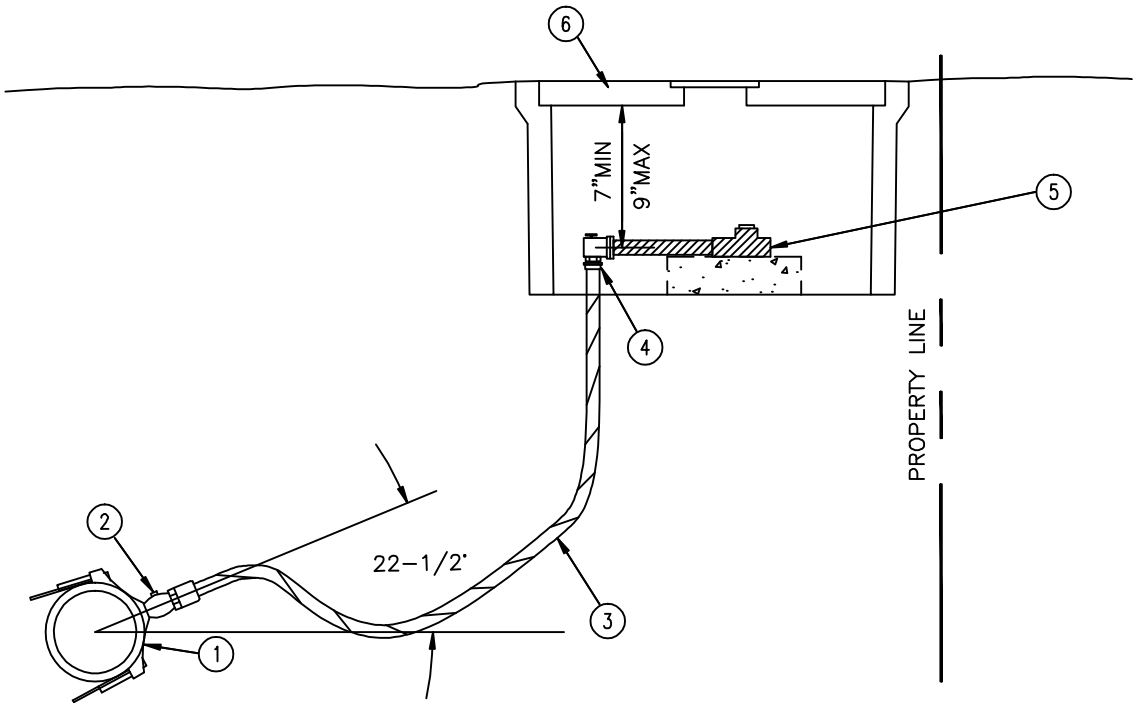
1. ANY VARIATION TO THIS DETAIL SHALL BE REVIEWED AND APPROVED BY CITY ENGINEER.
2. CASING SHALL BE SEALED AT BOTH ENDS.
3. PIPE CASINGS SHALL EXTEND 6 FEET BEYOND THE EDGE OF PAVEMENT. IF THE RIGHT–OF–WAY IS NOT OWNED BY CITY OF ARLINGTON, PIPE CASING SHALL EXTEND 6 FEET BEYOND RIGHT–OF–WAY.

APPROVED BY	L. OLIVE	
DATE	07/31/2008	
REF STAD SPEC		

DEPARTMENT OF PUBLIC WORKS
STANDARD DETAILS

WATER LINE CASING DETAIL

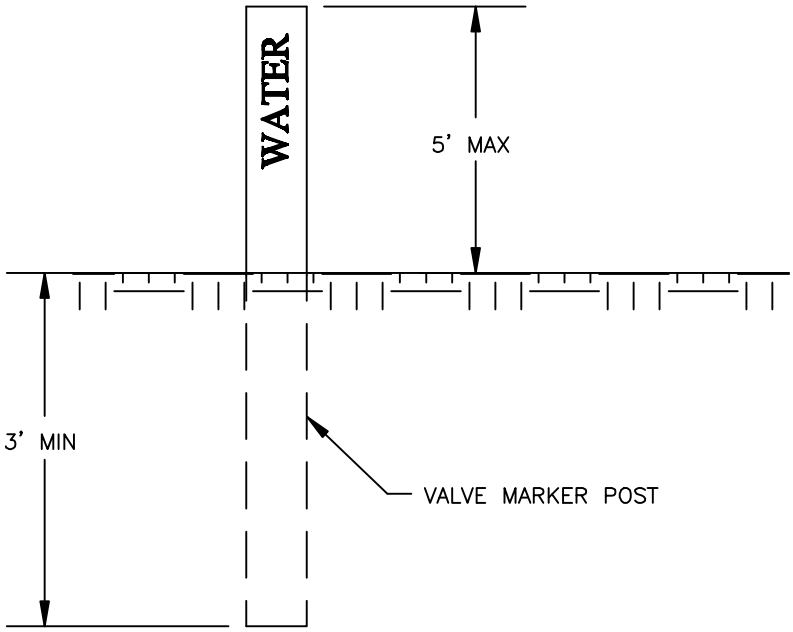
STANDARD DETAIL NUMBER
W–230



NOTES:

1. STAINLESS STEEL DOUBLE STRAP SERVICE SADDLE WITH CC THREAD TO BE USED ON ALL MAINS 4" DIAMETER AND LARGER INCLUDING AC MAINS.
2. CORPORATION STOP, MUELLER OR FORD ONLY, CC x COMPRESSION BALL CORPORATION.
3. 1" HDPE CTS SERVICE PIPE (200 PSI RATING). REQUIRES STAINLESS STEEL STIFFINER. #10 TRACER WIRE REQUIRED ON BOTH ENDS.
4. 1" COMPRESSION ANGLE METER BALL VALVE X 5/8" METER.
5. SAMPLING STATION EQUIPMENT TO BE SUPPLIED BY THE DEVELOPER BUT NOT INSTALLED. DELIVER TO CITY OF ARLINGTON UTILITIES DIVISION. THE COMPLETE LIST OF EQUIPMENT COMPONENTS IS AVAILABLE FROM THE CITY OF ARLINGTON UTILITIES DIVISION.
6. METER BOX SHALL BE MIDSTATES PLASTICS 1324-12 W/READER DI LID.

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS	STANDARD DETAIL NUMBER
	DATE	07/31/2008		
	REF STAD SPEC		SAMPLING STATION	W-240



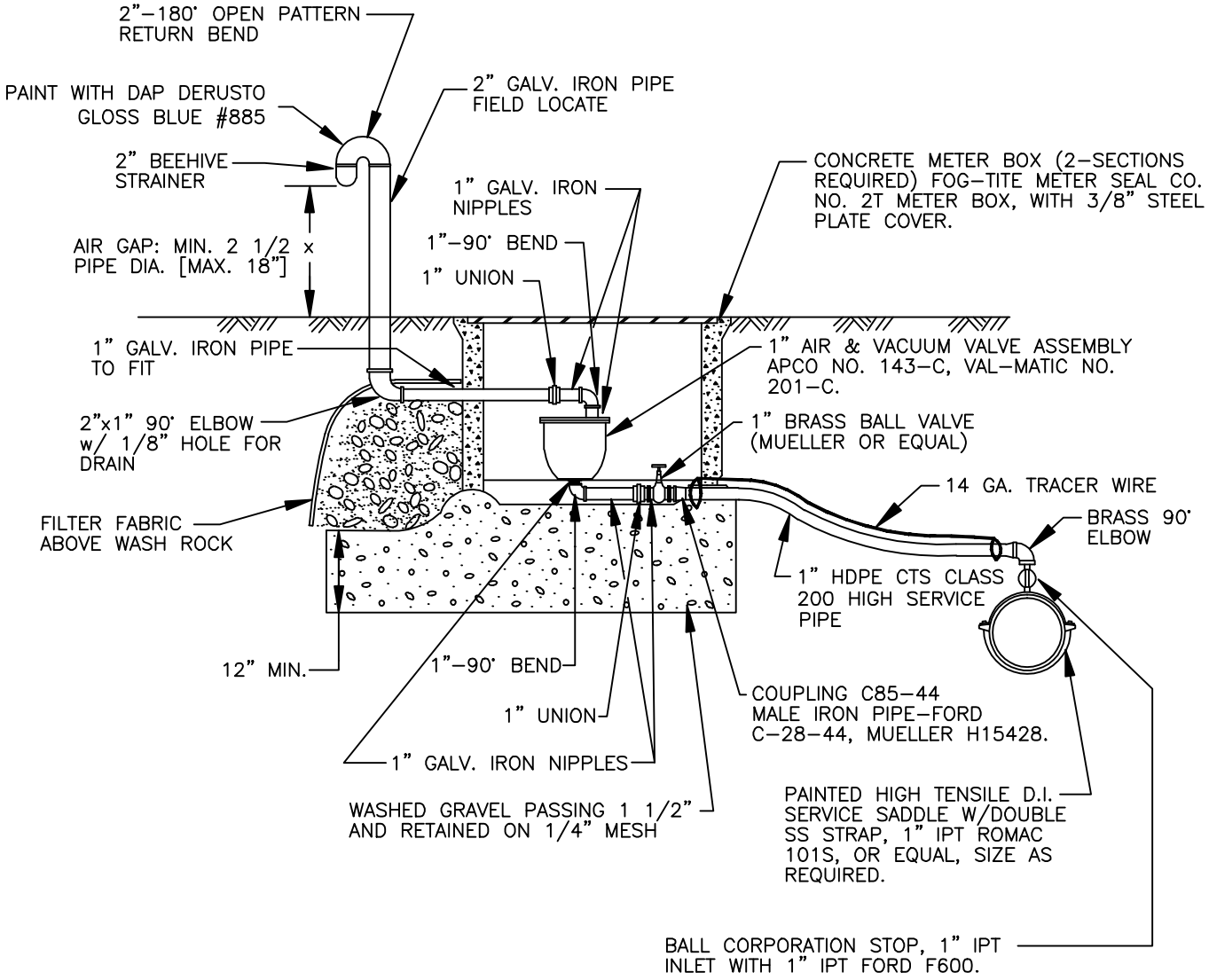
NOTES:

1. CARSONITE PLASTIC POST MARKER, BLUE, LABELED "WATER".
2. VALVE MARKER POSTS SHALL BE INSTALLED FOR ALL VALVES LOCATED IN UNPAVED AREAS. VALVE MARKER POSTS SHALL BE SET AS DIRECTED BY THE PUBLIC WORKS INSPECTOR IN A SAFE AND REASONABLY CONSPICUOUS LOCATION.
3. VALVE MARKER POSTS MAY NOT BE REQUIRED FOR AUXILIARY HYDRANT VALVES.

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS
	DATE	07/31/2008	
	REF STAD SPEC		VALVE MARKER POST

STANDARD DETAIL NUMBER

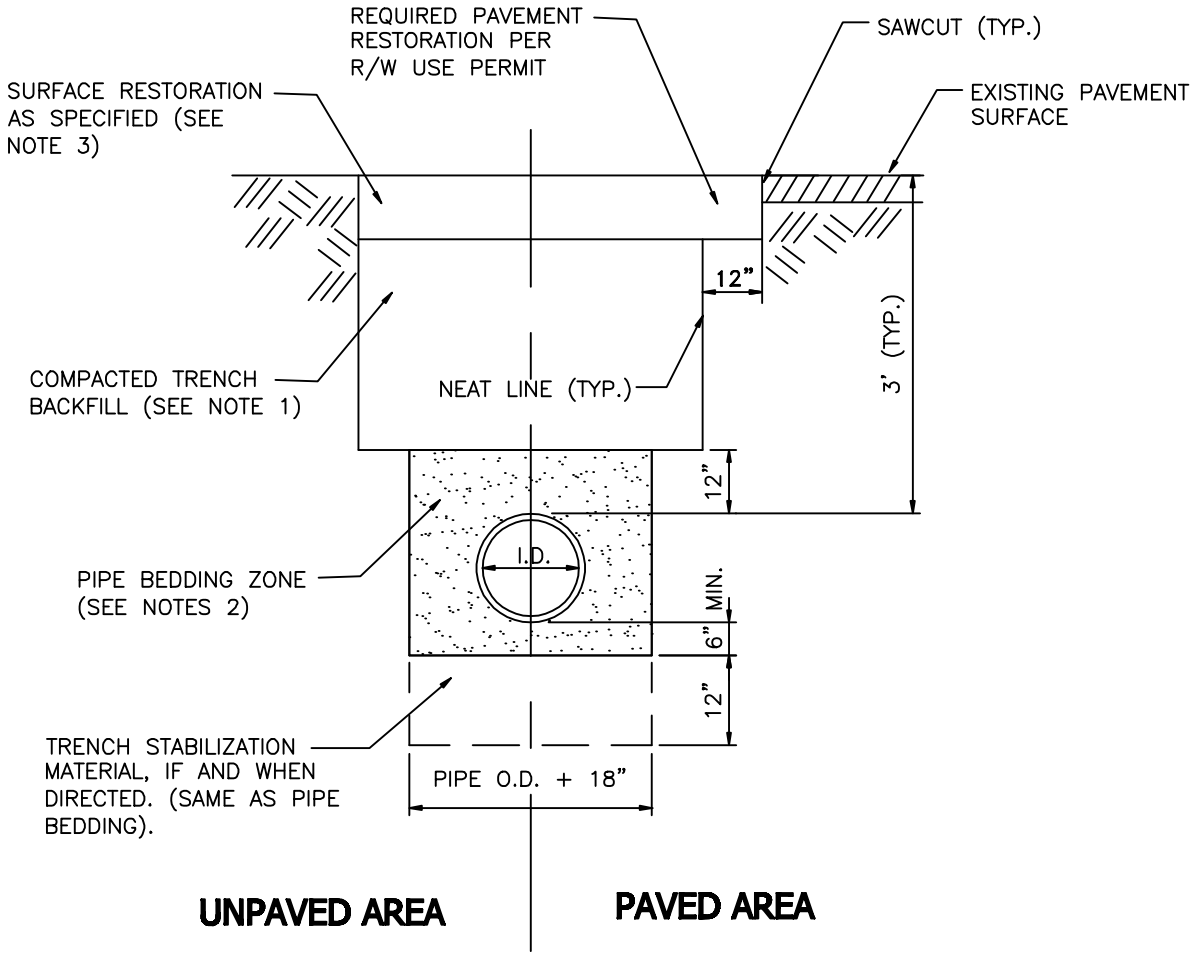
W-250



NOTES:

1. ALL FITTINGS TO BE BRASS OR COPPER FROM WATER MAIN TO 1" AIR & VACUUM ASSEMBLY.
2. AIR & VACUUM RELEASE VALVE ASSEMBLY MUST BE INSTALLED AT THE HIGHEST POINT OF THE LINE. IF THE HIGH POINT FALLS IN A LOCATION WHERE ASSEMBLY CANNOT BE INSTALLED, PROVIDE ADDITIONAL DEPTH OF LINE TO CREATE HIGH POINT AT A LOCATION WHERE ASSEMBLY CAN BE INSTALLED.

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS	STANDARD DETAIL NUMBER
	DATE	07/31/2008		
	REF STAD SPEC		1" COMBINATION AIR VALVE ASSEMBLY	W–260



NOTES:

1. TRENCH BACKFILL SHALL BE:

   * PAVED AREA: GRANULAR BACKFILL AS APPROVED BY LOCAL AGENCY, OR PER WSDOT 9-03.9(3), OR CDF, OR 5/8" MINUS CRUSHED SURFACING, OR APPROVED NATIVE MATERIAL COMPACTED TO 95% OF MAXIMUM DENSITY.

   * UNPAVED AREA: SELECTED GRANULAR MATERIAL WITH MAXIMUM DIMENSION OF 6" PER WSDOT 9-03.15, COMPACTED TO 90% OF MAXIMUM DENSITY.

2. GRAVEL BACKFILL FOR PIPE ZONE BEDDING SHALL BE SELECTED GRANULAR MATERIAL PER WSDOT 9-03.12(3), WASHED SAND, OR APPROVED SUITABLE EXCAVATED MATERIAL WITH MAXIMUM DIMENSION OF 1-1/2" COMPACTED TO 95% OF MAXIMUM DENSITY BY APPROVED HAND-HELD TOOLS.

3. EXCAVATE FOR THE PIPE BELL TO ENSURE UNIFORM SUPPORT FOR THE PIPE BARREL.

4. UNPAVED AREA SHALL BE RESTORED WITH 4" TOP SOIL, FERTILIZER AND SEED, OR AS SPECIFIED. PAVEMENT RESTORATION SHALL BE DONE PER RIGHT-OF-WAY USE PERMIT, OR AS SPECIFIED.

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAILS
	DATE	07/31/2008	
	REF STAD SPEC		TYPICAL TRENCH DETAIL
			STANDARD DETAIL NUMBER W-270

CHAPTER 5

SANITARY SEWER

TABLE OF CONTENTS

5-1 DESIGN

5-1.01 GENERAL

All sanitary sewer mains, manholes, side sewers, and other sanitary sewer facilities shall be designed and constructed in accordance with the latest edition of the *"Criteria for Sewage Work Design"* published by the *Washington State Department of Ecology*, the WSDOT/APWA Standards Specifications, and these Standards.

5-1.02 SANITARY SEWER MAIN EXTENSION

A sanitary sewer main extension shall be required when the property does not front a sewer main. The sewer main shall be extended 5 feet beyond the farthest edge(s) of the property, or as directed by the City Engineer. The sanitary sewer shall be sized for the ultimate development of the tributary area and match the City's Sanitary Sewer Comprehensive Plan. The City may require the installation of a larger size main if the City determines that it is needed to meet the requirement for future service. Sewer main replacement and upgrade shall be required when the existing sewer main is not adequate for the proposed use. Such criteria used to determine adequacy include but are not limited to age, pipe diameter, type, and conditions of existing sewer mains. If the proposed development requires pump station and/or force main upgrade, it shall be done at the Developer's expense. The extent of the improvements shall be extended from the project to a point where the system is deemed reliable. The improvements shall be consistent with the City's Design Standards for new construction and must be approved by the City Engineer.

If the Developer's project directly benefits other property owners, the Developer may enter into a reimbursement agreement with the City per AMC Chapter 12.32.

5-1.03 SANITARY MANHOLE

Manhole Location

Sanitary sewer manholes shall be located so that the center of the frames and covers shall be in the middle of the traveled lanes on the west or south side of the street center lines, or as directed by the City to make sure frames and covers are not located in the tire track of a traveled lane. If sanitary sewers are in easements, they shall be in the middle of the easements and parallel to the easement lines unless otherwise directed by the City Engineer.

Sanitary manholes shall be installed at the end of each line; all changes in grade, size, or alignment; all intersections; and at distances not greater than 400 feet.

Drop Manhole

Drop manholes may be allowed if a sanitary sewer extension has no possibility of future extension to avoid unnecessary construction costs. See Standard Detail SS-060.

Manhole Diameter

The sanitary manhole diameter depends on sizes, location and number of holes for pipes. The minimum diameter of manholes shall be 48 inches. Larger diameters are required for larger diameter sewers. The maximum pipe size is 12 inches for 48 inch manholes, 24 inches for 54 inch manholes, 36 inches for 72 inch manholes, and 48 inches for 96 inch manholes.

The minimum distance between cutout holes is 8 inch (48 inch or 54 inch manholes) and 12 inches (72 inch or 96 inch manholes) measured on the inside of the manhole. The cutout hole size is equal to the outer pipe diameter plus manhole wall thickness. A minimum access diameter of 24 inches shall be provided. See City Standard Details SS-010 and SS-015.

Manhole Depth

The minimum sanitary manhole depth shall be 7 feet. The minimum depth of flat-top manholes may be used with the approval of the City. Where depths are more than 25 feet, the manhole base slabs shall be designed by a Professional Structural Engineer licensed in the State of Washington.

Manhole Inverts

Drop in invert elevation across the manhole shall typically be from 0.1 to 0.2 feet. Maximum allowable drop in invert elevation across the manhole shall be 2.0 feet.

Where a side sewer connects to a manhole, the invert of the side sewer shall be equal to or above the main sewer crown, but not to exceed 18 inches above the invert of the main sewer.

Clean-Out

Cleanouts are not an acceptable substitute for manholes. This rule does not apply to 6 inch building sewers. Clean-out location and spacing for building sewers are governed by Section 5-1.13 in these Standards.

5-1.04 SANITARY SEWER PIPE

Sewer Pipe Sizing

No public gravity sewer conveying raw wastewater shall be less than 8 inches in diameter. The pipe diameter and slope shall be selected to obtain the greatest practical velocities to minimize settling problems. Oversize sewers will not be approved to justify flatter slopes.

New sewer mains shall be designed so that, under ultimate development, peak flow including inflow/infiltration (I/I) shall not exceed 50% capacity of the main. Existing sewer mains shall have peak flow of 75% capacity of the main.

No storm drainage connections shall be made to the City's sanitary sewer system.

Pipe Material

Sanitary sewer pipe shall be SDR 35 PVC conforming to ASTM 3034 where invert depths are from 5 feet to 14 feet. When invert depths are shallower than 5 feet or deeper than 14 feet, Class 52 ductile iron pipe (DIP) epoxy coated or AWWA C900 PVC pipe shall be used. If the depth exceeds 14 feet on any portion of the pipe segment, the entire segment between manholes must be DIP or C900 including side sewers.

Sewer Depth

In general, gravity sewers should be sufficiently deep to receive wastewater from basements. Gravity sewers should also be sufficiently deep to benefit future developments. The minimum depth of gravity sewer is 5 feet.

Slope

Sanitary sewers shall be laid with uniform slope between manholes. All sanitary sewers shall be designed and constructed to give mean velocities of not less than 2.0 feet per second when flowing full, based on Manning's Formula using an "N" value of 0.013. The following are the minimum slopes, however, slopes greater than these are desirable.

Sewer Pipe Diameter	**Minimum Slope**
(inches)	**(% or feet per 100 feet)**
4	2.00
6	1.00
8	0.40
10	0.28
12	0.22
15	0.15
18	0.12
21	0.10
24	0.08
27	0.07
30	0.06
36	0.05

Maximum sewer main slope shall not induce velocities greater than 10 feet per second under daily peak flows.

Pipe anchor blocks shall be installed where the pipe slope exceeds 20%. Each pipe length shall have one anchor block and they shall be spaced at 20 foot on center.

Timber baffle or hill holders shall be required on unpaved slopes that exceed 20%, with minimum spacing of 20 feet on center.

Alignment

In general, sanitary sewers 24 inches or smaller shall be laid with straight alignment between manholes. Curvilinear alignment of sewer larger than 24 inches may be considered on a case-by-case basis, providing compression joints are specified and the specific pipe manufacturer's maximum allowable pipe joint deflection limits are not exceeded. Curvilinear sewers shall be limited to simple curves which start and end at manholes. When curvilinear sewers are proposed, minimum slopes required in these Standards must be increased accordingly to provide a recommended minimum velocity of 2.0 feet per second when flowing full.

Changes in Pipe Size

Where a smaller sewer main joins a larger one, the invert of the larger sewer main at the manhole should be lowered sufficiently to maintain the same energy gradient. An approximate method for securing these results is to place the crowns of both sewers at the same elevation.

5-1.05 SEWER IN RELATION TO STREAMS

Sanitary sewers crossing streams shall be designed to cross the stream as nearly perpendicular to the stream flow as possible and shall be free from change in grade. Sewer systems shall be designed to minimize the number of stream crossings.

Sanitary sewers located along streams shall be located outside of the stream bed and sufficiently away from the stream to provide for future possible stream widening and to prevent pollution by siltation during construction. Sanitary sewer structures shall not interfere with the free discharge of flood flows of the stream.

The top of all sewers entering or crossing streams shall be at sufficient depth below the natural bottom of the stream bed to protect the sewer line. In general, the following cover requirements shall be met.

1) A minimum of 1 foot of cover above the top of the casing pipe if the sewer is located in rock;

2) A minimum of 5 feet of cover above the top of the casing pipe in other material.

5-1.06 AERIAL CROSSING

Supports shall be provided for all joints in sanitary sewer for aerial stream crossing. The supports shall be designed to prevent frost heave, overturning, and settlement.

Precautions against freezing, such as insulation and increased slope, shall be provided. Expansion joints shall be provided between above ground and below ground sewers.

For aerial stream crossings, the impact of flood waters and debris shall be considered. The bottom of the pipe shall be placed no lower than the elevation of the 100 year flood. Ductile iron pipe with mechanical joints is required.

5-1.07 HORIZONTAL SEPARATION FROM OTHER UTILITIES

Sanitary sewer mains shall be laid at least 10 feet horizontally from any existing or proposed water main. The distance shall be measured edge to edge. In cases where it is not practical to maintain a 10 foot separation, the City may allow deviation on a case-by-case basis using DOE criteria. Side sewer and water service lines shall have minimum horizontal clearances of 10 feet unless otherwise approved by the City Engineer.

Horizontal clearances from sanitary sewers:

Cable	5’
Gas	5’
Power	10’
Storm drain	5’
Telephone, Fiber optic	10’
Water	10’

5-1.08 VERTICAL SEPARATION FROM OTHER UTILITIES

Sewers crossing water mains shall be laid to provide a minimum vertical distance of 18 inches between the outside of the sewer and the outside of the water main. The City prefers the water main to be above the sewer main. Where a sewer crosses a water main, one full length of water pipe (18 feet minimum) shall be used with the pipe centered over the sewer for maximum joint separation. When the above conditions cannot be met, the City has the right to approve a variance, but shall require that the sewer be constructed of ductile iron pipe and be pressure tested before being activated, and/or be encased as directed by the City Engineer. DOE criteria will also apply.

Vertical clearances from sanitary sewer:

Cable	1’
Gas	1’
Power	1’
Storm drain	1’
Telephone, Fiber optic	1’
Water	1.5’

5-1.09 STEEL CASING

Sewer pipe shall be encased in a steel or ductile iron casing when crossing under improvements where the ability to remove and replace pipe without disturbance to the improvement is needed. Casings are required when:

1) Crossing under rockeries over 5 feet high;

2) Crossing under retaining wall footings over 5 feet wide;

3) Crossing under reinforced earth retaining walls;

4) Crossing under streams or wetlands; and

5) Crossing under railways and highways.

Casings shall extend a minimum of 5 feet past each edge of the structure, or a distance equal to the depth of pipe, whichever is greater. The carrier pipe shall be supported by casing spacers per City Standard Detail W-230. The minimum vertical clearance between the bottom of the wall (or footing) and top of the pipe (or casing) shall be 2 feet. The pipe trench at the casing shall be backfilled with gravel backfill material when the vertical clearance is less than 3 feet.

Ductile iron pipe shall be encased in a steel casing when crossing under a railroad or highway where open cut is not allowed. Casings shall extend a minimum of six feet (6’) beyond the edges of the right-of-way if not owned by the City. The casing pipe and carrier pipe shall be installed in accordance with the applicable Federal, State and local regulations. In the case of railroad crossings, the project shall also comply with regulations established by the railroad company. Casing spacers shall be placed under the carrier pipe to ensure approximate centering within the casing pipe and to prevent damage during installation. Voids between all steel casings and native soil shall be pressure grouted. The Design Engineer shall refer to the City Standard Detail W-230.

5-1.10 SEWER CONNECTION

A side sewer shall be connected to the sewer main with a 6 inch tee connection or at a manhole. Where an existing side sewer stub is not available, a ROMAC tapping tee or core drilled INSERT-A-TEE is required for an existing sewer main. See City Standard Detail SS-100.

All new sanitary sewer mains (8 inches and larger) shall connect to existing sewer mains at manholes. If an existing manhole is not available, a new saddle manhole on existing sewer is required per the City Standard Detail SS-020.

The Design Engineer shall check that the existing manhole diameter is adequate to accommodate the new sewer mains. If not, the existing manhole shall be upgraded at the Developer's expenses. If the existing manhole access is less than 24 inches in diameter, and/or concentric cone (manhole over 7 feet deep), the manhole shall be upgraded to include new 24 inch ring and cover and/or eccentric cone.

At the connection to the existing sewer system, new sewer connections shall be physically plugged until all tests have been completed and the City approves the removal of the plugs.

5-1.11 FAT, OIL, AND GREASE SEPARATION

Oil/Water Separator

An oil/water separator is required whenever an industrial or commercial business generates or has the potential to generate fats, oils, or greases exceeding 100 milligrams per liter which will be discharged to the sanitary sewer system. An oil/water separation device shall be installed on the private property by the property owner. Water discharged from any oil/water separator to the sanitary sewer system shall not contain more than 100 milligrams per liter of fats, oils or greases.

The oil/water separator shall be covered with removable sections. Access and inspection covers, weighing not more than 30 lbs., with suitable hand holds, are to be provided directly above the inspection "tee" and oil/grit collection compartments.

Only wastewater from floor drains and covered parking areas shall drain to the separator. The location and design shall eliminate the possibility of stormwater reaching the separator.

The separator shall be located within 20 feet from the driveway for access by maintenance vehicles.

A sampling tee shall be located on the outlet with a minimum 18 inch drop below the invert. Access to the separator shall be available for inspection and compliance determination sampling at all times.

When pre-treatment is no longer required, the inlet and outlet pipes shall be permanently plugged, the separation chambers pumped out, and the vault removed, or filled with

compacted crushed rock or controlled density fill.

Grease Interceptor

The size and design of grease interceptors and hydromechanical grease interceptors (HGI's) shall conform to the Uniform Plumbing Code and shall be approved by the City Building Official after review by the Utilities Division. The interceptor shall be located on private property outside the building within 20 feet of driveway for access by maintenance vehicles. An HGI may be located inside the building, and shall remain privately owned, maintained at the owner's or occupant's expense. A maintenance program must be submitted and approved that includes maintenance, testing requirements and reporting intervals. These facilities shall be available for the inspection by City Utilities crews any time with a 24 hour verbal notification to the occupant or property owner, or as allowed by the discharge agreement.

When pre-treatment is no longer required, the inlet and outlet pipes shall be permanently plugged, the separation chambers pumped out, and the vault removed, or filled with compacted crushed rock or controlled density fill.

5-1.12 EASEMENTS

All public sanitary sewer mains, manholes, air valves, lift stations, and other appurtenances not in public right-of-way shall have easements designated on submitted plans to provide the City with permanent access to these facilities, as well as easements for future sewer extension, as required. The width of the easement depends on the maximum depth of the sewer in the easement (see table below).

Depth (ft)	Easement Width (Ft)
< 5	10
5 - 10	15
10 - 15	20
15 - 20	25
>20	30

Before the project is accepted by the City, easements shall be recorded. Easement drawings and legal description shall be included as exhibits.

If off-site easements are required on properties not owned by the Developer or the City, the Developer shall acquire the easements at their own expense before construction plans are approved by the City.

5-1.13 SIDE SEWERS

A side sewer stub shall extend from the main line to 10 feet past the edge of the property line. A side sewer stub shall also extend additional 5 feet beyond any easements including the standard 10 feet utility easement required on lots fronting public right-of-way. Pipe of 6 inches in diameter shall be used within the public right-of-way or easement unless expected

flow requires a larger size of line. See Standard Detail SS-090.

4 inch side sewers on private property from the end of a 6 inch stub to the building may be a minimum of 4 inches for residential side sewers with a single connection within the lot.

Each unit in a duplex or triplex shall have its own separate side sewer stub and connection. 6 inch minimum pipe shall be used for commercial side sewers.

For a multi-family development four-plex and larger, a side sewer for each separate building is required and must be at least 6 inches in diameter. For side sewers serving more than ten units or serving more than one building, side sewers shall be a minimum of 8 inches in diameter and must connected to a manhole.

Maximum distances between side sewer clean-outs shall be 100 feet. All side sewer clean-outs on commercial and multi-family developments shall include at grade access with covers per the City Standard Detail SS-080.

5-1.14 SEPTIC TANKS

Septic systems are generally not allowed within the City limits. If the City Engineer determines that public sanitary sewer service is not available or it is not "practical" to provide public sewer service, the septic tank systems may be installed upon approval by the City Engineer and issuance of a septic permit by the Snohomish Health District.

5-1.15 PRIVATE GRINDER PUMP

Use of grinder pumps requires approval by the City Engineer and will be evaluated on a case-by-case basis. The City may require the applicant to deepen the existing gravity sewer at their expense to eliminate the need for grinder pumps. The applicant shall demonstrate that there is no other feasible means of sewer service available.

The Design Engineer shall specify pumps with proper flow rate and dynamic head and provide pump curves from the manufacture to the City for review and approval. The minimum diameter of the force main shall be 2 inches (Schedule 80 PVC or approved equal). Interior grinder pump systems shall meet the requirements of UPC. Exterior grinder pumps systems shall be approved by the City Engineer.

5-1.16 LIFT (PUMP) STATION

All sanitary sewers shall be gravity when possible. Use of lift stations requires approval by the City Engineer and will be evaluated on a case-by-case basis. The City may require the applicant to deepen the existing gravity sewer at their expense to eliminate the need for pumping. The applicant shall demonstrate that there is no other feasible means of sewer service available.

Lift stations shall be wet well and dry well type as manufactured by Smith & Loveless with auxiliary power generators, automatic transfer switches, telemetry, and alarms. Design reports, plans and specifications for lift stations shall be prepared by the Design Engineer and

reviewed/approved by the City. The following are general guidelines for lift station design.

Pump

All lift stations shall have a designed minimum pumping capacity of 250 GPM.

(Items supplied by Smith & Loveless) *Blank spaces will need to be completed when lift station is sized*.

One (1) only Smith & Loveless Duo-Duct, factory assembled, Automatic Pumping Station complete with 8 feet in diameter welded steel chamber, 8.5 feet internal height, xx integral base beam suctions. xx common side outlet discharge pipe, 36 inches diameter xx inches long entrance tube, access ladder, and electrical conduits to control panel in station.

Principal items of equipment will include two (2) Smith & Loveless Vertical, Non- Clog, xx pumps directly connected to xx HP, 1760 RPM, 460/3/60 Motors; ¼ inch plugged taps on suction and discharge; automatic static/dynamic pumping level controls using multiple float switch system connected with intrinsically safe GEM relays; NEMA, UL listed Central Control Panel with circuit breakers, motor starters, control circuitry; sump pump with integral discharge to wet well; ventilation blower with PVC inlet duct; dehumidifier; four magnesium anode packs with 15 foot copper leads; all internal wiring in the main chamber only.

The entrance tube with electrical conduits and ladder, the magnesium anode packs, level transducer and the two float switches for the wet well are furnished, but not installed. One or two circumferential welds are required to attach the entrance tube to the main chamber (by others). Touch up epoxy paint is provided to cover the weld areas.

Control Panel

The lift station control panel shall be equivalent to Clearwater Controls and Automations P/N LS-1000.

The panel shall be placed in the main building within reach of the dry well hatch.

Additional accessories included in the panel are:

1) Run time meters for pumps.

2) Signal and alarm contacts listed under the signal, alarm and data collected by telemetry section.

3) Terminal strips for external alarm and for telemetry system.

4) Emergency generator connection for the power interlocks to allow only one pump to run under generator power.

5) The 460/3/60 electrical power shall be installed and connected to the control panel terminals by a licensed Electrical Contractor.

6) Control panel shall be mounted in the lift station building in close proximity of the dry well entrance.

7) The control system shall consist of a wet well mounted, hydrostatic level transmitter, control panel mounted level indicator, pump controller and back-up emergency pump control from high and low wet well level floats. The back up float control shall be completely independent from the level transducer and pump control.

The control panel front cover shall have:

1) Wet well level indicator in inches.

2) Hand off auto switches for each pump.

3) Pump alternator switch from either pump 1, 2 or alternate each cycle.

4) Pump hour meters that read to the hundredth of the hour.

5) Data entry screen for setting levels.

6) Local alarm horn silencing switch.

7) Independent alarm reset push buttons for each pump.

8) Overload reset push buttons.

The pump controller shall receive a signal from the wet well level sensor and display the wet well level in inches on the control panel:

1) Low wet well level alarm.

2) Lead pump off.

3) Lag pump off.

4) Lead pump on.

5) Lag pump on.

6) High wet well level alarm.

In the event that the wet well transducer or pump controller failure, the high and low wet well float shall provide independent back up pump control. When the high wet well level float is tripped one pump shall start and run for the time set on the emergency run timer. The other pump shall start after a set amount of time and shut off with the first pump. If

the timer is still active when the low level float is reached, the pumps shall shut down. At no time while the station is in automatic control shall the pumps, pump below the low level float.

The hand/off/auto switch shall control the pumps by the controller while in the auto position. When the "hand" position is selected, the pump shall continue to run until the switched is moved to "off" or "auto" position. The hand position shall be the only way to pump below the low level float switch.

The pump alternator shall allow the pumps to alternate at the end of each pump cycle while in "alternate" position. When set on pump "1" or "2" the pump that is selected shall continue to be the lead pump and the other pump shall be used as the lag pump.
The data entry screen shall allow the operator to review and/or change the set points and review current and/or past alarms.

Telemetry

Telemetry shall be supplied and installed in the lift station. Telemetry components are to be included as part of the control panel. Telemetry shall be installed and operation verified by the supplier and the City.

Signals, Alarms, and Data to be Collected by Telemetry

1) High-high and low-low floats – Alarm

2) Pump fail by motor overload and check valve limit switch – Alarms

3) Water in dry well – Alarm

4) Power failure phase monitor – Alarm

5) Common generator failure – Alarm

6) Flow rate and total – Data

7) Wet well level – Data

8) Pump run – Data

9) Diesel fuel tank low fuel alarm – Alarm

10) Emergency button alarm – Alarm

11) Transfer switch position – Data

12) Generator running – Data

13) Pump run time – Data

14) Pump starts – Data

15) All data shall match existing Microsoft Office reports at the time of construction

Generator

The diesel generator shall be either Kohler or Onan. The minimum generator size shall be 25 KW. The generator shall be installed to automatically start during the event of a power outage and shall be sized to run all ancillary uses and one pump at a constant duty rating. The minimum fuel tank capacity shall be 100 gallons and shall be full at time of startup. The generator shall be capable of running for 36 hours without refueling. Connection points shall be provided by the manufacturer for alarms that are specified under the section "Signals and Alarms" that apply to the generator. Generator panel will have a minimum of the following operational items:

12 light alarm panel to include:

1) Run

2) Pre-low oil pressure

3) Pre-high engine temp

4) Low oil pressure

5) High engine temperature

6) Over speed

7) Over crank

8) Low engine temperature

9) Low fuel

10) Switch off

11) Low coolant level

- AC volts meter
- AC amperes meter
- RPM and Hz meter
- Field breaker

- Upper scale/lower scale indicator
- Voltage adjuster
- Emergency stop button
- Hour meter
- Temperature gauge
- Oil gauge
- DC volts gauge
- Phase selector to control view of volts and amperes meter

Equipment and Parts to be Furnished

1) One SnapOn® four drawer tool chest or approved equal.

2) Lock out/tag out station with appropriate equipment to lock out/tag out all equipment in the lift station. The equipment shall be the same type specified in the City's lockout/tag out program.

3) One cordless wall mounted telephone 900 mega Hz.

4) Safety climb for dry well entrance tube drop and one OSHA approved safety harness.

5) Manufacturer's recommended spare parts shall be provided for all equipment as specified in the Operation and Maintenance manuals (O&M).

6) Three complete sets of the O&M manuals.

7) One wall mounted fire extinguisher in enclosure. The minimum size shall be 6 pounds.

Wet Well

1) Minimum wet well size is 12 feet diameter.

2) The wet well shall have two explosion proof 110 VAC lights.

3) A wet well blower must be attached to either the wet well top or its own slab. It may not be attached to the generator building. The blower shall be enclosed to prevent exposure to the outside elements. The enclosure shall be built to allow access and match the lift station building.

4) The wet well shall have an operator walkway.

5) Transducer and float support shall be accessible from the operator walkway.

Yard Hydrant

One freeze proof 1 inch yard hydrant shall be installed outside of the building (placement to be determined during plan review). Hydrant shall have a minimum 3 foot bury and be an IOWA Woodford or approved equal. Yard hydrant shall have a separate shut off valve with valve box. ⅝ inch water service per City Standard Detail W-040 shall be provided as part of the lift station construction. Cross Connection control required per City Standard Detail W-090.

Telephone Line

1) One type 3002 voice grade leased multi-point telephone line shall be installed at the proposed lift station.

2) RJ-11 jack shall be provided with the two wires clearly identified and circuit I.D. number for that leg.

3) The telephone line shall be connected to a specific telephone circuit, specified at the time of design of the lift station.

4) The above telephone line will be for the telemetry system.

5) One additional telephone line shall be provided for a telephone.

Flow Meter

A magnetic flow meter with 4 to 20 milli amp output will be installed on the discharge line in accordance with the manufacturer's set up and operations manual. The meter will be from a company with local representation and service technicians for calibration and operational trouble shooting. Flow will be totalized in hundreds of gallons. If the meter is installed outside of the main building the flow tube will be NEMA 6 rated.

Pump Station Building

The following criteria and minimum requirements shall apply to the lift station building. Additional items to match the building to development structures may be allowed but must be approved by the City Engineer.

1) Building permit required and will need to include electrical, plumbing, and mechanical.

2) Land use permit, design review, and other applicable permits may be required.

3) Building shall meet all applicable zoning and building code requirements.

4) Building size shall be a minimum 14 feet x 20 feet.

5) Building shall have 2 inch x 6 inch stud construction.

6) Craft face R-19 insulation.

7) ⅝ inch fire rated drywall finished and painted with enamel white paint.

8) All conduits shall be run exposed on the exterior of building drywall.

9) 6 inch beveled cedar siding with 1 inch x 4 inch corner boards or as otherwise approved.

10) 6 foot x 6 foot, 8 inch x 1 ¾ inch double swing insulated metal doors; key operated dead bolt, minimum of 6 keys keyed to City Standard.

11) Roof standards:

- 2 inch x 6 inch rafters 24 inch on center.
- 2 inch x 6 inch rafter ties.
- 2 inch x 8 inch ridge board.
- ½ inch plywood (CD) decking.
- 4 feet x 4 feet clear opening access hatch with internal lock (must be placed directly over dry well access tube).

12) Roofing materials:

- Profile TBC 305 Series Standing Seam Roofing (18 inches wide).
- Gauge = 22-gauge.
- Finish = Kynar 500, Evergreen Code #815G112.
- Flashing, closures, trim, gutters, downspouts, etc., shall be fabricated of same material, gauge, and finish as the roofing.
- Fasteners shall be as per manufacturer's recommendation.

13) Rain gutter with down spout must be provided on access door side of building. Downspouts must be connected to the drainage system.

14) All exterior wood surfaces shall be treated with a brown or equal latex stain. (Other

colors must be approved by the City Engineer).

15) Minimum clearances of 3 feet will be required between any components to include distance from the wall. Exceptions to this will be:

- The generator to wall where louver is and;
- One (1) foot from the back of the dry well hatch to the finished wall. Clearances must meet electrical codes or provide safe access to all components.

16) One solid wood wall mounted cabinet with minimum size of 3 feet x 3 feet x 16 inches.

17) Emergency eye wash station with overhead shower required.

18) Provide an emergency contact sign for the outside of the building per City of Arlington Standards.

19) Provide adequate yard lighting with automatic timer.

20) Additional Electrical Requirements:

- Air intake and exhaust louvers in generator room shall be motor operated. They shall open upon generator start-up and close with generator shut down.
- Wet well controls shall be intrinsically protected.
- Low wet well water alarm float shall also provide pump lockout upon activation and be self clearing.
- Pump station building lighting shall consist of 2 incandescent fixtures with 150 watt bulbs.
- Audio/Visual alarm shall be installed on the exterior of the building (location to be determined by the City Engineer). Horn and light must be one unit. Unit must have silence and reset buttons. Horn shall be 85 db.
- Wet well lights and blower shall be switched on the exterior of the building in a weatherproof box (location to be determined by the City Engineer).
- A minimum of two internal 20 amp double outlets with GFI.

Fencing

The pump station site shall be enclosed by a 6 feet tall, black vinyl coated chain link fence. A 12 foot black vinyl double swing gate shall also be installed (location to be

determined by the City Engineer). Two gates may be required in some situations.

Site Access

Appropriate area shall be provided to allow City vehicle, turn around and access wet well with vactor truck. This is defined as a vehicle 30 feet in length. This may be accomplished in conjunction with a street or a turn around area. The entire area within the fence shall be paved, including the driveway approach to the street.

Force Main

The force main shall be installed per these Standards. Force main valving shall be installed on the lift station site. Valves shall be placed in a concrete vault of a size to allow City personnel access to the valves for safe maintenance. The minimum force main size shall be 4 inches. The force main shall be constructed with CL 52 epoxy coated ductile iron pipe.

Landscaping

All Developer installed landscaping will remain the maintenance responsibility of the Developer/Homeowners Association. This includes landscaping within the dedicated property of the lift station site. Any landscaping within the fenced area will be maintained by the City.

5-1.17 MONITORING MANHOLE

Monitoring manholes are required for all industrial/commercial applications and other applications as determined by the City Utilities Manager. The monitoring manhole shall be located to be accessed for inspection by City staff at any time and under all weather conditions. The depths of monitoring manholes shall be 4 feet minimum and 8 feet maximum. If the depth is less than 7 feet, a flat top manhole shall be used. Monitoring manholes shall be 48 inch Type I (or larger) with locking rings and covers. The rim elevations of the monitoring manholes shall be set to finished grade or as directed by the City Inspector. See City of Arlington Standard Detail SS-130.

5-2 MATERIAL

All materials shall be new and undamaged. The same manufacturer of each item shall be used throughout the work. All materials not specifically referenced shall comply with applicable sections of ANSI, ASTM, AWWA, the WSDOT/APWA Standard Specifications and these Standards, and approved by the City.

When specific manufacturers or models are specified in these Standards, no substitutions will be allowed without prior approval by the City Engineer. If required by the City, the Contractor shall furnish certification from the manufacturer of the materials being supplied that the inspection and all of the specified tests have been made and the results thereof comply with the requirements of the reference standards.

The Developer and/or Contractor is required to provide construction material submittals to the City. See Section 5-3.02 for material submittal procedures and requirements.

5-2.01 MANHOLE

Manholes shall be constructed of pre-cast sections with a confined O-ring rubber gasket joints, and with either a pre-cast base or a cast-in-place base in accordance with the City Standard Details SS-010. Any request to deviate from these details must be reviewed by the City Engineer.

Manholes shall be constructed in accordance with AASHTO M-199 (ASTM C 478) unless otherwise shown on plans and approved by the City.

All pre-cast concrete and reinforced cast-in-place concrete shall be Class 4000. Non-reinforced concrete in channel and shelf shall be Class 3000. Concrete blocks or concrete (masonry) rings may be used for adjustment of the casting to final street grade. Pre-cast bases shall be furnished with cutouts or knockouts. Knockouts shall have a wall thickness of 2 inch minimum.

All base reinforcing steel shall have a minimum yield strength of 60,000 psi and be placed in the upper half of the base with one inch minimum clearance.

5-2.02 MANHOLE RING AND COVER

Ductile iron rings and cast iron rings and covers shall conform to the City Standard Detail SS-030 and Section 9-05.15 of the WSDOT/APWA Standard Specifications.

Manhole rings shall be gray iron conforming to the requirements of AASHTO M 105 Grade 30B. Manhole cover shall be ductile iron conforming to ASTM A536, GR 80-55-06, and Olympic Foundry Part No. MH 30 or approved equal. Rings and covers shall be tested for accuracy of fit and shall be locked down with a 5 ⅝ inch stainless steel socket head cap screws. All castings shall have a bituminous coating.

5-2.03 GRAVITY SEWER PIPE & FITTINGS

Sanitary sewer pipe shall be PVC or ductile iron meeting the following requirements unless otherwise directed by the City Engineer:

1) Polyvinyl Chloride (PVC) sanitary sewer pipe and fittings shall conform to the requirements of ASTM D-3034 SDR-35 with joints and rubber gaskets conforming to ASTM D 3212. All pipes shall be clearly marked with the data of manufacture. All pipe shall be provided with a reference mark for proper spigot insertion. Joint gaskets shall be fabricated from a compound of which the basic polymer shall be a synthetic rubber consisting of styrene, butadiene, polyisoprene or any combination thereof and shall meet the requirements of ASTM D-3212.

2) Ductile iron sewer pipe shall conform to ANSI A-21.51 or AWWA C-151 and shall be epoxy coated, push-on joint (Tyton joints only) or mechanical joint. Cement-lined ductile iron pipe shall not be used for sanitary sewer. The ductile iron pipe shall be Class 52, unless otherwise approved by the City.

3) AWWA C900 PVC pipe shall be pressure class 150 (SDR 18) unless otherwise called for in the plans. Pipe joints shall be manufactured using an integral bell with an elastomeric gasket push-on type joint. Elastomeric gaskets shall conform to ASTM F477. All fittings shall be PVC, compatible with C900 with respect to joint dimensions and physical properties.

5-2.04 SIDE SEWER

Side sewer services shall be PVC, ASTM D-3034 SDR-35, with flexible gasket joints. Depths greater than 14 feet shall be AWWA C900 or CL 52 epoxy coated DIP.

5-2.05 TRACER TAPE

Utility pipe tracer tape shall be detectable below ground surface, color coded, with utility name printed on tape. Tracer tape shall be detectable type, up to 6 inches in width, and buried 24 inches to 48 inches below finished grades. The color of the tape for sanitary sewer shall be green with black printing reading "CAUTION SANITARY SEWER BURIED BELOW". Tracer tape shall be “Lineguard Type II Detectable”, or approved equal.

5-2.06 PLUGS

Plugs shall be able to withstand all test pressures without leakage. All plugs shall be approved by the City Inspector.

5-2.07 BACKWATER CHECK VALVE

Backwater check valves installed on 4 inch through 8 inch diameter side sewers shall be rubber flapper swing type check valves. Flapper shall be constructed from steel reinforced rubber with 45 durometer standard rubber hardness. Valve seat shall be at 45 degree angle to direction of flow. Flow area through valve shall equal full pipe area. Valve body shall be cast iron with flanged ends and bolted over to allow removal of flapper without removing valve from line.

The backwater valve shall be housed in a 48 inch diameter pre-cast concrete valve chamber with concentric 48 inch by 24 inch concentric reducing cone, or concrete meter box, depending on depth. The 24 inch frame and cover shall be marked “SEWER”.

5-2.08 STEEL CASING

Steel casing shall be black steel pipe conforming to ASTM A53. Casing thickness shall be 0.250 inch for casing 24 inches or less in diameter and 0.375 inch for casings over 24 inches in diameter.

5-2.09 CASING SPACER

Casing spacers and end seals shall be sized for pipe installation and shall be manufactured by Advance Products & Systems, Cascade Waterworks, Pipeline Seal and Insulators Co., or approved equal. See Standard Detail W-230.

5-2.10 CONTOLLED DENSITY FILL

Controlled Density Fill (CDF) shall conform to the requirements of Section 2-09.3(1) E of the WSDOT/APWA Standard Specifications.

5-2.11 CONCRETE

Concrete used for pads, thrust blocking, encasement, or slope anchor shall be mixed from materials acceptable to the City and shall have a 30 day compressive strength of not less than 2,500 psi. The mix shall contain five (5) sacks of cement per cubic yard and shall be of such consistency that the slump is between 1 inch and 5 inches.

5-2.12 BEDDING MATERIAL

Bedding material shall be ⅜ inch minus manufactured pea gravel. Pipe bedding shall be ⅜ inch minus pea gravel meeting the requirements of Section 9-03.17 of the WSDOT/APWA Standard. Bedding will be to the pipe zone shown on Standard Details SS-120.

5-3 CONSTRUCTION

5-3.01 GENERAL REQUIREMENTS

All work shall be constructed as shown in the Plans and in accordance with WSDOT/APWA Standards and Specifications, and these Standards. Materials shall be installed in compliance with the manufacturer's instructions and specifications, except where a higher quality of workmanship is required by the Plans and these Standards. All work shall be in accordance with any applicable regulations of the State, County and local jurisdictions. The Contractor shall arrange for such inspection by these agencies and shall submit evidence of their approval, if requested by the City.

Construction shall not start prior to approval of the construction plans by the City Engineer.

5-3.02 MATERIAL SUBMITTALS

The Developer/Contractor shall provide material submittals to the City for approval after the plans are approved for construction. The Developer shall assume the risk for material or equipment, which is fabricated or delivered prior to the City's approval of material submittals.

Five (5) sets of material submittals are required. The City shall either approve or otherwise indicate the reasons for disapproval. Disapproved submittals shall be resubmitted to the City

for approval.

The City's review of material submittals covers only general conformity to the plans and these Standards. The Developer is responsible for quantity determination. No quantities are to be verified by the City. The Developer is responsible for any errors, omissions or deviations from the contract requirements. Review and approval of submittals by the City does not relieve the Developer from his obligation to furnish required items in accordance with the plans and these Standards.

Each "Material Submittal" section shall follow a Material Submittal Form provided by the City. Each submittal must have the specific part number(s) checked or highlighted along with its specific purpose.

5-3.03 PRE-CONSTRUCTION CONFERENCE

The Developer/Contractor shall contact the Public Works Department (360-403-3500) to schedule a pre-construction conference after plans are approved before staking and construction start. The conference shall include the Developer, Developer's Engineer, and Contractor, representatives from the permit agencies, other utility companies, and City staff. An on-site tailgate meeting between the Contractor and the City Inspector shall be arranged by the Contractor at least 48 hours prior to commencing construction.

5-3.04 CONSTRUCTION SCHEDULE

The Developer/Contractor shall provide the City with the construction schedule a minimum of five (5) business days prior to start of sewer system extension construction to arrange staking inspection and to give permitting agencies and customers two (2) business days notice. No construction is allowed until the construction plans have been approved.

5-3.05 EASEMENT

Prior to the start of the sewer system extension construction, the Developer must acquire easements for construction of any sewer mains or facilities not located in existing City right-of-way, City easements, or on the Developer's property.

5-3.06 PERMITS

All public right-of-way permits for the sewer system extension shall be obtained by the Developer at the Developer's expense. The Developer shall provide the traffic control plan prepared by the Developer, Developer's Engineer, or Contractor. The Developer shall apply for and obtain permits from other agencies listed in Section 1-3.04 of these Standards prior to commencing construction.

5-3.07 HANDLING OF PIPE

All types of pipe shall be handled in a manner that prevents damage to the pipe, pipe lining or coating. Pipe and fittings shall be loaded and unloaded using forks or cable choker in a manner that avoids shock or damage, and under no circumstances shall they be dropped,

skidded, or rolled against other pipe. Damaged pipe will be rejected, and the Contractor shall immediately place all damaged pipe apart from the undamaged and shall remove the damaged pipe from the project site within 24 hours.

Pipe shall be stacked in such a manner as to prevent damage to the pipe, to prevent dirt and debris from entering the pipe, and to prevent any movement of the pipe. The bottom tiers of the stack shall be kept off the ground on timbers, rails or other similar supports. Pipe on succeeding tiers shall be alternated by bell and plain end. Timbers of 4 inch × 4 inch shall be placed between tiers and chocks shall be placed at each end to prevent movement. Each size of pipe shall be stacked separately.

Threaded pipe ends shall be protected by couplings or other means until the pipe is installed. Dirt or other foreign material shall be prevented from entering the pipe or pipe joints during handling and installation. When pipe installation is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other means approved by the City.

5-3.08 STAKING

Staking shall be performed by or under the direct supervision of the Developer's Land Surveyor licensed in the State of Washington. Provide the City with two (2) business days notice to inspect construction staking before construction begins.

The minimum staking of sewer lines shall be as directed by the City Engineer or as follows:

1) Staking location of sewer mains and side sewers every 50 feet with cut or fill to invert of pipe.

2) Staking location of all manholes for alignment and grade with cut or fill to rim and pipe inverts.

3) Staking front lot corners prior to installation for side sewer tees.

5-3.09 DEVIATION FROM PLANS

No deviations from the approved plans and these Standards shall be allowed without the City's approval. Minor changes may be approved by the City Engineer. If major changes are required, the Developer's Engineer shall revise and sign the plans for the City Engineer's approval prior to restart of construction.

If the City is aware of any deviation from the approved plans and determines that it is not acceptable, the City shall give a written notice to the Developer. The project will not be accepted unless the deviation is corrected.

5-3.10 INSPECTION AND TESTING

The City Inspector shall have access to the project site for the purpose of inspections and testing at all times. The Contractor shall provide proper facilities for such access, inspection, and testing.

If any work is covered without approval or consent of the City Inspector, it must be uncovered for inspection if required by the City Inspector.

Before a pressure test is to be observed by the City Inspector, the Contractor shall make whatever preliminary tests to ensure that the material and/or equipment are in accordance with the plans and these Standards.

Written and/or verbal notices of deficiency shall be given to the Contractor. The Contractor shall correct such deficiencies before final inspection by the City Inspector.

5-3.11 WATER QUALITY

The Contractor is required to implement water pollution controls and maintain these until the project is accepted by the City. The Contractor shall familiarize themselves with the requirements of the DOE and other regulatory agencies having jurisdiction over such matters. The oil and chemical storage site shall be approved by the City and the area shall be diked. There shall be no disposal of waste oil or oil products on the project site. The Contractor shall provide a waste oil disposal tank if needed.

5-3.12 CONSTRUCTION ON EXISTING EASEMENTS

All work on the public utility easements shall be performed in accordance with easement provisions. Easements shall be restored equal to or better than the original conditions. The Contractor shall not work on easement areas until specifically authorized by the City Engineer. The City and the Contractor shall coordinate with the property owner(s).

5-3.13 PRE-CONSTRUCTION PHOTOS

Before commencing any construction work as described in the plans, the Contractor shall provide photographs of pre-existing conditions of the area that will be disturbed during construction operations. Photographs will be obtained as follows:

1) 50 foot interval in easements up station and down station.

2) Any other locations as directed by the City Inspector.

The photographs shall be 5 inch x 7 inch, color prints, contained in albums, catalogued, and cross-referenced. A digital copy shall also be provided by the Contractor.

5-3.14 UNDERGROUND UTILITIES

The plans show the approximate locations of various existing utilities known to the Design Engineer such as gas lines, water mains, storm drainage, power lines, telephone lines, TV cables, fiber optics, and other obstructions based on information obtained from various sources. This information is not guaranteed to be accurate, and the Contractor is responsible to check for interferences and obstructions by inquiry from the different utilities and by underground exploration before commencing excavation.

The Contractor shall request field locates and notify the owners of underground utilities about the scheduled commencement of excavation through the one-call system (1-800-424-5555). If the utility is not included in the one-call number system service, notice shall be provided individually to those owners of underground utilities known to or suspected of having underground utilities within the area of proposed excavation.

Notice shall be made to owners of underground utilities not less than two (2) business days or more than ten (10) business days prior to scheduled date of commencement of excavation.
Test pits, for the purpose of locating underground utilities or structures in advance of the construction, shall be excavated and backfilled by the Contractor. Test pits shall be backfilled immediately after their purpose has been satisfied and the surface restored and maintained in a manner satisfactory to the applicable agency.

The Contractor shall excavate around and under active utilities with special care and shall support and maintain them in service. Where it is necessary to cut, move or reconnect any service lines, arrangements shall be made with the respective utility owners.

The Contractor shall coordinate with utility owners and notify the City in advance of any conflicts affecting the work schedule, and/or possible cost increase to the City if the project is a City capital improvement projects.

The Contractor shall be responsible for any damage of utilities or services resulting from his operations and shall hold the City harmless from any claims resulting from disruption of or damage to same.

5-3.15 TRENCH EXCAVATION

Trench excavation and backfill operations within State right-of-way: All excavation and backfill within state right-of-way shall adhere to the WSDOT/APWA Standard Specifications.

Trench excavation and backfill operations within County right-of-way: Excavation within Snohomish County right-of-way shall conform first to Snohomish County Road Standards, and secondly to standards set forth by the WSDOT.

Trench excavation and backfill operations within City right-of-way: Excavation within City right-of-way shall conform to these Standards.

Clearing and grubbing limits may be established by the City or governing agency for certain areas and the Contractor shall confine his operations within those limits. Debris resulting from the clearing and grubbing shall be disposed of by the Contractor.

Trenches shall be excavated to the line and grade shown in the plans or designated by the City. Where higher strength pipe or special bedding is required because of excess trench width, it shall be furnished.

Unsuitable material below the depth of the bedding shall be removed to the extent approved

by the City Inspector and replaced with satisfactory materials as determined by the City Engineer.

The length of trench excavation in advance of pipe laying shall be kept to a minimum and shall not exceed more than 150 feet without written approval of the City Engineer.

When trenching operations take place in the public right-of-way, the pavement and all other improvements shall be restored as required by the right-of-way permit.

When excavation of rock is encountered, all rock shall be removed to provide a clearance below, on each side of all pipe, and fittings of at least 6 inches for pipe sizes 24 inches or smaller and 9 inches for pipe sizes 30 inches or larger. Material removed shall be replaced with appropriate backfill material, which shall be compacted to 95% standard proctor. See Standard Detail SS-120.

5-3.16 SHEETING AND SHORING

The Contractor shall provide and install sheeting and shoring as necessary to protect workers, the work and existing utilities and other properties in compliance with OSHA and WISHA requirements. Removal of the sheeting and shoring shall be accomplished in such a manner that there will be no damage to the work or to other properties.

5-3.17 TRENCH DEWATERING

The Contractor shall maintain sufficient pumping equipment on the project site to keep the trench free from standing water. Surface runoff shall not be allowed to flow to the trench. The trench water or other deleterious materials shall not be allowed to enter the pipe at any time. If, at anytime, water is found to be entering the new sewer pipe, the Contractor shall plug the pipe and cease working until the trench water is completely pumped out or otherwise controlled, to the satisfaction of the City Inspector. Dewatering and its methods shall be the responsibility of the Developer/Contractor. Any method used must be in accordance with the specifications and requirements of the City and DOE.

5-3.18 MANHOLE

Manhole Foundation

Unless otherwise directed by the City, manhole bases (pre-cast base sections or cast-in-place) shall be placed on a minimum thickness of 6 inches of crushed surfacing base course meeting the requirements of Section 9-03.9(3) of the WSDOT/APWA Standard Specifications. The crushed surfacing base course must be compacted to 95% of standard density.

Manhole Sections

Manhole sections shall be placed and aligned so as to provide vertical sides and vertical alignment of the ladder steps. The completed manholes shall be rigid, true to dimension and watertight. Rough or uneven surfaces shall not be permitted inside or outside. All

manhole sections shall be newly manufactured and free of breaks or cracks.

Joints between pre-cast manhole elements shall be rubber gasketed in a manner similar to pipe joints conforming to ASTM C-443 and they shall be grouted inside and outside. The grout used between joints in the pre-cast sections and for laying manhole adjusting bricks shall be composed of two-part cement to one-part of plaster sand. All joints shall be thoroughly wetted and completely filled with grout, smoothed both inside and outside. Grout shall be ½ inch minimum thick and 3 inch minimum on each side of joints. The exterior joints shall receive a water proof coating that overlaps the manufacturer's water proofing by a minimum of 1 inch when required by the City Inspector. Shop drawings of the joint design shall be submitted to the City Inspector for approval prior to manufacture.

Completed joints shall show no visible leakage and shall conform to the dimensional requirements of ASTM 478. They must be inspected before backfill. See Standard Detail SS-010.

Lift Holes and Steel Loops

All manhole lift holes shall be completely filled with expanding grout and smoothed both inside and outside to ensure water tightness. All steel loops must be removed, flush with the manhole structure. The stubs shall be covered with grout and smoothed. Rough or uneven surfaces shall not be permitted.

Manhole Channels

All manholes shall be channeled unless otherwise approved by the City. Channels shall match existing sewer grades. Channels shall converge with smooth transitions rounded into well finished junctions. Channel sides shall be carried up vertically to the crown elevation of the various pipes. Concrete shelves between channels shall be smoothly finished, warped evenly and sloped to drain.

All manholes shall have a minimum drop of 0.10 feet to a maximum drop of 2.0 feet between the invert in and the invert out.

Pipe Connections at Manholes

All pipes except PVC pipe entering or leaving the manhole shall be provided with flexible joints within ½ of a pipe diameter or 12 inches, whichever is greater, from the outside face of the manhole structure. The flexible joint shall be placed on firmly compacted bedding, particularly within the area of the manhole excavation which normally is deeper than that of the sewer trench. Special care shall be taken to see that the openings through which pipes enter the manhole are completely and firmly rammed full of non-shrink grout to ensure water tightness.

PVC pipe connected to manholes shall be provided with a manhole adapter complete with gasket and approved by the City Engineer. No PVC pipe joint shall be placed within 10 feet of the outside face of the manhole.

All stubbed out pipes placed through manhole walls for future connections shall be suitably plugged and blocked, with bell end left intact in a manner acceptable to the City.

Drop Manholes

Drop manholes shall be constructed with an outside drop connection per City Standard Detail SS-060 for new manholes. Inside drop structures may be allowed on connections to existing manholes if approved by the City Engineer.

Ladders

Manhole ladders shall be installed in accordance with the approved manufacturer's recommended procedures and City Standard Detail SS-040 on sides of manholes opposite the pipe and channels if possible.

Connection to Existing Manholes

When connecting to an existing manhole, check that the existing manhole diameter is adequate to accommodate the new sewer mains. The existing manhole may need upgrade or repair at the Developer's expenses. If the existing manhole access is less than 24 inches in diameter, and/or concentric cone (manhole over 7 feet deep), the manhole shall be upgraded to include new 24 inch ring and cover and/or eccentric cone. If connection to an existing manhole places a channel directly under access opening, move the ladder and rotate the cone section to place the access the over concrete shelf.

The Contractor shall verify invert elevations prior to construction. The crown elevation of laterals shall be the same as the crown elevation of the incoming pipe unless specified. The existing base shall be reshaped to provide a channel equivalent to that specified for a new manhole.

The Contractor shall excavate completely around the manhole to prevent unbalanced loading. The manhole shall be kept in operation at all times and the necessary precautions shall be taken to prevent debris or other material from entering the sewer, including a tight pipeline bypass through the existing channel if required.

Connection of new sewer pipe to an existing manhole shall be accomplished by using core drilled holes to match the size of pipe. All openings must provide a minimum of 1 inch and a maximum of 2 inch clearance around the outside circumference of the pipe. The transition of connecting channels shall be constructed so as not to interrupt existing flow patterns.

Upstream pipes, except PVC pipe, penetrating the walls of manholes shall be placed with the bell facing out such that the bell is placed snug against the outside wall of the structure as the angle of penetration allows. Pipe, except PVC pipe, leaving or entering the manhole shall be provided with a flexible joint within ½ of a pipe diameter, or 12 inches, whichever is greater. After pipes have been placed to their final position, they shall be grouted tight with non-shrink grout. PVC pipe shall be connected to an existing

manhole per these Standards.

The Contractor shall provide protective clothing and equipment (coveralls, gloves, boots, head covering, goggles, and respirators) to crews working with asbestos cement pipe in order to assure the workers' exposure to asbestos material be at or below the limit prescribed in WAC 296-62-07705.

Asbestos cement pipe shall be cut with a reed wheel cutter with controlled flowing water. Contaminated clothing shall be transported in sealed, impermeable bags and labeled in accordance with WAC 396-62-07705. Asbestos cement pipe shall be left and buried in the trench.

Pipe Plugging at Connections

At the connection to the existing sewer system, Contractor shall physically plug all new sewer connections until all tests have been completed and the City approves the removal of the plugs.

Saddle Manhole

A saddle manhole shall be constructed per City Standard Detail SS-020 and these Standards. The existing pipe shall not be cut until approval is received from the City.

Manhole Ring and Cover

Manhole rings and covers shall be installed per City Standard Details SS-01 and SS-03. All castings shall be coated with bituminous coating prior to delivery at the job site. Manholes in paved areas shall match the finished grade of the pavement.

Grade Adjustment

Manholes located in the public right-of-way, not less than 8 inches and not more than 26 inches shall be provided between the top of the cone (or slab for flat top manholes) and the bottom of the manhole frame. Grade adjustments shall be done within 24 hours after paving. Paving, repaving, and patching shall be completed within 72 hours.

Manhole rim elevations in unpaved areas (planters and grassed areas) shall be 4 inches to 6 inches above the finished grade or as directed by the City Inspector. See Standard Detail SS-070.

Locking cover shall be used for all manholes. Manholes shall not be located in areas subject to inflow. If a manhole must be located in an area subject to inflow in the opinion of the City Engineer, the manhole shall be equipped with a PRECO sewer guard watertight manhole insert or approved equal.

5-3.19 SEWER MAIN

General

No broken or defective sewer pipe and related materials will be allowed to be used.

The maximum permissible trench width between the foundation level and to 12 inches above the pipe shall be 40 inches for pipe 15 inches or smaller or 1½ times the inside diameter plus 18 inches for pipes 18 inches or larger. See City Standard 120. If the maximum trench width is exceeded without authorization from the City Inspector, the Developer will be required to provide pipe of higher pressure class or to provide a higher class of bedding, at the discretion of the City Engineer.

During excavation and installation of the sewer lines and placement of trench backfill, excavations shall be kept free of water. The Developer shall control surface run-off so as to prevent entry and collection of water in excavations. The static water level shall be drawn down a minimum of 1 foot below the bottom of the excavation so as to maintain the undisturbed state of the foundation soils and along the placement of any fill or backfill to the required density. The dewatering system shall be installed and operated so that the groundwater level outside the excavation area is not reduced to the extent which would damage or endanger adjacent structures or property.

Pipe Bedding

Pipe bedding shall be ⅜ inch minus manufactured pea gravel. Bedding will be to the pipe zone shown on the City Standard Detail SS-120. The pipe zone is identified as 6 inches below the bottom of the pipe to 12 inches above the top of pipe.

Bedding shall be installed and spread smoothly so that the pipe is uniformly supported. Subsequent lifts are not to exceed 6 inches in thickness and shall be installed to the crown of the pipe. All lifts shall be individually compacted to 90% of the maximum density as determined by ASTM D-698. A 12 inch lift of material shall be placed and compacted over the crown of the pipe prior to backfilling the trench. The Developer may use Controlled Density Fill (CDF) for pipe backfill above the pipe's invert level.

Laying Sewer Pipe

All sewer main installations shall have line and grade set by survey, prior to construction. Staking shall show each manhole, cuts to all inverts. All sewer mains shall be straight between manholes at a minimum depth of 7 feet measured from the invert, unless otherwise approved in writing by the City Engineer or shown on the approved plans.

The Contractor may use any method such as "line and batter board" and "laser beam" etc., which would allow the Contractor to accurately transfer the control points provided by the Surveyor in laying the pipe to the designated alignment and grade.

When using the "line and batter board" method, the Developer shall transfer line and grade into the ditch where they shall be carried by means of a taut grade line supported

on firmly set batter boards at intervals of not more than 30 feet. Not less than three batter boards shall be in use at one time. In the event that the batter boards do not line up, the work shall be immediately stopped and the cause remedied before proceeding with the work.

When using a "laser beam" to set pipe alignment and grade, the Developer shall constantly check the position of laser beam from surface hubs provided by the Surveyor to ensure the laser beam is still on alignment and grade. In the event the laser beam is found out of position, the Contractor shall stop working and make the necessary corrections to the laser beam equipment and pipe installed.

There shall be a minimum horizontal clearance between sewer and water main of 10 feet, unless a design alternative has been specifically approved by the City Engineer. Sanitary sewers shall be installed lower than water mains whenever possible. Where sanitary sewers and water mains cross, there shall be a minimum vertical separation of 18 inches between water mains and sanitary sewer mains unless an alternative design has been specifically approved by the City Engineer.

Sanitary sewers laid 14 feet and deeper must be epoxy coated ductile iron pipe of Class 52 or C-900 PVC.

Trenches shall be excavated to a depth and grade required. Pipe bedding shall be placed to provide a uniform and continuous bearing and support for the pipe on solid undisturbed or compacted ground.

Sewer lines shall be laid upgrade from the starting point of connection on the existing sewer or from a designated starting point, as approved by the City Inspector. Sewer pipe shall be installed with the bell end forward or upgrade. After placing a length of pipe in the trench, the spigot shall be centered in the bell and the pipe forced home and brought to correct line and grade. During joining, the pipe shall be partially supported to minimize unequal lateral pressure and to maintain concentricity. Pipe handling after the gasket has been affixed shall be carefully controlled to avoid disturbing and dislocating the gasket. Any disturbed or dislocated gaskets shall be removed, cleaned, replaced and lubricated before joining the sections.

The maximum amount of open trench on streets and roadway shoulders shall not exceed 150 feet at any one time, unless specifically approved by the City Inspector. The Developer shall ensure that the project site is a safe environment at all times. At the end of each day all open trenches must either be backfilled or covered with steel plates and barricaded with attached flashing yellow lights to prevent vehicles, people and animals from falling into the trench.

The Contractor shall provide experienced personal on-site to oversee the construction process during all shoring operations. Where conditions exist which require shoring, the Contractor shall adequately shore trenches to protect existing property, utilities, pavement etc. and to provide safe working conditions inside and above the trench. The method of shoring shall be according to the Contractor’s design. The Contractor may elect to use a combination of shoring and over break, tunneling, boring, sliding trench shields, or other

methods to accomplish the work, provided the method(s) meet all applicable local, State and Federal safety codes. Damages resulting from improper cribbing or from failure to crib shall be the sole responsibility of the Developer.

Compaction tests shall be required for all backfilled trenches in paved public roadways and in roadway shoulders. A minimum of one test location shall be chosen by the City Inspector for every 200 lineal feet of sewer main installed. The City Inspector has the discretion to require additional tests, in locations specified by the City Inspector. All testing shall be at the expense of the Developer.

The Contractor shall remove all excavated trench material deemed by the City Inspector to be unsuitable for trench backfill at the Contractors expense.

No construction materials, soil, debris etc. shall be stockpiled in the public right-of-way unless specific permission is granted in writing by the City Inspector.

Under no circumstances shall pipe materials be dropped or dumped into trench. Broken or otherwise defective pipe shall be removed from the job site and replaced.

Every precaution shall be taken to ensure foreign material does not enter the pipe. When pipe laying is not in progress, the open ends of the pipe shall be closed by a water tight plug or other means approved by the City Inspector. If water is in the trench when work resumes, the seal on the pipe shall remain in place until the trench is completely pumped dry. No pipe shall be laid in water, or when in the opinion of the City Inspector, trench conditions are unsuitable.

No willows, poplars, cottonwoods, birches, soft maple, gum or any other tree or shrub whose roots are likely to obstruct public sewers are allowed within 30 feet of any public sewer. Any of these trees found to be located within 30 feet of a proposed sewer main shall be removed at the Developer's expense.

Connection to Existing Pipe

When connecting to the end of a existing pipe known to have a bell at the end of the pipe, a new pipe in the same material as the existing pipe, plans can specify connection by inserting a spigot of the new pipe into the existing bell end, with a "donut" gasket.

When connecting to the end of a existing pipe known to have a plain end, or must be cut, plans shall specify use of a coupling to connect new and existing lines.

Couplings and O-ring adapters utilized for joining pipes of dissimilar materials or different nominal sizes shall be flexible elastomeric PVC as manufactured by Fernco, Inc. or approved equal. Couplings shall be supplied with 316 stainless steel band clamps, fasteners and shear rings as applicable to the sizes and types that are being connected together.

Plugs and Connections

All fittings shall be capped or plugged with a plug of an approved material and gasketed with the same gasket material as the pipe unit, or the pipe shall be fitted with an approved mechanical stopper, or the pipe shall have an integrally cast knock-out plug. The plug shall be able to withstand all test pressures without leaking.

Jointing

Where it is necessary to break out or connect to an existing sewer during construction, only new pipe having the same inside diameter will be used in reconnecting the sewer. Where joints must be made between pipes with a mismatched wall thickness, the Developer shall use flexible gasket coupling, adapter or coupling-adapter to make a watertight joint. Couplings shall be those manufactured by "Romac", "Smith Blair", or approved equal for reinforced pipes and "Fernco" or approved equal as approved by the City Inspector for non-reinforced pipes.

Jacking, Auguring and Tunneling

See Section 2-10 – Underground Utilities.

Slope

All sanitary sewers shall be designed and constructed to give mean velocities, of not less than 2.0 feet per second when flowing full. The slopes shall meet the minimum required in these Standards.

Sewer Abandonment

Existing sewer lines to be abandoned shall be removed or filled completely with sand, concrete or controlled density fill. At the manhole connection, where existing sewer main is to be abandoned, the manhole shall be rechanneled with 3,000 psi cement concrete.

Cleaning and Testing of Sanitary Sewer

All sanitary sewer pipe shall be cleaned and tested after backfilling. Testing shall be by either exfiltration or low pressure air method. The Contractor has the option to select the method of testing, unless the ground water table is such that the City Inspector may require the infiltration test.

The Contractor shall clean and flush all sewer lines with clean water using approved jet vactoring equipment prior to testing.

All testing shall be under the direction and in the presence of the City Inspector. The Developer shall notify the City Inspector at least 2 business days prior to the start of any testing. Cleaning and testing of sewer lines shall be completed within 15 business days after backfilling of sewer lines and structures. Any additional delay will require the written consent of the City Inspector. The Developer shall furnish all labor, materials,

tools, and equipment necessary to make clean and test the sewer lines. Any damage resulting from testing shall be repaired by the Developer to the satisfaction of the City Inspector.

All tees and stubs shall be plugged with flexible jointed caps, or acceptable alternate, securely fastened to withstand the internal test pressure. These plugs or caps shall be readily removable and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension.

Testing of sewer mains shall include a television inspection by the Contractor. Television inspection shall be done after the air test has passed and before the roadway is paved. Immediately prior to a television inspection, enough water shall run down the line so it comes out the lower manhole. A copy of the VHS video tape and written report shall be submitted to the City. Acceptance of the sewer will be made after the tape has been reviewed and approved by the City Inspector. Any tap to an existing system needs to be televised as well. No ponding within the sanitary sewer line will be accepted.

If the Contractor elects to test larger diameter pipe one joint at a time, leakage allowances shall be converted from GPH per 100 feet to GPH per joint by dividing the number of joints occurring in 100 feet. If leakage exceeds the allowable amount, corrective measures shall be taken and the line shall be re-tested to the satisfaction of the City Inspector.

A mandrel test in accordance with Section 7-17.3(2)G of the WSDOT/APWA Standards and Specifications may be required for sewers mains (not side sewers).

If any sewer installation fails to meet the requirements of the test method used, the Developer shall determine the source or sources of the leakage and shall replace all defective pipes. The complete pipe installation shall meet the requirements of the test method used before being considered acceptable. Replacement of defective pipe shall not commence until the Developer has received approval of their plan from the City Inspector.

Exfiltration Test

Prior to exfiltration leakage testing, the Developer may fill the pipe with clear water to permit normal absorption into the pipe walls provided, however, after filling the pipe the Developer shall complete the leakage test within 24 hours. When under test, the allowable leakage shall be limited according to the provisions which to follow. Specified allowances assume pre-wetted pipe.

Leakage shall be no more than 0.28 GPH per inch diameter per 100 feet of sewer, with a hydrostatic head of 6 feet above the crown at the upper end of the test section, or above the natural groundwater table at the time of test, whichever is higher. The length of pipe tested shall be limited so that the pressure at the lower end of the section tested does not exceed 16 feet of head above the invert, and in no case shall the length of pipe being tested be greater than 700 lineal feet or the distance between manholes, whichever is shorter.

Where the test head is other than 6 feet, the maximum leakage shall not exceed 0.28 GPH per inch of diameter, per 100 feet of pipe length times the square root of the test head. The leakage can be determined from the equation:

Maximum leakage (in gallons per hour) = $0.28 \times \frac{\sqrt{H}}{\sqrt{6}} \times D \times \frac{L}{100}$

Where: D = diameter (in.)
L = length of pipe (ft.)
H = test head (ft.)

When the test is to be made one joint at a time, the leakage per joint shall not exceed the computed allowable leakage per length of pipe.

Television Inspection

All new sanitary sewer mains within the public right-of-way and those in the easements to be maintained by the City will be subject to a visual inspection with a TV camera. Any deficiencies noted by the TV camera inspection shall be corrected to the satisfaction of the City Inspector.

5-3.20 SANITARY SIDE SEWERS

Fittings and Clean-outs for Side Sewers

All fittings shall be factory produced and shall be designed for installation on the pipe to be used. Fittings shall be of the same quality and material as the pipe used, except when installing a PVC insert on existing pipe.

Side sewers shall be connected to the tee provided in the public sewer where such is available, utilizing approved fittings or adapters. Where no tee is provided or available, connection shall be made by the use of a Romac tapping tee or core drilled INSERT-A-TEE. See City Standard Detail SS-100.

All side sewers shall have a 6 inch clean-out at the property line per City Standard Detail SS-080. The riser portion of the clean-out shall be PVC unless otherwise approved by the City Inspector. For longer side sewer installations, extra clean-outs will be required at spacing not to exceed 100 feet.

Marking of Side Sewers

Tracer tape shall be installed over side sewer pipes and side sewer stubs. The tracer tape shall be placed 24 inches to 48 inches below the finished grade and it shall extend its full length. The location of all side sewers shall be marked with a 12 gauge wire and 2 inch x 4 inch wood marker at the termination of the stub. The marker shall be connected to the

pipe at the invert and wrapped around marker post. Above the ground surface, it shall be painted white with black letters of 2 inches in height "SEWER LOT xx INVERT DEPTH xx". Offset markers may be used when the side sewer location is within an existing driveway or other obstacle.

Testing of Side Sewers

All side sewers shall be tested after backfill. Side sewers that are reconstructed or repaired to a length of 10 feet or more shall be tested for water-tightness. Testing of newly reconstructed sections of side sewers consisting of a single length of pipe will not be required. Testing shall be performed in the presence of the City Inspector in accordance with these Standards or as directed by the City Inspector.

When a new side sewer is installed, the entire length of new pipe installed shall be tested.

In cases where a new tap is made on the main, the first joint of pipe off the main shall be installed with a test tee, so that an inflatable rubber ball can be inserted for sealing off the side sewer installation for testing. In cases where the side sewer stub is existing to the property line, the test ball may be inserted through the clean-out wye to test the new portion of the side sewer installation.

Side Sewer As-Built Plans

The as-built drawings shall show the following:

1) Location of the side sewer, its connection with the building(s) and all dimensions.

2) Show station as distance of side sewer tee from the center of the next downstream manhole.

3) The depth and point of connection of the side sewer to the sanitary sewer main.

4) Any additional information which might be deemed pertinent.

Side Sewer Demolition

Side sewer demolition shall be performed prior to removal of building foundation. The side sewer for each building shall be excavated and removed from the house connection to the property line or the main as required by the City. The contractor shall cap the end of the side sewer to remain in place. Side sewer demolition shall be performed in the presence of the City Inspector.

5-3.21 CLEANOUT

All clean-outs in the City right-of-way or easements shall be extended to grade and a 3 feet x 3 feet x 4 inch concrete pad shall be installed around all clean-outs in unpaved areas. See City of Arlington Standard Detail SS-080.

5-3.22 GREASE TRAP AND INTERCEPTOR

Grease traps and interceptors shall be installed and sized according to the criteria in the Uniform Plumbing Code. Grease trap and interceptors shall be located on private property, and they shall remain privately owned and maintained at the owner's or occupant's expense. These facilities shall be available for the inspection by the City's Public Works crews with a 24 hour verbal notification to the occupant or property owners.

5-3.23 PRIVATE GRINDER PUMP

Private grinder pumps shall be installed in accordance with the manufacture procedures and per approved plans by the City. The force main shall be pressure tested at 150% of the total dynamic head. All inspections must be completed prior to backfilling.

5-3.24 LIFT (PUMP) STATIONS

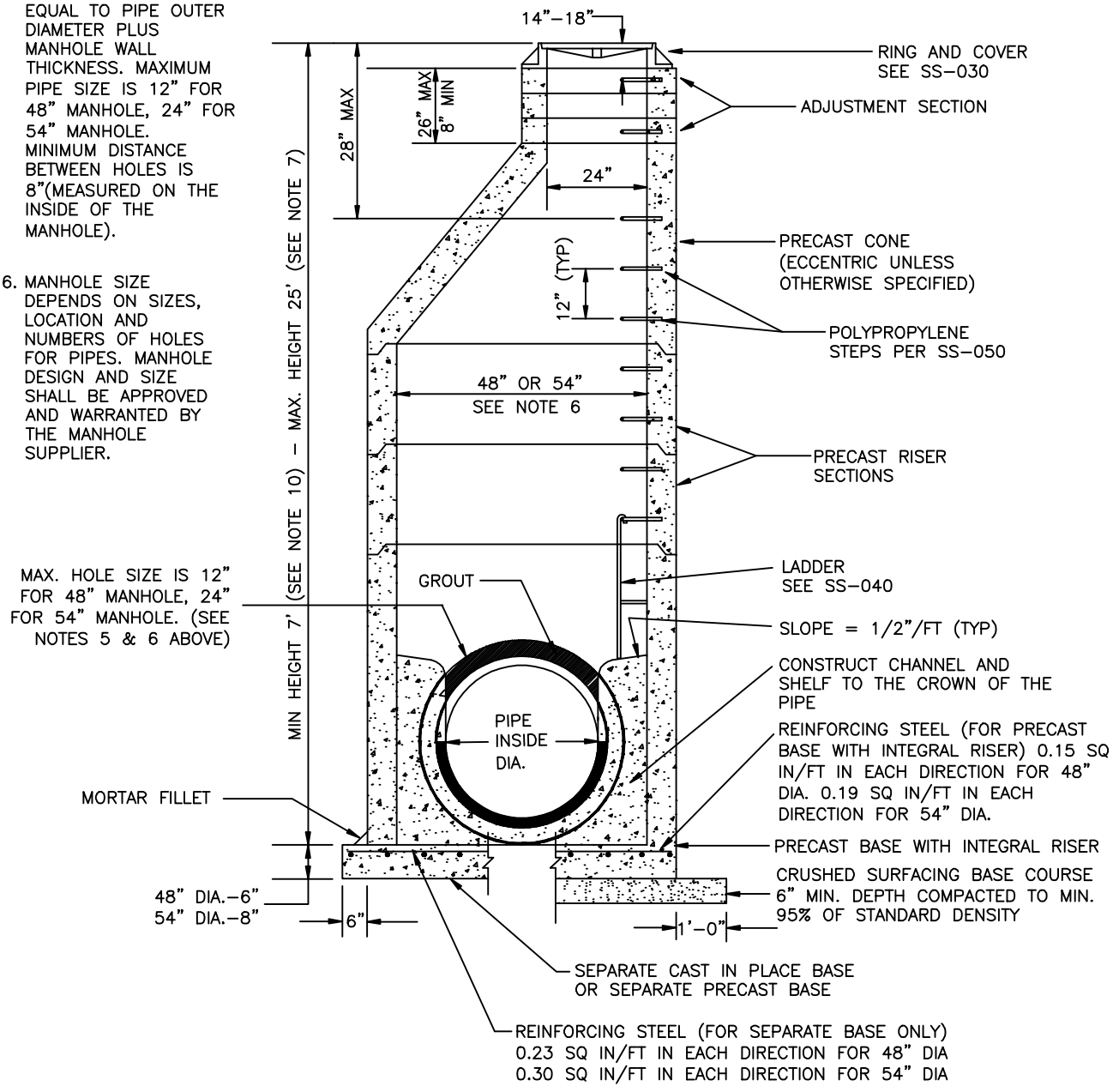
Lift stations shall be constructed, per approved plans and specifications prepared by a Design Engineer licensed in the State of Washington.

5-3.25 SPECIFICATIONS NOT COVERED BY THESES STANDARDS

In the event a construction or installation specification relating to sanitary sewers is not covered by this regulation, the City may require compliance with other applicable manuals or standards.

NOTES:

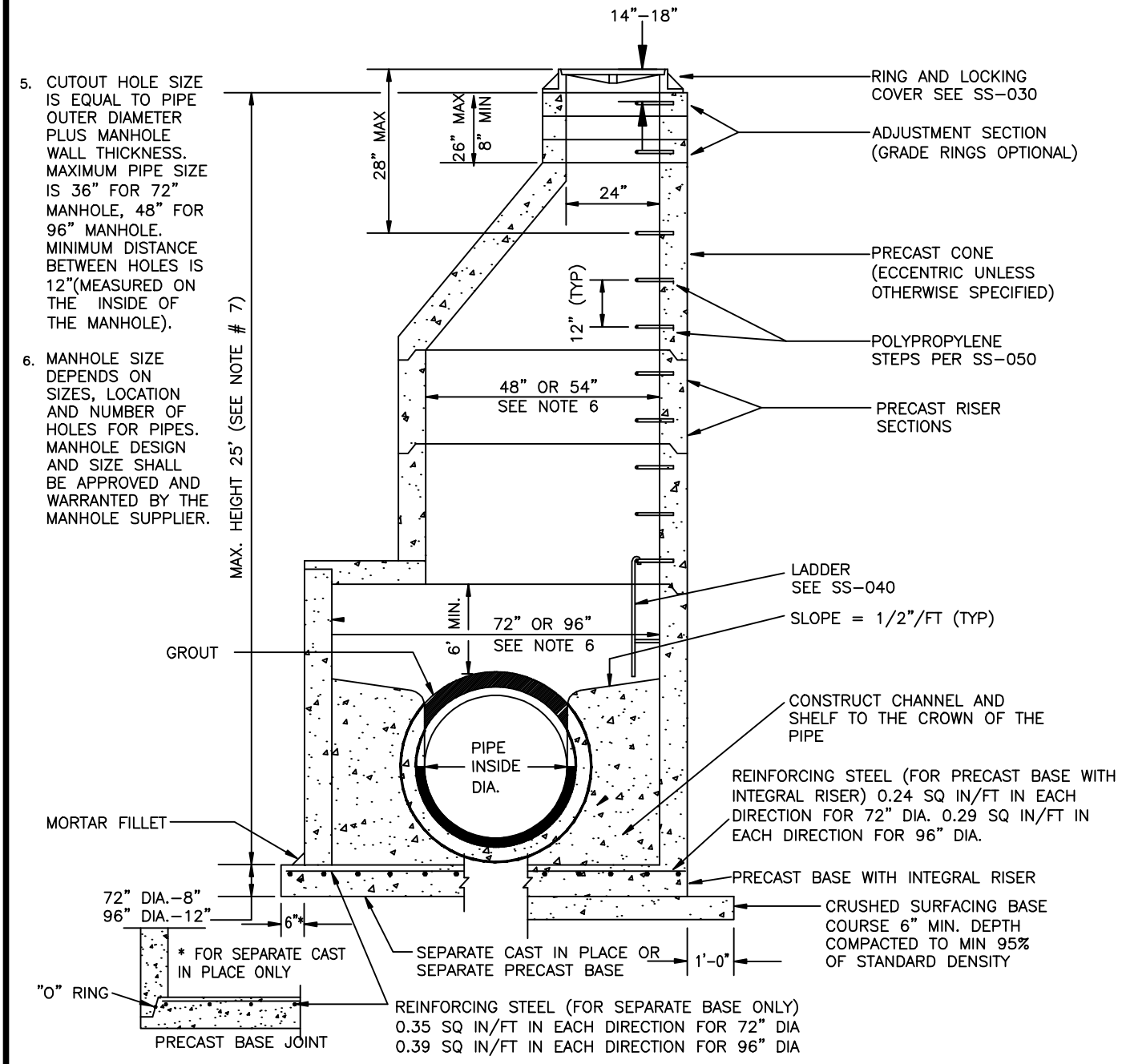
1. MANHOLES TO BE CONSTRUCTED IN ACCORDANCE WITH AASHTO M–199 (ASTM C 478) UNLESS OTHERWISE SHOWN ON PLANS OR NOTED IN STANDARD SPECIFICATIONS.
2. ALL REINFORCED CAST IN PLACE CONCRETE SHALL BE CLASS 4000. NON–REINFORCED CONCRETE IN CHANNEL AND SHELF SHALL BE CLASS 3000. ALL PRECAST CONCRETE SHALL BE CLASS 4000.
3. PRECAST BASES SHALL BE FURNISHED WITH CUTOUTS.
4. ALL BASE REINFORCING STEEL SHALL HAVE A MINIMUM YIELD STRENGTH OF 60,000 PSI AND BE PLACED IN THE UPPER HALF OF THE BASE WITH 1" MINIMUM CLEARANCE.
5. CUTOUT HOLE SIZE IS EQUAL TO PIPE OUTER DIAMETER PLUS MANHOLE WALL THICKNESS. MAXIMUM PIPE SIZE IS 12" FOR 48" MANHOLE, 24" FOR 54" MANHOLE. MINIMUM DISTANCE BETWEEN HOLES IS 8"(MEASURED ON THE INSIDE OF THE MANHOLE).
6. MANHOLE SIZE DEPENDS ON SIZES, LOCATION AND NUMBERS OF HOLES FOR PIPES. MANHOLE DESIGN AND SIZE SHALL BE APPROVED AND WARRANTED BY THE MANHOLE SUPPLIER.
7. FOR DEPTHS OVER 25' MANHOLE BASE SLAB DESIGN SHALL BE DESIGNED BY A STRUCTURAL ENGINEER.
8. ALL INTERIOR AND EXTERIOR JOINTS TO BE GROUTED (SEE GROUT SPECIFICATIONS). GROUT TO BE 1/2" THICK MINIMUM AND 3" EACH SIDE OF JOINT MINIMUM. THEY MUST BE INSPECTED PRIOR TO BACKFILL.
9. CORE DRILLING ONLY, HAMMERING KNOCKOUTS WILL NOT BE ALLOWED. KOR–N–SEAL FACTORY INSTALLED BOOTS ARE ALLOWED.
10. MANHOLES 5'–7' DEEP MUST BE FLAT TOPS.



CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL
	DATE	07/31/2008	
	REF STAD SPEC		MANHOLE TYPE I
			STANDARD DETAIL NUMBER SS–010

NOTES:

1. MANHOLES TO BE CONSTRUCTED IN ACCORDANCE WITH AASHTO M–199 (ASTM C 478) UNLESS OTHERWISE SHOWN ON PLANS OR NOTED IN STANDARD SPECIFICATIONS.
2. ALL REINFORCED CAST IN PLACE CONCRETE SHALL BE CLASS 4000. NON–REINFORCED CONCRETE IN CHANNEL AND SHELF SHALL BE CLASS 3000. ALL PRECAST CONCRETE SHALL BE CLASS 4000.
3. PRECAST BASES SHALL BE FURNISHED WITH CUTOUTS
4. ALL BASE REINFORCING STEEL SHALL HAVE A MINIMUM YIELD STRENGTH OF 60,000 PSI AND BE PLACED IN THE UPPER HALF OF THE BASE WITH 1" MINIMUM CLEARANCE.
5. CUTOUT HOLE SIZE IS EQUAL TO PIPE OUTER DIAMETER PLUS MANHOLE WALL THICKNESS. MAXIMUM PIPE SIZE IS 36" FOR 72" MANHOLE, 48" FOR 96" MANHOLE. MINIMUM DISTANCE BETWEEN HOLES IS 12"(MEASURED ON THE INSIDE OF THE MANHOLE).
6. MANHOLE SIZE DEPENDS ON SIZES, LOCATION AND NUMBER OF HOLES FOR PIPES. MANHOLE DESIGN AND SIZE SHALL BE APPROVED AND WARRANTED BY THE MANHOLE SUPPLIER.
7. FOR HEIGHTS OVER 25' MANHOLE BASE SLAB DESIGN SHALL BE DESIGNED BY A STRUCTURAL ENGINEER.
8. ALL INTERIOR AND EXTERIOR JOINTS TO BE GROUTED. GROUT TO BE 1/2" THICK MINIMUM AND 3" EACH SIDE OF JOINT MINIMUM. THEY MUST BE INSPECTED PRIOR TO BACKFILL.
9. CORE DRILLING ONLY, HAMMERING KNOCKOUTS WILL NOT BE ALLOWED. KOR–N–SEAL FACTORY INSTALLED BOOTS ARE ALLOWED.



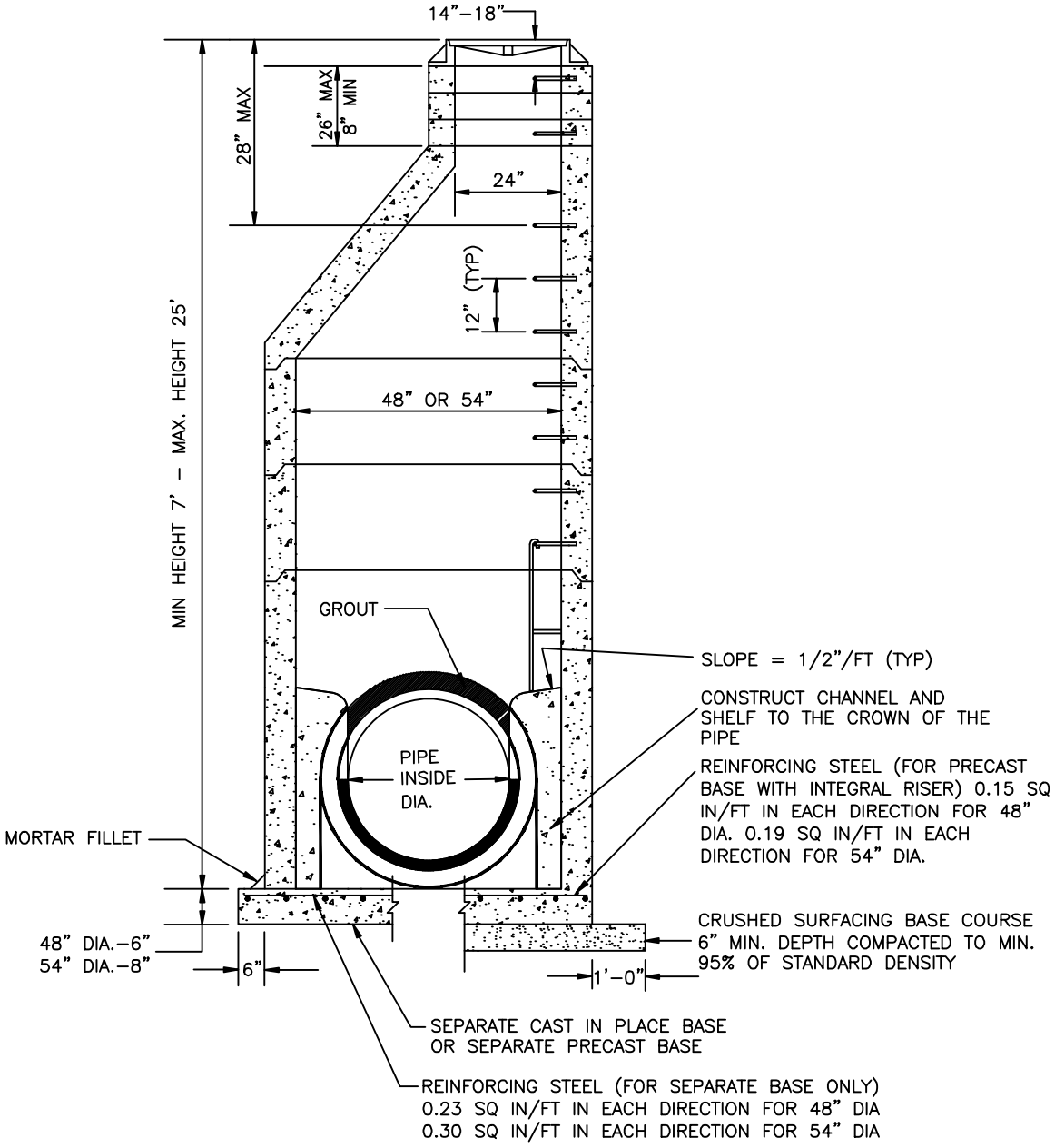
CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL
	DATE	07/31/2008	
	REF STAD SPEC		
			MANHOLE TYPE II

STANDARD DETAIL NUMBER

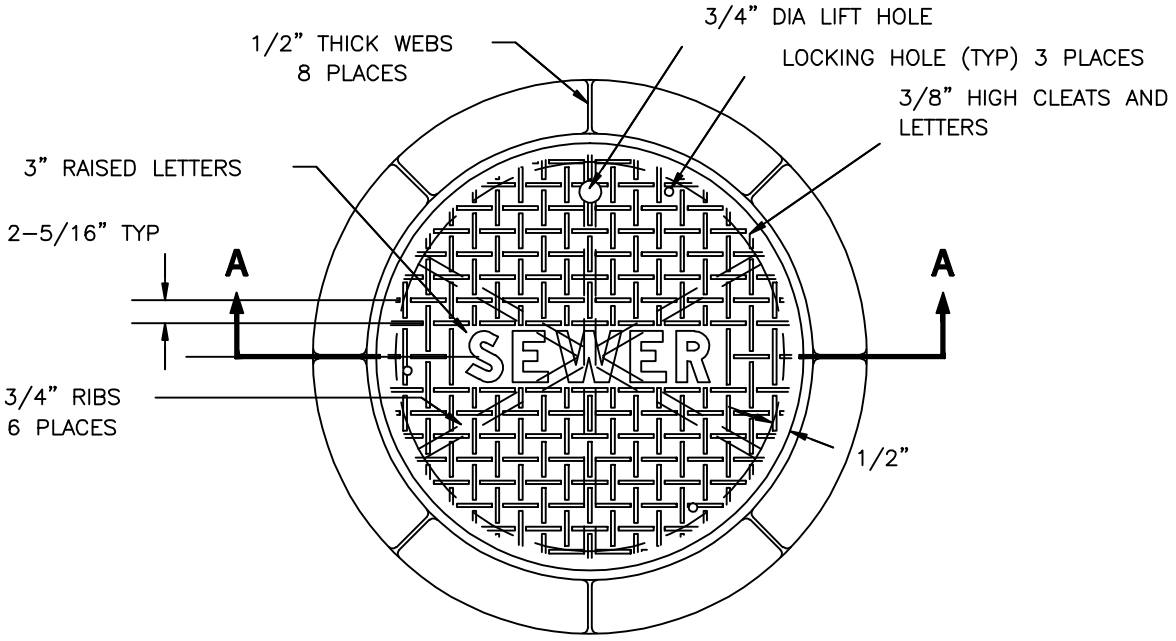
SS–015

NOTES:

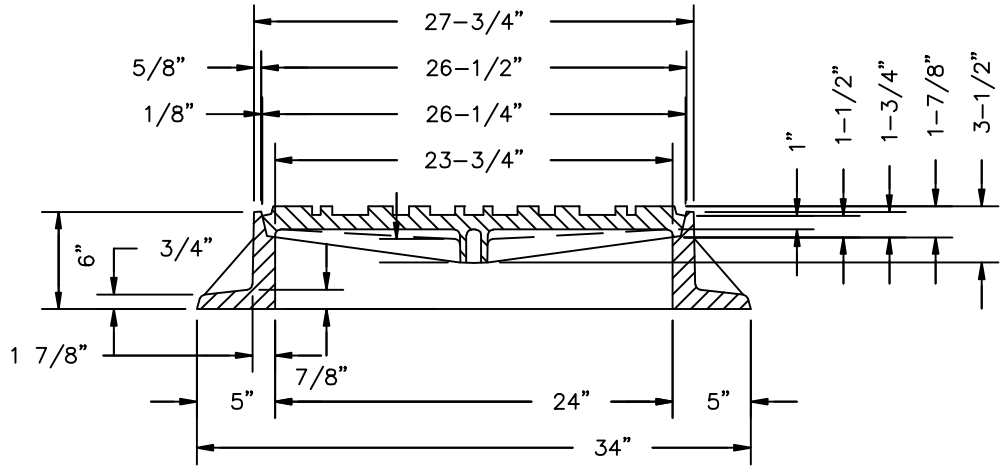
1. SADDLE MANHOLE MAY ONLY BE USED WHEN PLACING A NEW MANHOLE OVER AN EXISTING SEWER LINE. SIZE, LOCATION, AND ANGLE MUST BE AS REQUIRED BY PLANS.
2. OPENINGS IN PRECAST UNITS ARE TO BE 4" MINIMUM TO 8" MAXIMUM LARGER THAN THE OUTSIDE DIAMETER OF THE PROPOSED PIPE.
3. CONSTRUCT BENCH AND INVERT TO ALLOW SMOOTH TRANSITION OF FLOW FROM NEW SEWER TO EXISTING SEWER.
4. ALL NOTES ON SS-010 AND SS-015 ALSO APPLY TO THIS DETAIL.



CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL
	DATE	07/31/2008	
	REF STAD SPEC		SADDLE MANHOLE
			STANDARD DETAIL NUMBER SS-020



PLAN

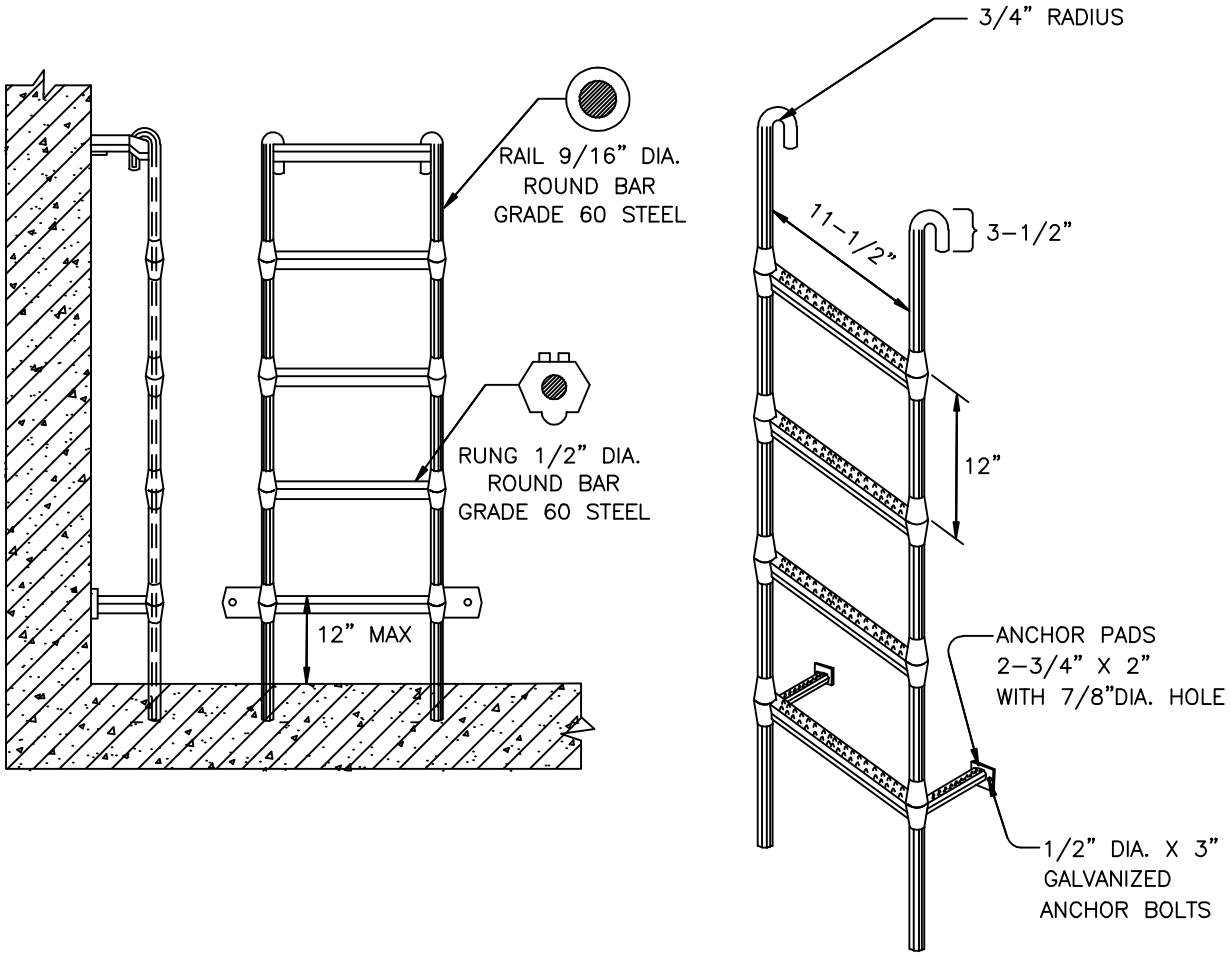


SECTION A-A

NOTES:

1. MANHOLE RINGS SHALL BE GRAY IRON CONFORMING TO THE REQUIREMENTS OF AASHTO M 105, GRADE 30B.
2. MANHOLE COVER TO BE DUCTILE IRON CONFORMING TO ASTM A536, GR 80–55–06 OLYMPIC FOUNDARY PART NO. MH30 OR APPROVED EQUAL.
3. LOCKING COVER TO BE USED IN ALL LOCATIONS. THE LID SHALL BE LOCKED DOWN WITH 3–5/8" S.S SOCKET HEAD CAP SCREWS.
4. RING AND COVER SHALL BE TESTED FOR ACCURACY OF FIT AND SHALL BE MARKED IN SETS FOR DELIVERY.
5. ALL CASTINGS TO HAVE A BITUMINOUS COATING.

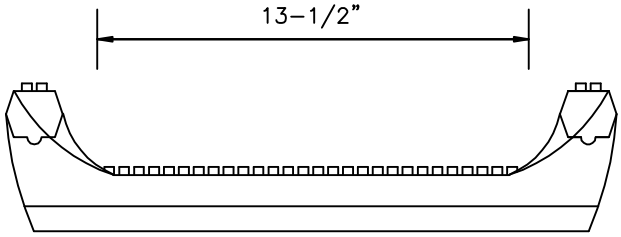
CITY OF ARLINGTON	APPROVED BY: L. OLIVE DATE: 07/31/2008 REF STAD SPEC:	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL MANHOLE COVER	STANDARD DETAIL NUMBER SS–030



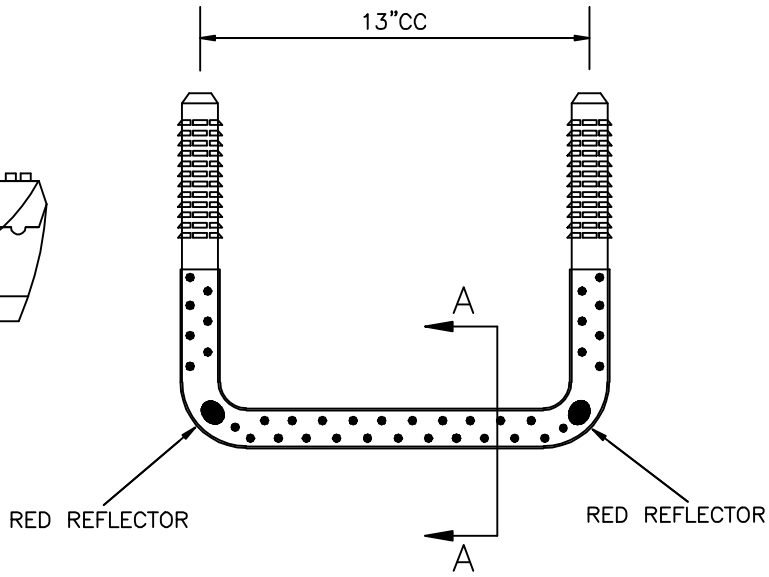
NOTES:

1. STEPS SHALL BE STEEL REINFORCED COPOLYMER POLYPROPYLENE PLASTIC CONFORMING TO:
   (A) ASTM C 478 AND AASHTO M-199, MINIMUM HORIZONTAL LOAD SHALL BE 1500 LBS.
   (B) ASTM A615 GRADE 60 (REINFORCING STEEL BAR).
   (C) POLYPROPYLENE CONFORMS TO D-4101.
2. MANHOLE STEPS SHALL HAVE MOLDED SAFETY HAND GRIP. RED REFLECTORS ARE REQUIRED.
3. ALL FABRICATION DIMENSIONS INDICATED ARE MINIMUM.
4. THE ENTIRE POLYPROPYLENE PLASTIC MATERIAL SURROUNDING THE REINFORCING STEEL BAR SHALL BE CAST MONOLITHICALLY. MINIMUM COVER SHALL BE 3/16-INCH.
5. STEPS SHALL BE SPACED AT 12 INCHES.
6. LADDER SHALL BE INSTALLED IN ACCORDANCE WITH THE APPROVED MANUFACTURERS RECOMMENDED PROCEDURES.

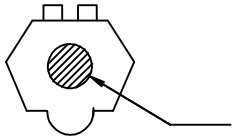
CITY OF ARLINGTON	APPROVED BY: L. OLIVE DATE: 07/31/2008 REF STAD SPEC:	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL MANHOLE LADDER	STANDARD DETAIL NUMBER SS-040



ELEVATION



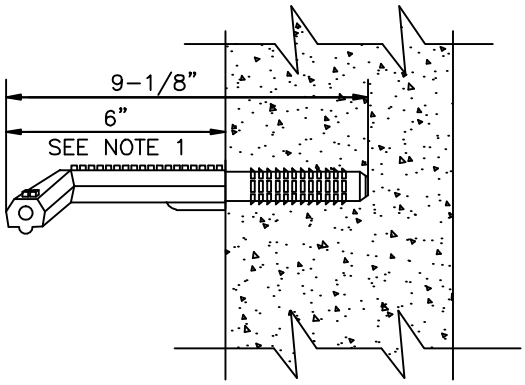
PLAN



1/2" GRADE 60 STEEL
REINFORCING BAR (ASTM A–615)

POLYPROYLENE ASTM D4101
STEP MEETS ASTM C–478

SECTION A-A



SIDE ELEVATION

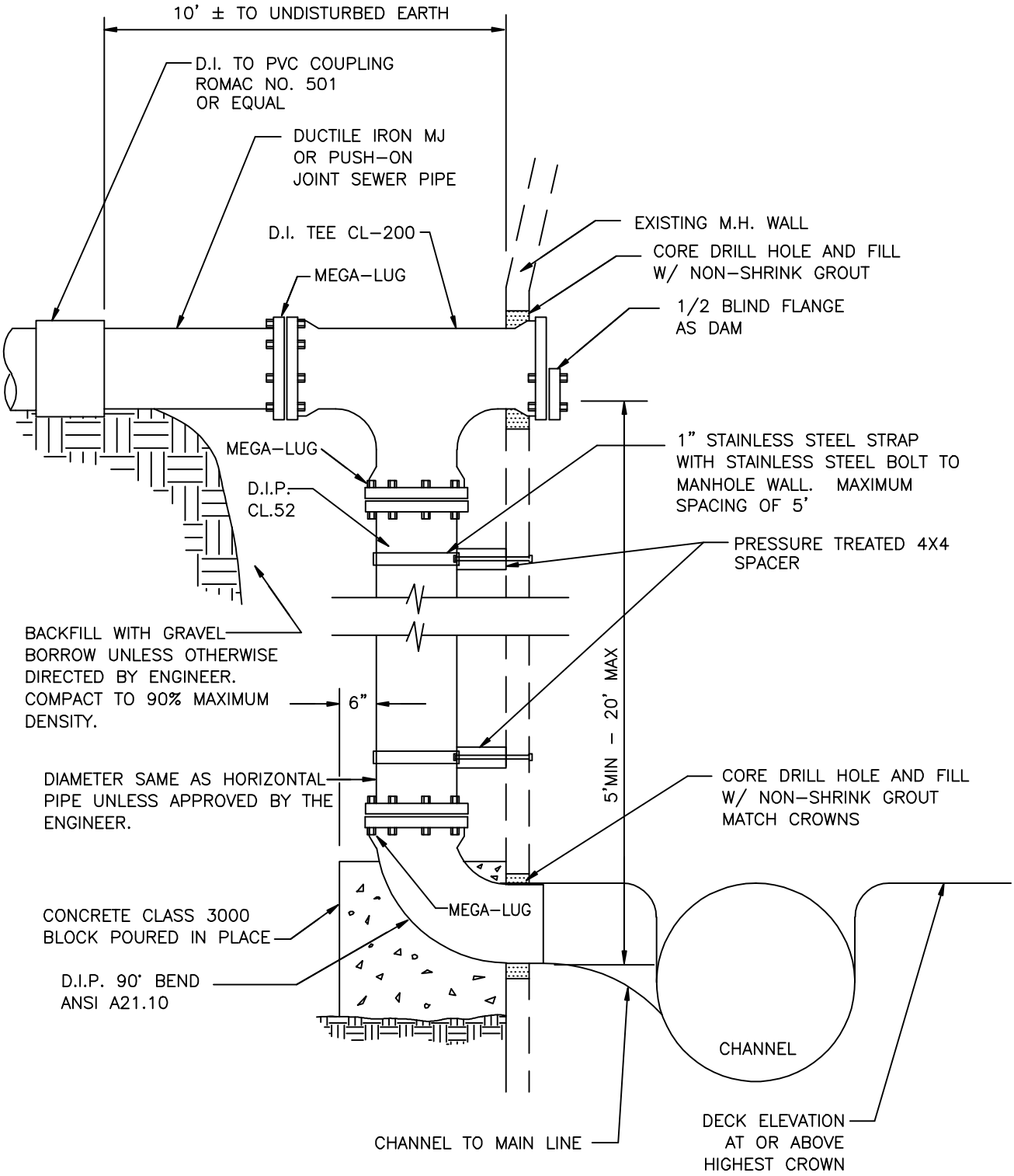
NOTE:

1. STEPS LOCATED IN RISER SECTIONS SHALL BE 6".

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL
	DATE	07/31/2008	
	REF STAD SPEC		MANHOLE LADDER STEP

STANDARD DETAIL NUMBER

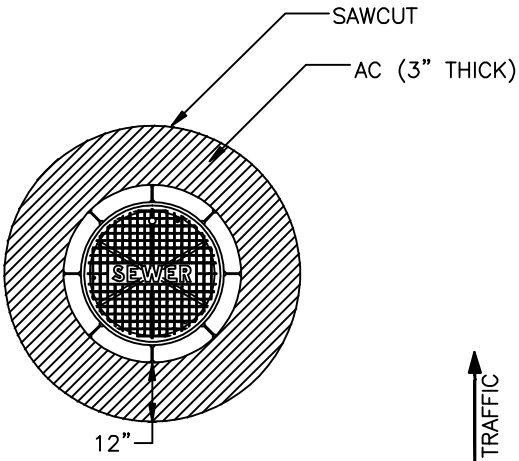
SS–050

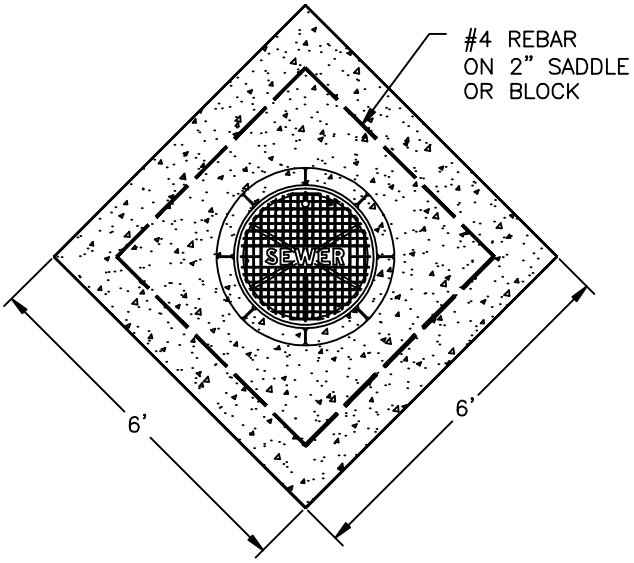


CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL
	DATE	07/31/2008	
	REF STAD SPEC		MANHOLE DROP CONNECTION

STANDARD DETAIL NUMBER

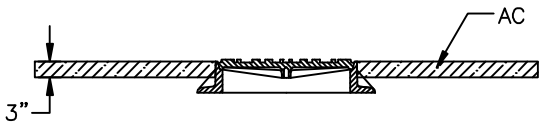
SS-060



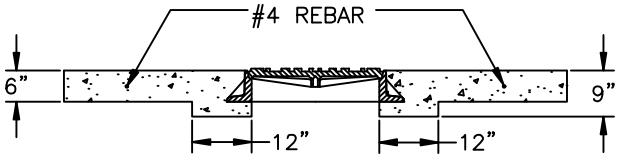


FLOW OF TRAFFIC

PAVED TRAFFIC AREAS



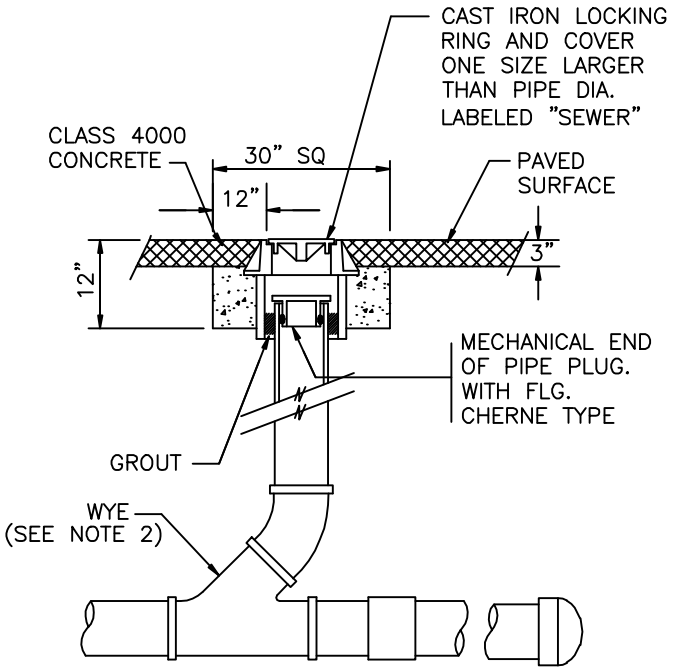
OUTSIDE PAVED TRAFFIC AREAS



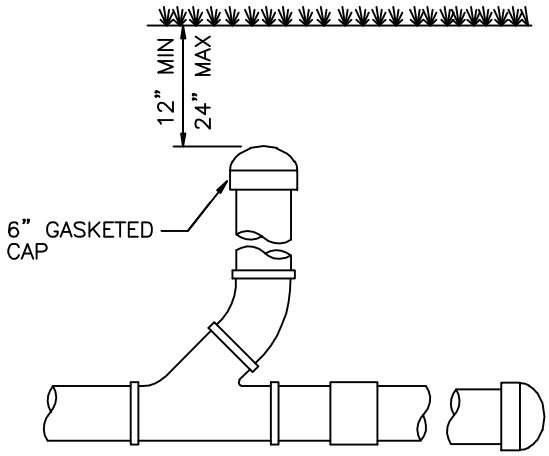
NOTES:

1. CONCRETE SHALL CONFORM TO CURRENT STANDARDS AND SHALL BE 5.5 SACK MIX. (MINIMUM 3000–PSI 28–DAY STRENGTH)
2. WHERE DEPTH OF NECK EXCEEDS 26 INCHES, ADJUST MANHOLE TO GRADE BY INSERTING A NEW MANHOLE BARREL SECTION BETWEEN THE CONE AND EXISTING BARREL.
3. ADJUSTMENT RINGS/BLOCK, TOP OF CONE SECTION, AND BOTTOM OF IRON RING, SHALL BE WET STACKED IN 3/4" GROUT, PLASTER SMOOTH INSIDE AND OUT.
4. STEPS OR RUNGS SHALL BE ADDED AS NEEDED PER SS–040 AND SS–050.
5. PRECAST ADJUSTMENT RINGS SHALL BE CAST WITH GROOVE TO ALLOW FIELD INSTALLATION OF SAFETY STEP.
6. CONCRETE PERIMETER SEAL SHALL EXTEND TO 12 INCH MINIMUM OR 2 INCHES BELOW THE BOTTOM OF THE ADJUSTMENT RINGS OR BLOCKS.
7. SAWCUT ONLY. NO OVERCUTTING LIMITS OF PATCH.
8. IN NON–TRAFFIC AREAS (LANDSCAPED) THE CONCRETE PAD IS 4" THICK WITHOUT REINFORCEMENT.

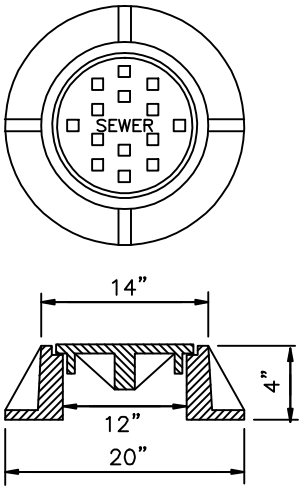
CITY OF ARLINGTON	APPROVED BY: L. OLIVE DATE: 07/31/2008 REF STAD SPEC:	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL MANHOLE PAD AND ADJUSTMENT	STANDARD DETAIL NUMBER SS–070



PAVED AREAS



UNPAVED AREAS



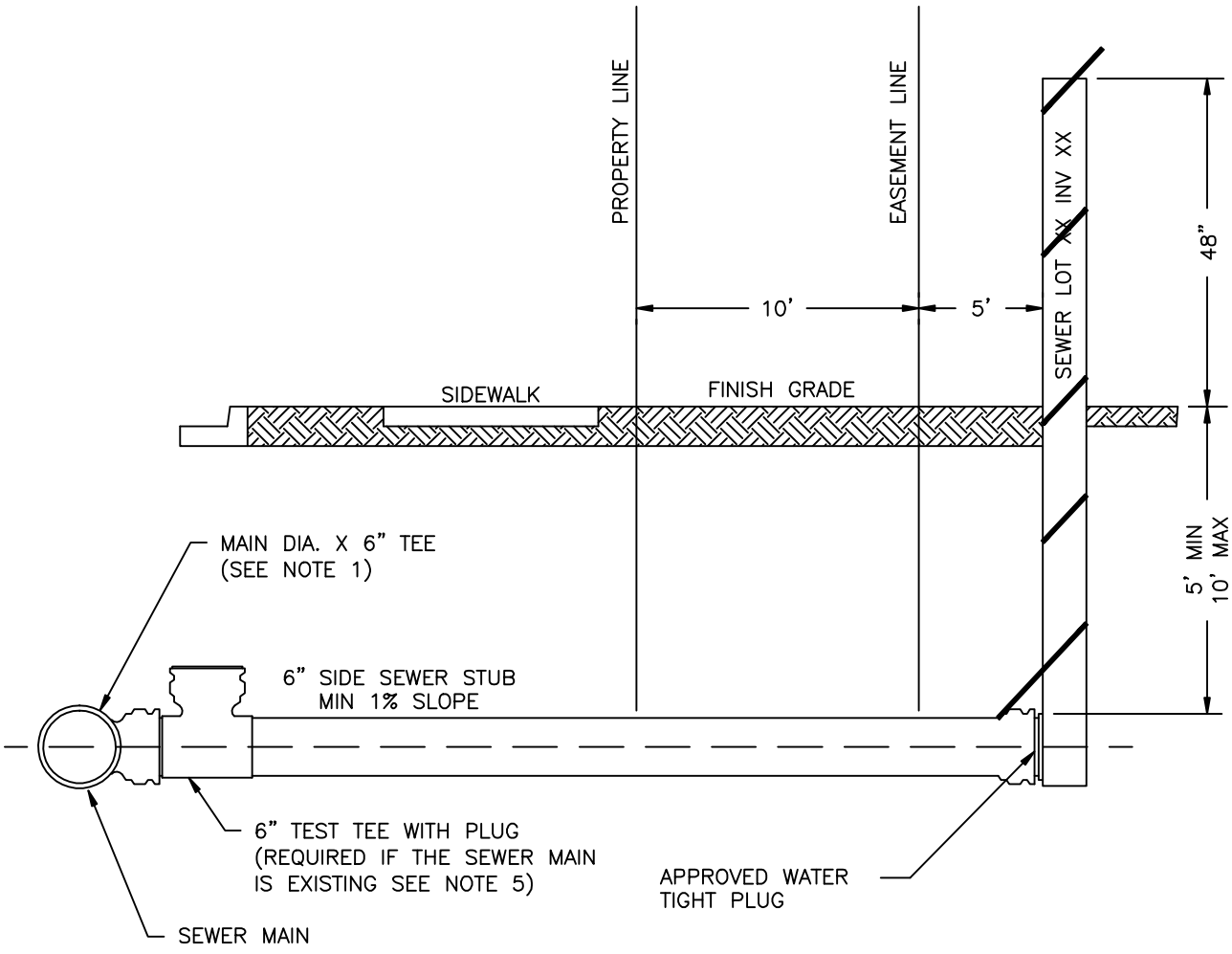
12" CAST IRON LOCKING RING AND COVER

OLYMPIC M1025 OR APPROVED EQUAL

NOTES:

1. CLEAN–OUT PIPE AND FITTINGS SHALL BE THE SAME MATERIAL AS THE SEWER MAIN.
2. A SANITARY TEE, SWEEP, OR STRAIGHT TEE IS NOT ACCEPTABLE.
3. SEWER STUB WILL BE EXTENDED 10' BEYOND PROPERTY LINE AND 5' BEYOND UTILITY EASEMENTS TO PREVENT DAMAGE TO CLEAN–OUT AND MINIMIZE CONFLICTS WITH OTHER UTILITIES WHEN SERVICE TO BUILDING IS ACCOMPLISHED.

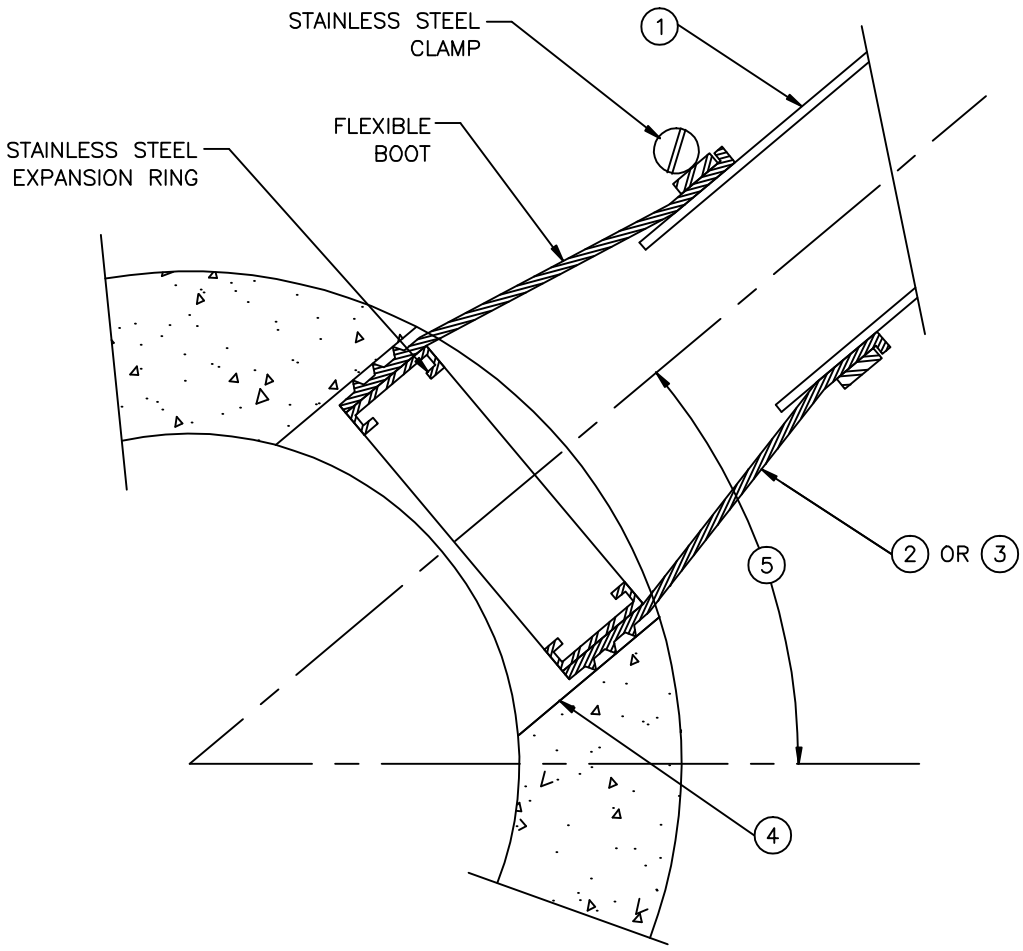
CITY OF ARLINGTON	APPROVED BY: L. OLIVE DATE: 07/31/2008 REF STAD SPEC:	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL SEWER CLEANOUT	STANDARD DETAIL NUMBER SS–080



NOTES:

1. AT THE CONNECTION TO THE SEWER MAIN A MAIN DIA. X 6" TEE IS REQUIRED FOR NEW SEWER MAINS AND A ROMAC TAPPING TEE OR CORE DRILLED INSERT–A–TEE REQUIRED FOR AN EXISTING SEWER MAIN.
2. 2x4 PRESSURE TREATED MARKER POST SHALL BE PAINTED WHITE WITH BLACK LETTERS "SEWER LOT # INVERT DEPTH".
3. 12 GAUGE WIRE SHALL BE CONNECTED TO PIPE AT INVERT AND WRAPPED AROUND MARKER POST.
4. DETECTOR TAPE REQUIRED FROM SEWER MAIN TO MARKER POST.
5. TEST TEE SHALL BE INSTALLED AT THE SEWER MAIN WHEN A SIDE SEWER IS CONNECTED TO AN EXISTING SEWER MAIN.

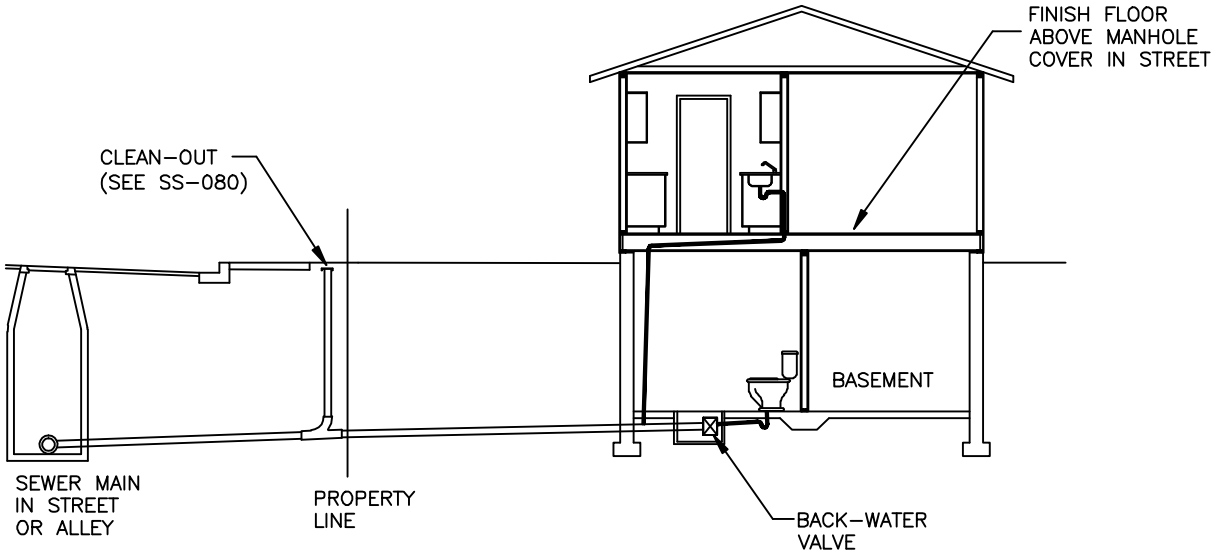
CITY OF ARLINGTON	APPROVED BY: L. OLIVE DATE: 07/31/2008 REF STAD SPEC:	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL SIDE SEWER STUB	STANDARD DETAIL NUMBER SS–090



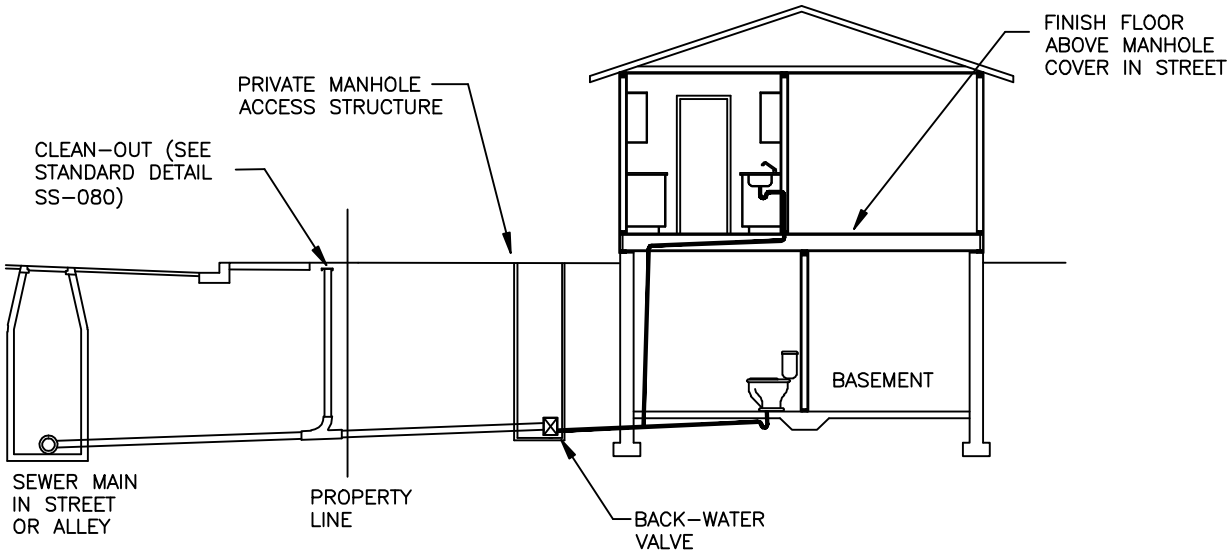
NOTES:

1. PVC SIDE SEWER. FOR REMAINDER OF PVC SERVICE SEE SS–090.
2. ROMAC STYLE CB TAPPING SADDLE OR APPROVED EQUAL ON ALL PIPE.
3. CORE–DRILLING WITH INSERT–A–TEE MAY ALSO BE USED ON ALL PIPE.
4. CORE DRILL EXISTING MAINLINE PIPE PER MFG'S SPECIFICATIONS.
5. 35° MIN, 45° MAX.

CITY OF ARLINGTON	APPROVED BY: L. OLIVE DATE: 07/31/2008 REF STAD SPEC:	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL NEW SERVICE ON EXISTING MAIN	STANDARD DETAIL NUMBER SS–100



NEW DEEP SIDE-SEWER

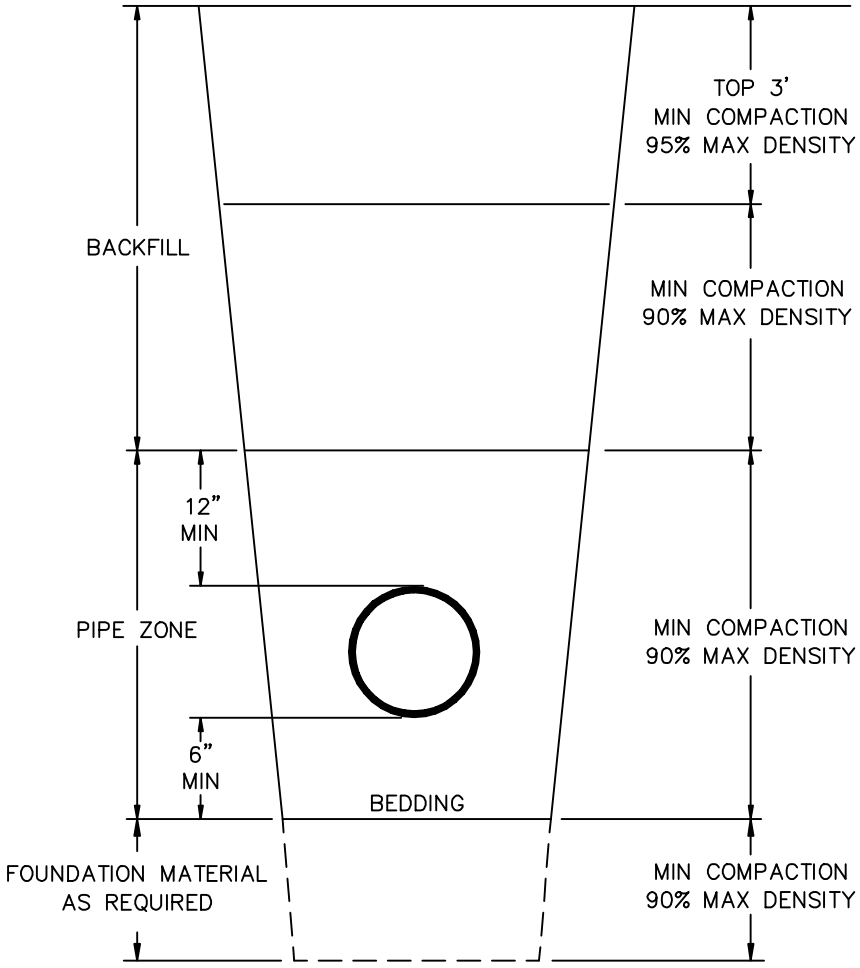


RETROFIT EXISTING DEEP SIDE-SEWER

NOTES:

1. ANY PLUMBING WITHIN THE BUILDING MUST COMPLY WITH THE CURRENT CITY OF ARLINGTON ADOPTED PLUMBING CODE.
2. THE SIDE–SEWER OUTSIDE THE BUILDING MUST COMPLY WITH THE CITY OF ARLINGTON PUBLIC WORKS CONSTRUCTION STANDARDS.
3. ALL BACKWATER VALVES MUST BE ACCESSIBLE FOR INSPECTION AND MAINTENANCE BY THE OWNER.

CITY OF ARLINGTON	APPROVED BY: L. OLIVE DATE: 07/31/2008 REF STAD SPEC:	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL BACK WATER VALVE	STANDARD DETAIL NUMBER SS–110



SECTION

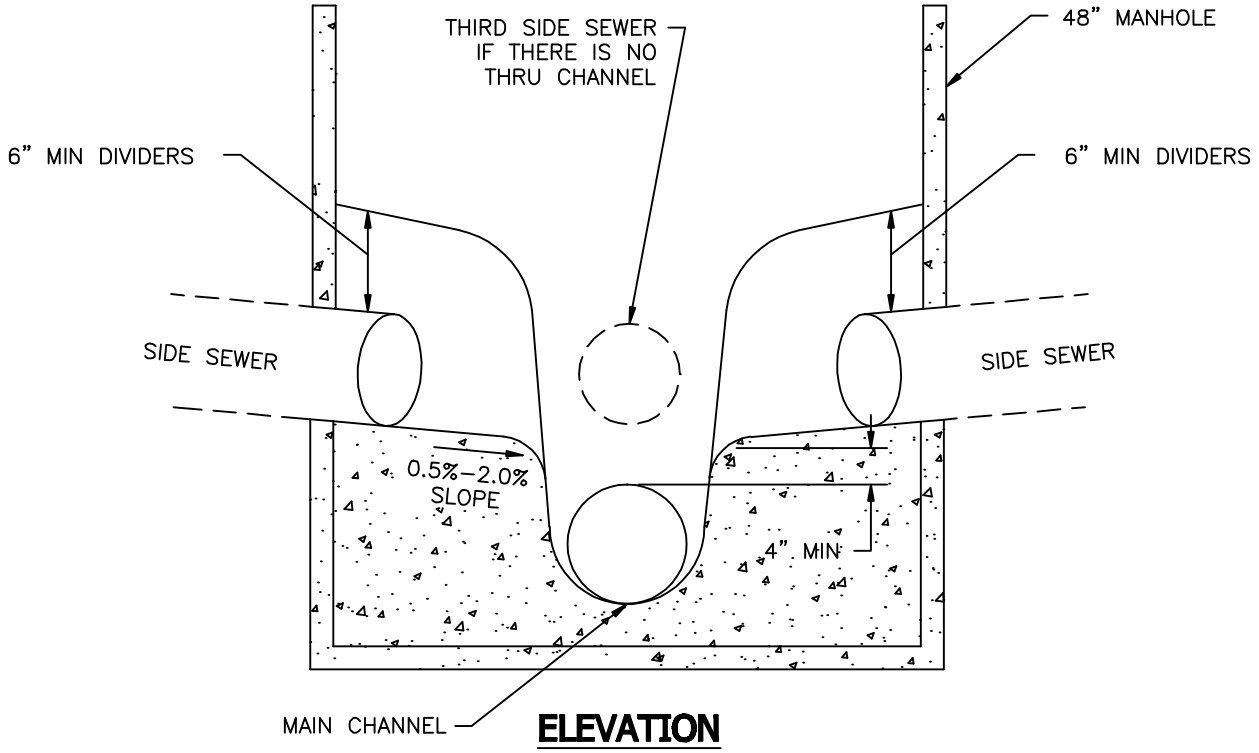
NOTES:

1. ALL BACKFILL MATERIAL SHALL BE PLACED IN LIFTS NOT TO EXCEED 12 INCHES BEFORE COMPACTION UNLESS AUTHORIZED BY THE CITY ENGINEER DUE TO THE CHARACTER OF THE MATERIAL AND THE COMPACTING EQUIPMENT.
2. MECHANICAL COMPACTION OF BACK FILL MATERIAL SHALL NOT BEGIN UNTIL THE DEPTH OF COMPACTED BACKFILL MATERIAL IS 2 FEET ABOVE THE TOP OF PIPE.
3. EACH LIFT SHALL BE MECHANICALLY COMPACTED TO THE REQUIRED DENSITY PRIOR TO PLACING SUCCEEDING LIFTS OF BACKFILL MATERIAL.
4. COMPACTION TESTS SHALL BE AS REQUIRED BY THE CITY ENGINEER, BUT IN NO CASE LESS THAN 2 TESTS EVERY 200 FEET OF TRENCH (ONE AT SUBGRADE AND ONE AT 50% OF TRENCH DEPTH).
5. IN-PLACE DENSITY AND MOISTURE CONTENT WILL BE DETERMINED USING NUCLEAR METHOD, ASTM 2922-71.
6. LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT WILL BE DETERMINED USING THE MODIFIED PROCTOR METHOD IN ACCORDANCE WITH ASTM D-1557.
7. BEDDING MATERIAL SHALL BE 3/8" MINUS.

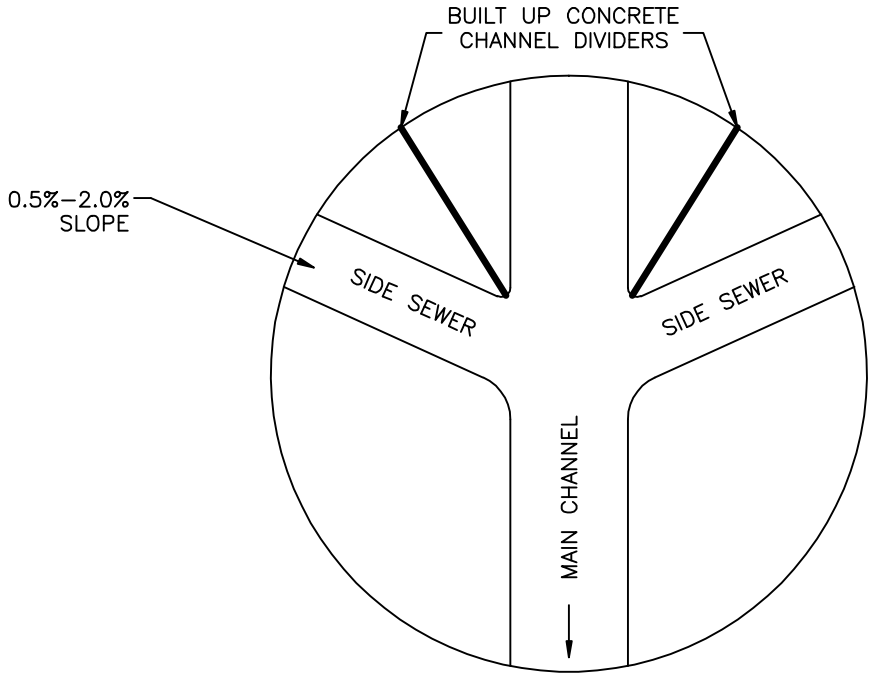
CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL
	DATE	07/31/2008	
	REF STAD SPEC		TRENCH SECTION

STANDARD DETAIL NUMBER

SS-120



ELEVATION



PLAN

48" TYPE I OR II SEWER MANHOLE

CITY OF ARLINGTON	APPROVED BY	L. OLIVE	*DEPARTMENT OF PUBLIC WORKS* STANDARD DETAIL
	DATE	07/31/2008	
	REF STAD SPEC		MONITORING MANHOLE

STANDARD DETAIL NUMBER

SS–130